

Implementing Shorebird Conservation on Public Lands

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Abstract: Working toward fulfilling regional habitat objectives for migratory shorebirds, the Kentucky Department of Fish and Wildlife Resources (KDFWR) constructed moist soil units on three Wildlife Management Areas (WMA) to specifically be managed for stopover habitat. Units either were converted from agriculture land and fitted with water pumps or constructed at the base of a hill to collect rainwater. The most commonly observed shorebirds using these sites and other available habitat on the WMAs were killdeer (*Charadrius vociferus*), pectoral sandpiper (*Calidris melanotos*), and lesser yellowlegs (*Tringa flavipes*). Managing for shallow water habitat on public lands, particularly during fall migration and/or drought years, is key to ensuring that priority shorebirds arrive on the wintering or breeding grounds in good condition. Recommendations include considerations of spatial placement and topography of shorebird units, control of vegetation, and monitoring protocols.

Key words: Kentucky, shorebird, stopover habitat, moist-soil unit, managed land

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Coordinated conservation of migratory birds began in 1986 with the signing of the North American Waterfowl Management Plan (NAWMP), which set population objectives for waterfowl and a process to achieve these objectives. Recognizing that migratory waterfowl also require quality habitat while at staging and wintering grounds, the NAWMP was updated in 1998 to include migration and wintering habitat objectives based upon flyway population objectives that were stepped down to the Joint Ventures that are bird conservation partnerships originally established to support the implementation and achievement of the NAWMP objectives. As of 2003, NAWMP partners have protected or restored over 5.3 million ha of habitat (NAWMP 2004). With the success of the NAWMP, other bird conservation plans have followed this habitat modeling approach.

The U.S. Shorebird Conservation Plan (USSCP) is a multi-partner plan dedicated to promoting conservation of priority shorebird populations and the unique habitats upon which they depend. Regional plans that step-down habitat objectives



Figure 1. The shorebird planning regions of Kentucky. The Appalachian Mountains Bird Conservation Region is not part of a shorebird-planning region at this time.

to the state or planning region have either been published or are in the planning stages (Brown et al. 2001). Because availability of habitat during fall migration is assumed to be the limiting factor for migrating shorebirds (Brown et al. 2001), habitat objectives are aimed at providing habitat on public land sufficient to accommodate all shorebirds in the region during southward migration. Habitat objectives are based on assumptions of population size, food density, and estimated stop over time (Elliott and McKnight 2001). Because Kentucky is a highly diverse state in terms of ecoregions, it falls within four shorebird planning regions (Figure 1): Lower Mississippi Valley/Western Gulf Coastal Plain (LMVWGC), Upper Mississippi Valley/Great Lakes (UPVGL), Southeastern Coastal Plain-Caribbean (SECP), and the Appalachian Mountains (for which there is no shorebird plan at this time).

The SECP shorebird-planning region has stepped-down coastal habitat objectives, and non-coastal objectives are pending (C. Hunter, USFWS, personal communication, May 2005). The LMVWGC shorebird-planning region, in which the extreme western portion of Kentucky lies (see Fig. 1), has stepped-down shorebird habitat objectives to its member states (Elliott and McKnight 2000). Kentucky's habitat objective in this planning region is 35 ha. However, recent research on validating assumptions indicates that these habitat objectives should be doubled at minimum (R. Wilson, USFWS, personal communication, May 2005). The UPVGL shorebird-planning region has set habitat objective for shorebirds and migratory waterfowl for the northern- and mid-latitude sections of this planning region. Kentucky is within the mid-latitude portion of this region where the habitat objective is 213,000 ha (de Szalay 2000) (Fig. 1).

Working toward fulfilling these habitat objectives, the Kentucky Department of Fish and Wildlife Resources (KDFWR) constructed moist soil units (MSUs) on three WMAs in western Kentucky to be specifically managed for shorebird stopover habitat (to the extent possible, both spring and fall migration).

Study Area

Shallow water MSUs were constructed on three Wildlife Management Areas (WMA) located in western and west-central Kentucky: Ballard/Boatwright, Sloughs, and Peabody WMAs. The Sauerherber unit of Sloughs WMA (hereafter referred to as Sloughs WMA) is a 1,215-ha area of agriculture fields and emergent and forested wetlands. The shorebird unit is a 6.5-ha area completed in 2002. Ballard and the adjacent Boatwright WMA (hereafter referred to as Ballard WMA) encompass a 6,760-ha area of agriculture fields, cypress swamps, and upland forest. The shorebird unit is an 8-ha impoundment built on the Boatwright portion of the WMA and construction was completed in fall 2003. Finally, Peabody WMA is a 14,170-ha area of reclaimed emergent wetlands and mine lands. The shorebird unit is approximately a 1-ha impoundment composed of 5 subunits that was completed in summer 2004.

These WMAs were selected for habitat projects because of their history of migratory bird use and waterfowl habitat management. Sites for construction of shorebird units were selected because they either were marginal agriculture land (Boatwright and Sloughs) or because the site was currently receiving shorebird use (Peabody).

Methods

Area managers recommended potential development sites based on suitability and management capabilities. On Sloughs and Ballard, agriculture fields were taken out of production and were dedicated to shorebird habitat. On Peabody WMA, a plot of land adjacent to a man-made lake was selected for shorebird habitat improvement. Units were designed to hold impounded water from either pumped or rain water. Low-head earthen levees (≤ 1 m) were constructed around the exterior of each unit by grading the interiors of the project sites with bulldozers and/or scrapper pans and utilizing the fill material for levee construction. Levees were built on three sides of each unit, with the side of highest elevation left un-impounded. Interior levees were constructed on the Peabody unit to form a total of five subunits with water control structures placed between the inner units.

Water pumps were installed in association with the units at Ballard and Sloughs WMAs. The Peabody unit was constructed at the base of a hill and designed to collect rainwater. Water control structures were installed in each unit which enables the WMA manager to drain or hold water at varying levels.

Areas were surveyed for shorebird use following the guidelines issued by the International Shorebird Survey, (ISS; shorebirdworld.org). In 2003, KDFWR biologists surveyed the Sloughs shorebird unit ($N = 23$) and other waterbirds utilizing the shorebird units were noted. The Sloughs WMA unit was the only unit surveyed in 2003 because it was the only one completed.

In 2004, KDFWR partnered with Eastern Kentucky University (EKU) to document shorebird use of and prey availability on public managed land. While this study is ongoing, we can report observations of shorebird species composition and

abundance at this time. The Ballard, Sloughs, and Peabody WMAs were surveyed, and protocol was expanded to include all available habitat on the WMAs (rather than just the shorebird units) and one tract of private land adjacent to Sloughs WMA. Units were surveyed every 10-day period during spring (mid March to mid June, $N = 10$) and fall (mid-July to 31 October, $N = 11$) migration for a total of 21 surveys per WMA.

Results

2003 surveys

A total of 1,954 individuals of 12 species were observed on the Sloughs WMA unit. The most abundant shorebird species were the pectoral sandpiper, killdeer, and lesser yellowlegs (Table 1). Pectoral sandpipers were observed only in the spring while lesser yellowlegs and killdeer were observed during spring and fall migration (Table 1). Killdeer were observed during both migration periods and throughout the summer. Both species of yellowlegs were observed during spring and fall migration, but not during the summer. The lesser yellowlegs was not observed from late May to late June, and the greater yellowlegs was not observed from mid-June to mid-July.

Waterfowl was the most abundant group taking advantage of the new shallow water habitats (Table 1). The majority of these birds were green-winged teal (*Anas crecca*) observed in April ($N = 2500$) on Sloughs WMA. Great blue herons were observed during the entire survey period while great egrets began using the Sloughs shorebird unit beginning in early June.

Other species observed on the Sloughs unit include greater yellowlegs ($N = 57$), semipalmated plover (*Charadrius semipalmatus*) ($N = 4$), solitary sandpipers (*Tringa solitaria*) ($N = 20$), spotted sandpiper (*Actitis macularia*) ($N = 28$), dowitch-

Table 1. Number and range of dates of the most commonly observed shorebirds and waterbirds in 2003 during International Shorebird Surveys ($N = 23$) on shorebird units on Sloughs Wildlife Management Area in western Kentucky.

| Species | <i>N</i> | Date range |
|--|----------|---------------|
| Shorebirds | | |
| Pectoral sandpiper (<i>Calidris melanotos</i>) | 800 | 15 Mar |
| Lesser yellowlegs (<i>Tringa flavipes</i>) | 311 | 15 Mar–16 Sep |
| Killdeer (<i>Charadrius vociferus</i>) | 236 | 3 Apr–15 Oct |
| Sanderling (<i>Calidris alba</i>) | 208 | 3 Apr–11 Aug |
| Semipalmated sandpiper (<i>Calidris pusilla</i>) | 137 | 3 Apr–11 Aug |
| Least sandpiper (<i>Calidris minutilla</i>) | 94 | 6 Jul–16 Sep |
| Waterbirds | | |
| Waterfowl | 2784 | 3 Apr–27 Oct |
| Great blue heron (<i>Ardea herodias</i>) | 123 | 3 Apr–27 Oct |
| Great egret (<i>Ardea alba</i>) | 75 | 5 Jun–10 Oct |

Table 2. Species and numbers of most commonly observed shorebirds in 2004 during International Shorebird Surveys ($N = 66$) of all available habitat on public land on Ballard, Sloughs, and Peabody WMAs in western Kentucky, separated by fall (mid-July to 31 October) and spring (mid-March to mid-June) migration.

| Species | Fall migration | Spring migration | Total observed |
|---|----------------|------------------|----------------|
| Killdeer | 2292 | 62 | 2354 |
| Pectoral sandpiper | 1363 | 25 | 1388 |
| Lesser yellowlegs | 51 | 354 | 405 |
| Least sandpiper | 391 | 14 | 391 |
| Greater yellowlegs | 29 | 161 | 190 |
| Semipalmated sandpiper | 154 | 22 | 176 |
| Solitary sandpiper | 64 | 15 | 79 |
| Semipalmated plover | 65 | 2 | 67 |
| Stilt sandpiper (<i>Calidris himantopus</i>) | 22 | 9 | 31 |
| Totals: | 4431 | 664 | 5081 |

ers (*Limnodromus* spp.) ($N = 8$), Wilson's snipe (*Gallinago gallinago*) ($N = 51$), cattle egret (*Bubulcus ibis*) ($N = 12$), snowy egret (*Egretta thula*) ($N = 12$), green heron (*Butorides virescens*) ($N = 36$), and sora rail (*Porzana carolina*) ($N = 1$).

2004 Surveys

In 2004, a total of 5,106 shorebirds representing 23 species was observed on Ballard, Sloughs, and Peabody WMAs. Killdeer, pectoral sandpiper, lesser yellowlegs and least sandpiper were the most commonly observed birds (Table 2). Other shorebirds observed were spotted sandpiper ($N = 29$), peeps (*Calidris* spp.) ($N = 22$), dunlin (*Calidris alpina*) ($N = 21$), Wilson's snipe ($N = 6$), western sandpiper (*Calidris mauri*) ($N = 5$), buff-breasted sandpiper (*Tryngites subruficollis*) ($N = 4$), willet (*Catoptrophorus semipalmatus*) ($N = 4$), black-necked stilt (*Himantopus mexicanus*) ($N = 3$), Baird's sandpiper (*Calidris bairdii*) ($N = 3$), Wilson's phalarope (*Phalaropus tricolor*) ($N = 2$), short-billed dowitcher (*Limnodromus griseus*) ($N = 1$), and Black-bellied plover (*Pluvialis squatarola*) ($N = 1$).

Discussion

In both 2003 and 2004, killdeer, pectoral sandpiper, and lesser yellowlegs were the most commonly observed shorebirds on both the shorebird units as well as nearby public and private lands. All of these species are important for varying reasons. Killdeer is currently a common and abundant species; however, long-term population trends indicate that the species is experiencing population declines and is of moderate concern (Brown et al. 2001). The pectoral sandpiper is a responsibility species for inland and managed wetlands in eastern planning regions (U.S. Shore-

bird Conservation Planning Summit, Galveston, Texas, February 2005). A responsibility species is one that the area supports a large portion of the population (for Kentucky, this time is during migration). The lesser yellowlegs is listed as a species of conservation concern on several lists including KDFWR's Wildlife Action Plan (hereafter referred to as the Conservation Plan).

In 2003, shorebird surveys were conducted on one completed shorebird unit. The following year the survey was expanded to include all available habitat (mostly agricultural fields) on the management areas and one private agricultural field adjacent to Sloughs WMA. As expected, we observed several more shorebird species in 2004 than in 2003; however, killdeer, pectoral sandpiper, and lesser yellowlegs were still the most commonly-observed birds. This observation indicates that the shorebird units may be providing similar habitat to flooded agriculture fields (except for the Peabody unit, the shorebird units were agriculture fields prior to this project). Other than mudflats and sandbars on the Mississippi, Ohio, Tennessee, and Cumberland rivers, agricultural land seems to provide the best shorebird habitat in Kentucky. Annual tilling disturbs vegetation and provides the bare ground or sparsely vegetated areas that shorebirds require, while spring flooding provides access to invertebrate resources. During drought years and fall migration, however, agriculture fields do not provide sufficient habitat. Therefore, our goal with the shorebird units is to gain the ability to provide water on agriculture-type fields in drought years and during migration to ensure that we provide habitat for transient shorebirds each year. Historically, fluctuating water levels and flooding events on large river systems provided stopover habitat for migrating shorebirds; however, dams and river channelization have reduced the variability and frequency of occurrence of these disturbance events. Therefore, managing for shallow-water habitat on public lands, particularly during drought years, is key to ensuring that priority shorebirds arrive on the wintering or breeding grounds in good condition.

Although there can be conflicts in managing for winter waterfowl resources and fall shorebird habitat, we found that these objectives are not mutually exclusive. Although we have not been able to quantify the possible effects to waterfowl resources, we believe that by taking poorly producing agricultural land out of production (as with Ballard and Sloughs WMAs), we were able to increase the diversity of habitats on WMAs without compromising our ability to provide high-energy crops for wintering waterfowl.

Another opportunity to provide shorebird habitat may be to intersect run-off water. At Peabody WMA, we constructed an impoundment at the base of a hill adjacent to a man-made lake (remnant from a mining operation). This design allows the unit to collect rainwater, while water control structures allow for the manipulation of water levels. This unit has five subunits so that water can be transferred from one basin to the next as needed. This kind of design should allow land managers to increase the diversity of water levels the area can provide, depending upon priority species.

Recommendations

The spatial placement of managed units within the matrix of public and private land is very important. The units on Boatwright and Sloughs WMA must drain through private agriculture land in order to lower water levels in the unit. At the time that units should begin draw-down (late June for Kentucky); crops are still growing on private land and are vulnerable to flooding. In this case, the best management plan for these areas is to fill the units after peak spring migration and allow evaporation to draw down the water level; however, the success of this plan is dictated by weather conditions. The down side of this approach is that these units may become more vulnerable to colonization of undesirable vegetation (such as cattails and cocklebur), poor water quality, and avian disease such as botulism (Helmert 1992).

Topography is critical to providing maximum habitat in designated units. It may be beneficial to survey the proposed site prior to establishing a unit. We found that even with a very mild slope, it was difficult to get two inches of water across the units. Future plans for these sites include creating small depressions within the unit in order to maximize shallow water habitat.

Finally, control of aggressive or invasive vegetation on these sites may be difficult. Staff at Sloughs WMA are now utilizing conventional tillage agriculture equipment (tractor and disk) to disturb the site to maintain approximately 50% bare ground component within the project because decomposing vegetative matter is an excellent medium for invertebrate growth (Helmert 1992). Care must be taken not to bury vegetation too deep when using mechanical means to remove vegetation. A shallow disk is preferable so that the decomposing matter and the invertebrates that feed upon it are available to shorebirds. Even with the ability to disturb the soil in these units, summer-time growth of weedy vegetation makes it difficult to meet the objective of providing sparsely vegetated habitat for fall migration.

Phenology of shorebird migration and knowledge of wintering sites is limited. It may be advisable for southeastern states to include a winter survey period during initial surveillance monitoring programs. Preliminary evidence suggests that Kentucky may over winter populations of least sandpipers (H. Chambers, Kentucky Ornithological Society, personal communication, 2004) and dunlin in Tennessee (H. Hill, Tennessee Valley Authority, personal communication, 2005).

By creating or improving habitat for transient shorebirds in Kentucky, KDFWR is working toward fulfilling regional habitat objectives that are based on the amount of habitat necessary to support shorebird populations migrating through this region. The creation of "shorebird units" on public lands not only benefits shorebirds, but we found that waterfowl and waterbirds also benefited from this type of wetland restoration. However, we still have a long way to go in terms of meeting habitat objectives, and these units will serve best as teaching tools for shorebird habitat management. Because of the lessons we have learned from the successes and failures associated with these units, KDFWR is better prepared to design more habitat improvement projects that will not only provide critical habitat for transient shorebirds, but other waterbird species as well.

Kentucky's Conservation Plan heavily emphasizes the need to manage for all birds across all habitats in all life stages. To that end, KDFWR's list of species in greatest conservation need includes rare breeding birds, common breeding birds experiencing long-term declines, and transient and/or wintering birds. Implementing habitat projects such as the one just described will be critical in achieving the ambitious goals set forth in Kentucky's Conservation Plan.

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