

Integrated Migratory Bird Planning in a Corps of Engineers' Irrigation Project, Bayou Meto, Arkansas¹

Allan J. Mueller², Hayley M. Dikeman³, Thomas L. Edwards⁴,
Robert S. Holbrook⁵, and Karen L. Rowe⁶

Abstract

The Bayou Meto Agricultural Irrigation Project, in the Mississippi Alluvial Valley, is currently being studied by the U.S. Army Corps of Engineers in eastern Arkansas. As part of the planning process the Arkansas Field Office of the U.S. Fish and Wildlife Service and the Arkansas Game and Fish Commission wrote a migratory bird management plan for the Bayou Meto project area. This plan addressed the needs of four bird groups: forest breeding birds, shorebirds, waterfowl, and wading and marsh birds. For the first three bird groups the plan applies the recommendations of the Mississippi Alluvial Valley Migratory Bird Initiative to the project area. The Mississippi Alluvial Valley Migratory Bird Initiative made quantified, landscape level recommendations for the habitat needs for these three bird groups. These habitat recommendations were "stepped down" to the Bayou Meto area. To conserve forest-breeding birds, we recommended reforestation of key tracts in the Big Ditch Forest Bird Conservation Area. This reforestation would also create habitat for wintering waterfowl. We recommended increasing shorebird habitat through a landowner incentive program to create mud flat habitat in dewatered aquaculture ponds during fall shorebird migration. Because the North American Waterbird Conservation Plan had not yet produced habitat recommendations useful for this area, we recommended surveys for wading and marsh birds. We need to know what species of secretive marsh birds are currently using the area before we can proceed to conservation recommendations. We also need to know the locations of wading bird breeding colonies to properly protect and manage them. This project shows how regional goals for priority bird species from various plans can be integrated during implementation at the local level.

Key words: irrigation, marsh birds, shorebirds, wading birds, waterfowl, wetlands.

Introduction

The U.S. Army Corps of Engineers, Vicksburg and Memphis Districts, is conducting a study of the agricultural irrigation and flood control needs in the Bayou Meto basin, Arkansas. This study could lead to a large water management project that would take water from the Arkansas River and distribute it to farms throughout the project area and construct levees or channel modifications to control flooding in the southern part of the basin. Migratory bird management is an important consideration in the design of this project. The Arkansas Game and Fish Commission's (AGFC) Bayou Meto Wildlife Management Area (BMWMA) is the most important wildlife habitat in the basin and has been managed primarily to provide habitat for waterfowl. This area also provides substantial habitat for other migratory birds including songbirds, shorebirds, and wading birds. We set habitat goals for migratory birds throughout the Bayou Meto basin.

Methods

Migratory birds can be divided into four groups: shorebirds, waterfowl, land birds, and other water birds (wading and marsh birds). The Mississippi Alluvial Valley Migratory Bird Initiative quantified the habitat needs of shorebirds, waterfowl, and songbirds in the MAV (Hunter et al. 1996, Mueller 1996, Twedt et al. 1999, Loesch et al. 2000, Mueller et al. 2000, Mueller et al. in press). Elliott and McKnight (2000) provided additional information on shorebirds, and the North American Waterbird Conservation Plan southeast working group is preparing a plan that will address the needs of wading and marsh birds. We "stepped down" the goals from these plans to derive habitat recommendations for migratory birds in the Bayou Meto basin and made recommendations for their implementation through the Corps of Engineers' project.

¹A version of this paper was presented at the **Third International Partners in Flight Conference, March 20-24, 2002, Asilomar Conference Grounds, California.**

²U.S. Fish and Wildlife Service, Arkansas Field Office, 1500 Museum Road, Suite 105, Conway, AR 72032. E-mail: allan_mueller@fws.gov.

³U.S. Fish and Wildlife Service, Tulsa Field Office, 222 S. Houston, Suite A, Tulsa, OK 74127.

⁴U.S. Fish and Wildlife Service, 110 Industrial Street, Hazen, AR 72064.

⁵Arkansas Game and Fish Commission, 807 Country Club Road, Sherwood, AR 72120.

⁶Arkansas Game and Fish Commission, Route 2, Box 160, DeWitt, AR 72042

Study Area

The Bayou Meto basin is part of the Mississippi Alluvial Valley physiographic area. A 310,127 ha portion of the basin, including portions of Lonoke, Jefferson, Prairie, Arkansas, and Pulaski Counties (fig. 1), is the subject of this study. Historically bottomland hardwood forest dominated the basin (MacDonald et al. 1979). Wetter portions of the basin were, and for the most part still are, vegetated with bald cypress (*Toxodium distichum*), water tupelo (*Nyssa aquatica*), and overcup oak (*Quercus lyrata*). Drier, but still flood prone, portions of the basin had water oak (*Q. nigra*), willow oak (*Q. phellos*), Nuttall oak (*Q. Nuttallii*), green ash (*Fraxinus pensylvanica*), and other hardwood species. Most of the forest outside of the BMWMA has been cleared, and the basin is now dominated by agriculture. Rice, winter wheat, corn, and sorghum are the major crops.

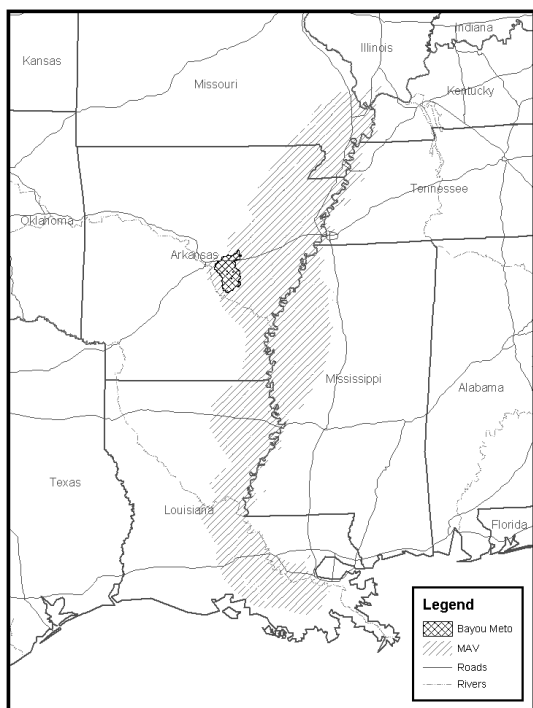


Figure 1— Location of Bayou Meto Study Area.

Results

Shorebirds

Few shorebirds breed (Killdeer [*Charadrius vociferus*], American Woodcock [*Scolopax minor*]) or winter (Least Sandpiper [*Calidris minutilla*], Killdeer, Lesser Yellowlegs [*Tringa flavipes*], Common Snipe [*Gallinago gallinago*]) in the Bayou Meto basin. The most common transient species are Pectoral Sandpiper (*Calidris melanotos*), American Golden-Plover

(*Pluvialis dominica*), Solitary Sandpiper (*Tringa solitaria*; Short 1999), Western Sandpiper (*C. mauri*), and Greater Yellowlegs (*T. melanoleuca*). During spring migration the combination of frequent rain and bare agricultural fields usually provides adequate shorebird habitat. During fall migration (July-September) there is little rain and almost all fields are covered with crops. Consequently, conservation planning has focused on shorebird habitat needs during this period (Twedt et al. 1999).

The habitat goal for shorebirds in the MAV is 2,000 ha of mudflat (Twedt et al. 1999) available for feeding during fall migration. This has been further stepped down to a need for 520 ha in Arkansas (table 1). Currently 149 ha of fall mud flat habitat is being provided on national wildlife refuges in Arkansas (Bald Knob, Oakwood, Overflow, and Wapanocca), none of which are in the Bayou Meto basin. An unknown amount of mud flat habitat is provided on public lands incidental to other management actions. The remainder (371 ha) of the fall Arkansas shorebird habitat goal is unmet at this time.

Table 1— Shorebird habitat goals in the Mississippi Alluvial Valley Bird Conservation Region.

State	Hectares
Arkansas	520
Illinois	70
Kentucky	35
Louisiana	520
Mississippi	600
Missouri	70
Tennessee	185
Total	2,000

Fall shorebird habitat in the Bayou Meto basin is present in very limited amounts. Drying of streams and lakes creates low quality mud flats that quickly dry up or grow up in herbaceous vegetation. The normal management regime of fish hatcheries and aquicultural facilities creates high quality shorebird habitat when ponds are drained for cleaning and refurbishing. The ponds are high in nutrients and, consequently, have a high population of benthic invertebrates, the prime food source for shorebirds (Baldassarre and Fischer 1984, McCollough 1981, Schneider and Harrington 1981). Ponds are drained throughout the year so their occurrence during the southward shorebird migration period is accidental and not assured. Also during the typically hot fall migration period (July-September) the drained ponds rapidly dry up, destroying their mud flat characteristics.

The AGFC's Joe Hogan Fish Hatchery is in the Bayou Meto basin, and the University of Arkansas at Pine

Bluff (UAPB) owns 13 fish ponds (approximately 81 ha) near Lonoke. The management of these facilities could be modified to provide a small amount of fall shorebird habitat. The UAPB ponds need renovating at a cost of approximately \$800/ha (pers. comm. Carole Ingle, UAPB). After renovation these ponds could be used by UAPB to research the management of agricultural irrigation reservoirs to provide fisheries habitat, with possible income to farmers from sport fishing, and also to provide fall shorebird habitat. Our current recommendations for the design of irrigation ponds to increase their value as fish and wildlife habitat include:

- Provide multilayered woody and herbaceous vegetation down to the water’s edge on one or more sides.
- Create variable bottom topography – deep holes and shallow edges.
- Create islands inside the reservoir.
- Provide gradual bottom slopes.
- Construct variable side slopes, some gradual (<20H:1V) and some steep (>4H:1V).
- Construct islands and sinuous or irregular shorelines with peninsulas.

Each of these design features, and others, could be investigated by UAPB to determine their usefulness for creating fish and wildlife habitat in irrigation reservoirs. Once established, these design features and complimentary management techniques could be applied throughout eastern Arkansas, where the number of irrigation reservoirs is rapidly increasing.

The potential exists to provide a much greater amount of fall shorebird habitat on the privately owned aquaculture farms in the basin. The Bayou Meto basin has approximately 6,450 ha of catfish and baitfish farm ponds. A partnership-based financial incentive program could be formed to assure that each farm would drain one or more ponds during the fall shorebird migration period and maintain 1 to 4 inches of water in the pond(s) to provide prime mud flat feeding areas. Both the AGFC and the Fish and Wildlife Service have private lands biologists already on staff that could

effectively deliver such a program.

Waterfowl

Arkansas is a major wintering area for waterfowl, especially dabblers, and achieving its waterfowl habitat goals (table 2) is critical to the North American waterfowl population (Loesch et al. 2000). The Mallard (*Anas platyrhynchos*) is the most abundant duck with Gadwall (*A. strepera*), Northern Shoveler (*A. clypeata*), American Wigeon (*A. americana*), Northern Pintail (*A. acuta*), and Green-winged Teal (*A. crecca*) also common wintering species.

The statewide waterfowl habitat goals have not been stepped down to the Bayou Meto basin, but goals have been established for individual parcels of public land, including BMWMA. Unmet habitat goals for wintering waterfowl in the Arkansas portion of the MAV remain for bottomland hardwood forest and moist soil (table 2). Within the BMWMA the goal is to maintain at least 7,462 ha of bottomland hardwood forest with water management capability and 354 ha of moist soil management. Currently, the management area has the ability to control water levels on only 6,390 ha of bottomland hardwoods, leaving a deficit of 1,072 ha. Managers also have the option of maintaining moist soil vegetation on 428 ha, although variations in water management capabilities and rainfall patterns result in only 257 ha being managed in any given year. This leaves a moist soil management deficit of 97 ha in the BMWMA. Any increase in bottomland hardwood forest or moist soil management in the BMWMA or elsewhere in the basin would contribute to the overall Arkansas goals. Moist soil management requires careful annual attention and the ability to regulate water levels.

Consequently, moist soil management will usually be applied only on public lands. On the other hand, bottomland hardwood reestablishment requires a large initial effort (planting and hydrology restoration as needed), but little annual effort. This makes bottomland hardwood restoration practical on both private and public lands.

In some years, water management on the BMWMA conflicts with adjacent farms. The inability to move

Table 2—Duck habitat goals (ha) in the Arkansas portion of the Mississippi Alluvial Valley.

Habitat	Private land	Private-managed		Private-unmanaged	
	Goal	Achieved (All habitat types)	Goal	Achieved	Goal (Duck-use-days)
Bottomland Hardwoods ^a	35,026	32,743	84,018	81,000	45,194,800
Moist Soil	2,853	1,017			
Unharvested Crop	1,250	1,219			
Harvested Crop	0	980			

^aMust have water management capability.

water quickly through the BMWMA sometimes causes flooding of adjacent cropland, preventing or delaying harvest or planting.

This situation could be resolved by improving the water management capability on the BMWMA or by reforesting the cropland. Ducks Unlimited, in cooperation with state and federal agencies, does the only other waterfowl management in the basin, consisting of agreements with private landowners to winter flood 292 ha of harvested cropland.

Forest Breeding Birds

Because the MAV was historically dominated by bottomland hardwood forest, the Mississippi Alluvial Valley Migratory Bird Initiative concentrated on forest breeding birds as the group of songbirds most in need of conservation action. Using the Partners in Flight priority system (Carter et al. 2000), 16 of the 20 species ranked as high overall concern use bottomland hardwood forest for breeding (table 3). The Mississippi Alluvial Valley Migratory Bird Initiative identified over 100 Forest Bird Conservation Areas (FBCA)

throughout the Mississippi Alluvial Valley (Twedt et al. 1999) to meet the needs of forest breeding birds. Some of these FBCAs only require protection, but most of them require some level of reforestation to achieve the desired patch size.

Two FBCAs are in the Bayou Meto basin, the Big Ditch and Bayou Meto FBCAs (fig. 2). To the extent practical, each FBCA should be an unbroken stand of forest. This was established to reduce or eliminate the adverse effects of forest fragmentation on forest breeding bird success. To be assured of long term, secure populations, many forest breeding birds require “core” or interior forest, that is habitat some distance from the forest edge (Rosenfield et al. 1992). The Bayou Meto FBCA meets its forest goals. The Big Ditch FBCA meets the total forest area goal, but is lacking in core forest (table 4). Reforestation of key tracts in the Big Ditch FBCA would reduce fragmentation and enable the core forest goal to be met with a relatively small amount of reforestation. Bottomland hardwood forest restoration for forest breeding birds would also help meet that goal for waterfowl.

Table 3— High Overall Priority Breeding Bird Species in the Mississippi Alluvial Valley Bird Conservation Region.

Species	Partners in Flight priority score
Bachman's Warbler (<i>Vermivora bachmanii</i>)	35 – BLH ¹
Ivory-billed Woodpecker (<i>Campephilus principalis</i>)	35 – BLH
Prothonotary Warbler (<i>Protonotaria citrea</i>)	28 – BLH
Swainson's Warbler (<i>Limnothlypis swainsonii</i>)	27 – BLH
Cerulean Warbler (<i>Dendroica cerulea</i>)	27 – BLH
Swallow-tailed Kite (<i>Elanoides forficatus</i>)	26 – BLH
Wood Thrush (<i>Hylocichla mustelina</i>)	25 – BLH
Mississippi Kite (<i>Ictinia mississippiensis</i>)	25 – BLH
Northern Parula (<i>Parula americana</i>)	24 – BLH
Red-headed Woodpecker (<i>Melanerpes eruthrocephalus</i>)	24 – BLH
Painted Bunting (<i>Passerina ciris</i>)	23
Bell's Vireo (<i>Vireo bellii</i>)	23
Worm-eating Warbler (<i>Helmitheros vermivorus</i>)	23
Orchard Oriole (<i>Icterus spurius</i>)	23 – BLH
White-eyed Vireo (<i>Vireo griseus</i>)	23 – BLH
Yellow-billed Cuckoo (<i>Coccyzus americanus</i>)	22 – BLH
Kentucky Warbler (<i>Oporornis formosus</i>)	22 – BLH
Ruby-throated Hummingbird (<i>Archilochus colubris</i>)	22 – BLH
Hooded Merganser (<i>Lophodytes cucullatus</i>)	22 – BLH
Dickcissel (<i>Spiza americana</i>)	22

¹BLH = Breeds in or requires bottomland hardwood forest as a component of breeding habitat.

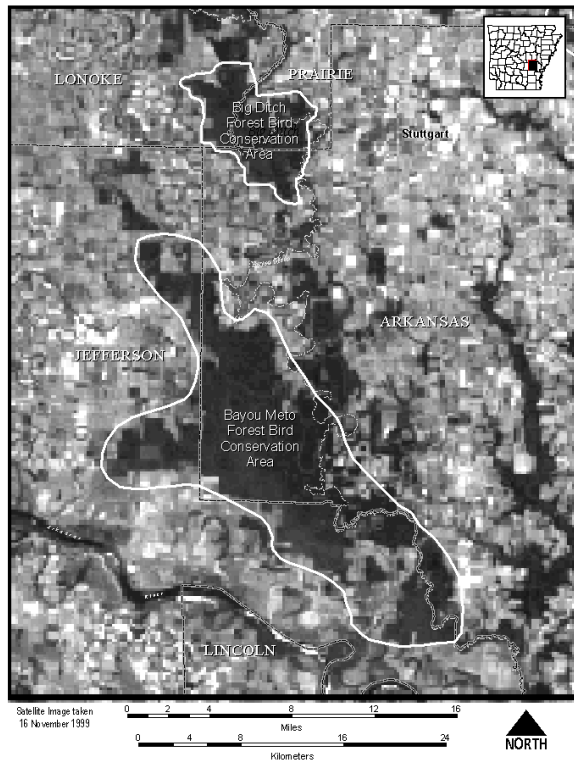


Figure 2— Forest Bird Conservation Areas in the Bayou Meto Study Area.

Reforestation under existing conservation programs has been limited in the Bayou Meto project area. Only one 22 ha tract has been reforested under the Wetland Reserve Program. Additional efforts will be required to accomplish the needed reforestation in the Big Ditch FBCA.

While establishing large, unbroken blocks of forest is the most important step in providing habitat for forest

breeding birds, other measures are also beneficial. Reforesting marginal agricultural lands would increase migratory bird, including waterfowl, habitat while only slightly reducing agricultural production. The two-year floodplain is difficult to farm and is a logical area in which to focus reforestation efforts. The recently established Conservation Reserve Enhancement Program, a cooperative effort between the AGFC and the U.S. Natural Resources Conservation Service, is an excellent program that could reforest much of the two-year floodplain. Additional marginal farmlands should be reforested by the irrigation project.

Wading and Marsh Birds

The North American Waterbird Conservation Plan is in the early stages of setting wading bird (herons, egrets, and bitterns) and marsh bird (rails, wrens, and moorhen) population and habitat goals for the nation and the southeast. At this time they have not produced any goals that can be applied to Bayou Meto. Wading and marsh bird occurrence in the project area is poorly known. Three wading bird breeding colony sites have been identified (table 5). Several other locations appear to be suitable to support breeding colonies, especially the BMWMA, yet no additional colonies are known.

Surveys to locate all breeding colonies are required. The locations of feeding concentrations points and fall and winter roosts would also be valuable information. The occurrence and distribution of marsh birds in the basin is almost totally unknown. This basic information must be gathered before an effective management plan can be formulated. A wading and marsh bird management plan would address the conservation needs of each species and any depredation problems identified in the basin.

Table 4—Forest area goals (ha) for the Big Ditch and Bayou Meto Forest Bird Conservation Areas.

	Forest goal	Existing forest	Core forest goal	Existing core forest
Big Ditch	4,000	4,346	2,100	897
Bayou Meto	8,100	21,216	5,200	6,325

Table 5—Wading bird colonies in the Bayou Meto project area¹.

Species/Colony ²	McSwain	Pine Tree	Preston Hamilton Reservoir
Great Blue Heron (<i>Ardea herodias</i>)	X		
Great Egret (<i>Ardea alba</i>)	X	X	X
Snowy Egret (<i>Egretta thula</i>)	X	X	X
Little Blue Heron (<i>Egretta caerulea</i>)	X	X	X
Cattle Egret (<i>Bubulcus ibis</i>)		X	
Green Heron (<i>Butorides virescens</i>)	X		
Black-crowned Night-Heron (<i>Nycticorax nycticorax</i>)	X		

¹Based on information provided by Michael Kearby, Wildlife Services, Stuttgart, AR.

²Colony locations available on request.

Recommendations

These recommendations are made in the spirit of the 1989 “Cooperative Agreement Between the Department of the Interior and the Department of the Army Regarding Waterfowl Habitat Conservation Opportunities Associated with Corps of Engineers Civil Works Projects and Activities Consistent with the North American Waterfowl Management Plan.” The habitat recommendations of the Mississippi Alluvial Valley Migratory Bird Initiative were established in cooperation with the North American Waterfowl Management Plan.

1. As part of the irrigation and flood control project, the Corps of Engineers should fund an incentive based, partnership program to ensure the presence of shorebird habitat on privately owned aquaculture facilities during the fall shorebird migration period. This program would be delivered by existing staff of the U.S. Fish and Wildlife Service and the Arkansas Game and Fish Commission.
2. The Corps of Engineers should also fund the University of Arkansas at Pine Bluff to establish a research program to investigate the design and management of irrigation reservoirs to provide sport fish, shorebird, and waterfowl habitat.
3. Until the University of Arkansas at Pine Bluff produces new recommendations, design and manage irrigation reservoirs as described in this document.
4. Do not construct irrigation reservoirs in wetlands or wooded upland habitat.
5. Resolve water management issues associated with Bayou Meto Wildlife Management Area by improving its water management capability or by reforesting adjacent cropland.
6. Reforest key tracts in the Big Ditch Forest Bird Conservation Area to achieve the core forest area goal required for forest breeding birds. This reforestation would also contribute to meeting waterfowl habitat goals.
7. Design project features to be compatible with the Conservation Reserve Enhancement Program.
8. Coordinate with the Service and Arkansas Game and Fish Commission to fund the establishment of 97 ha of moist soil management on newly purchased agricultural lands adjacent to existing public land in Bayou Meto WMA.
9. Survey the entire project area to locate and census wading-bird breeding colonies, roost sites, and feeding concentration points.

10. Conduct surveys to identify the locations and species of marsh birds present in the project area.

Acknowledgments

M. Hoy and M. Kearby of Wildlife Services provided information from their field experience on the occurrence of wading birds in the project area. C. Ingle of the University of Arkansas at Pine Bluff provided information on their ponds near Lonoke. J. Besely developed the project area map. J. Phillips and R. Wilson provided valuable reviews of this paper.

Literature Cited

- Baldassarre, G. A. and D. H. Fischer. 1984. **Food habits of fall migrant shorebirds on the Texas High Plains.** *Journal of Field Ornithology* 55(2): 220-229.
- Carter, M. F., W. C. Hunter, D. N. Pashley, and K. V. Rosenberg. 2002. **Setting conservation priorities for landbirds in the United States: The Partners in Flight approach.** *Auk* 117(2): 541-548.
- Elliott, L. and K. Mcknight. 2000. **U.S. shorebird conservation plan, Lower Mississippi Valley/Western Gulf Coastal Plain.** See: <http://www.manomet.org/USSCP/files.htm>.
- Hunter, W. C., D. J., Twedt, K. Tripp, and M. S. Woodrey. 1996. **Development of management and assessment objectives for shorebirds within the Mississippi Alluvial Valley Migratory Bird Initiative.** In: *Proceedings of The Delta: Connecting points of view for sustainable natural resources conference*; 1996 Aug. 13-16; Memphis, TN; 127-137.
- Loesch, C. R., D. J. Twedt, K. Tripp, W. C. Hunter, and M. S. Woodrey. 2000. **Development of management objectives for waterfowl and shorebirds in the Mississippi Alluvial Valley.** In: R. Bonney, D. N. Pashley, R. J. Cooper, and L. Niles, editors. *Strategies for bird conservation: The Partners in Flight planning process*; 1995; Cape May, NJ. *Proceedings RMRS-P-16*, Ogden, UT: Rocky Mountain Research Station, Forest Service, U.S. Department of Agriculture; 8-11. See: <http://birds.cornell.edu/pifcapemay>.
- MacDonald, P. O., W. E. Frayer, and J. K. Clauser. 1979. **Documentation, chronology, and future projections of bottomland hardwood habitat loss in the lower Mississippi Alluvial Plain.** Vicksburg, MS: U.S. Fish and Wildlife Service report.
- McCullough, M. A. 1981. **The feeding ecology of migratory Semipalmated Sandpipers, Short-billed Dowitchers, Semipalmated Plovers, and Black-bellied Plovers on staging areas in eastern Maine.** Orono: University of Maine; 36 p. MS Thesis.
- Mueller, A. J. 1996. **Development of a conservation strategy for forest breeding birds in the Mississippi Alluvial Valley.** In: *Proceedings of The Delta: Connecting points of view for sustainable natural resources conference*; 1996 Aug. 13-16; Memphis, TN; 81-94.

Migratory bird planning – Mueller et al.

- Mueller, A. J., D. J. Twedt, and C. R. Loesch. 1999. **Development of management objectives for breeding birds in the Mississippi Alluvial Valley.** In: R. Bonney, D. N. Pashley, R. J. Cooper, and L. Niles, editors. *Strategies for Bird Conservation: The Partners in Flight Planning Process*; 1995; Cape May, NJ. Proceedings RMRS-P-16, Ogden, UT: Rocky Mountain Research Station, Forest Service, U.S. Department of Agriculture; 12-17. See: <http://birds.cornell.edu/pifcapemay>.
- Mueller, A. J., D. J. Twedt, S. E. Mott, C. K. Baxter, C. R. Brown, R. J. Cooper, R. P. Ford, P. B. Hamel, W. C. Hunter, D. N. Pashley, and M. S. Woodrey. In press. **Migratory bird conservation planning in the Mississippi Alluvial Valley.** 1999 Partners in Flight meeting, Biloxi, MS.
- Rosenfield, R. N., C. M. Morasky, J. Bielefeldt, and W. L. Loope. 1992. **Forest fragmentation and island biogeography a summary and bibliography.** Technical Report NPS/NRUW/NRTR-92/08. Denver, CO: National Park Service, U.S. Department of the Interior; 52 p.
- Schneider, D. C. and B. A. Harrington. 1981. **Timing of shorebird migration in relation to prey depletion.** *Auk* 98(4): 801-811.
- Short, M. R. 1999. **Shorebirds in western Tennessee: migration ecology and evaluation of management effectiveness.** Knoxville, TN: University of Tennessee; 145 p. MS Thesis.
- Twedt, D. J., D. N. Pashley, W. C. Hunter, A. J. Mueller, C. R. Brown, and R. P. Ford. 1999. **Partners in Flight bird conservation plan for the Mississippi Alluvial Valley.** See: http://www.blm.gov/wildlife/plan/MAV_plan.html.