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Wildlife Benefits of the Wetlands Reserve Program

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Abstract

Since its initial authorization in 1990, more than 1.6 million acres of primarily drained or degraded wetlands on agricultural lands have been enrolled in the U.S. Department of Agriculture's (USDA) Wetlands Reserve Program (WRP). The Natural Resources Conservation Service (NRCS) and its partners are working with landowners to restore these lands to ecologically productive wetland and upland buffer habitats. Numerous studies have documented the value of restored and created wetlands to fish and wildlife resources. However, few objective studies have been completed that document fish and wildlife response to wetlands enrolled in and restored through WRP. Preliminary results of some studies underway indicate that wildlife use of WRP sites is comparable to or exceeds that of non-program restored wetland habitats. In addition, anecdotal reports on some WRP restored wetland complexes indicate that wildlife response has been greater than expected. Additional studies are needed to enable WRP program managers and participants to better understand how lands enrolled in the program affect local fish and wildlife use and the landscape factors that affect wildlife community dynamics and population trends influenced by the lands enrolled. Elements of USDA's Conservation Effects Assessment Project are intended to begin addressing this need.

Introduction

The Conservation Title of the 1985 Food Security Act represented a major shift in U.S. Department of Agriculture (USDA) agricultural policy toward emphasis on conservation of soil, water, and wildlife resources in agricultural landscapes (Myers 1988, Heimlich et al. 1998). The 1990 Farm Bill's amendments to the 1985 conservation provisions included establishment of the Wetlands Reserve Program (WRP), which provides incentives for restoration of wetlands previously impacted by agricultural development. A detailed description of the program is available on-line at <<http://www.nrcs.usda.gov/programs/wrp/>>.

Wetlands have long been recognized for their value as productive wildlife



Mechanical excavation increases microtopographic complexity that benefits a diversity of wetland wildlife on WRP sites in the Arkansas River valley. (Kiah Gardner, Arkansas Game and Fish Commission)

habitats (Greeson et al. 1978). As part of a comprehensive review of Farm Bill contributions to wildlife conservation (Heard et al. 2000), Rewa (2000a) summarized the literature documenting wildlife response to wetland restoration and made inferences on the contribution of WRP to wildlife habitat potential. That report concluded that while actual wildlife use of WRP sites had not been well documented, the literature on wildlife use of other restored wetlands implies that many species are likely benefiting from WRP wetland habitats. While the lack of program-specific wildlife response data prevented the quantification of species population responses to the program at that time, the variety of wetland habitats established and the predicted wildlife response to these habitats based on studies in the literature implied that the program was providing tangible benefits to individuals and likely benefiting at least some wildlife populations.

This paper provides an update on WRP accomplishments and, while still quite limited, summarizes the available literature documenting the benefits of wetland restoration and management specific to WRP sites. Since the 2000 report was completed, a number of additional studies have been published that document fish and wildlife response to wetland restoration not associated with WRP sites.

Program Enrollment

Enrollment in WRP has expanded substantially since the 2000 report was produced. Under the 2002 Farm Bill's expanded enrollment cap of 2,275,000 acres, over 1,627,000 acres in 8,396 separate projects had been enrolled through September 2004. The majority of acres (80%) and projects (75%) in the program are enrolled under permanent easements, 14% of both acres and projects are enrolled under 30-year easements, and 10% of the projects encompassing 6% of the acres are enrolled under 10-year cost-share agreements. The average size of projects enrolled is approximately 194 acres. Landowners continue to show great interest in the program; 3,173 applications covering over 535,932 acres in fiscal year 2004 were not accepted due to funding limitations. Landowner interest in the program stems from a range of factors, including use of wetlands for hunting and their general interest in wildlife and natural beauty (Despain 1995, Blumenfeld 2003). Projects range in size from 2-acre prairie pothole sites to floodplain wetlands exceeding 10,000 acres. Assemblages of individual projects remain commonplace, especially in marginal flood-prone areas where clusters of projects have restored wetland complexes; 1 wetland complex in Arkansas exceeds 18,000 acres in area. Although projects are located in all 50 states and Puerto Rico, 8 states have enrollments of greater than 60,000 acres (Arkansas, California, Florida, Iowa, Louisiana, Mississippi, Missouri, Texas) and 16 states have more than 200 separate contracts (Arkansas, California, Illinois, Indiana, Iowa,

Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New York, Ohio, Oklahoma, South Dakota, Wisconsin) (Figure 1).

As stated in the 2000 report, a wide variety of wetland types are being restored under the program, ranging from southeastern bottomland hardwood forests to herbaceous prairie marshes to expansive floodplain wetlands to coastal tidal salt marshes. Physical restoration of wetland characteristics remains a high priority of the program. In addition, greater emphasis is being placed on establishing a diversity of surface features through mechanical treatment to mimic natural micro- and macro-topography and encourage development of a diversity of fish and wildlife habitat conditions.

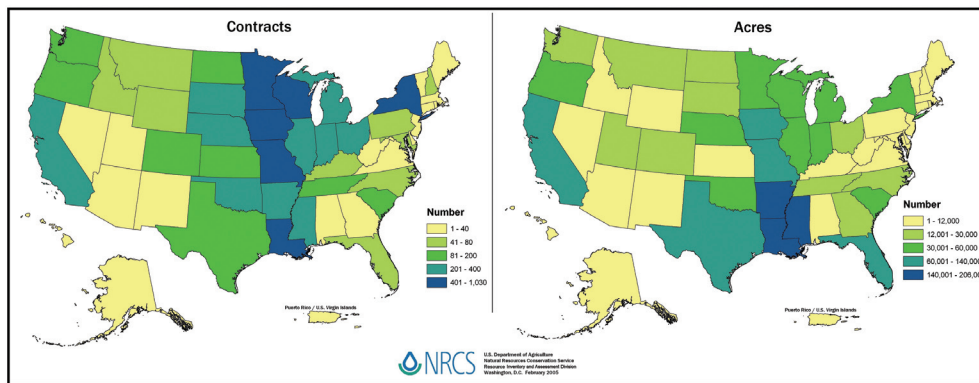


Figure 1. Distribution of total Wetlands Reserve Program contracts and acres enrolled through fiscal year (FY) 2004.

Actions taken to restore wetland conditions (e.g., plugging ditches, breaking tiles, installing water control structures, excavating meander swales, planting trees, etc.) are aimed at setting in place the natural processes that allow recovery of many wetland functions previously lost. While it may be many years or decades for most wetland functions to be restored, valuable habitat and other wetland functions can appear shortly after restoration actions are taken. Initial restored wetland condition may provide functions that are substantially different from the planned condition (NRC 2001). In documenting wildlife benefits resulting from WRP, it may take many years for studies to document the responses of wildlife species typically associated with mature forests to WRP-initiated bottomland hardwood restoration (Kolka et al. 2000). However, it is possible to document in a relatively short timeframe such wildlife responses as habitat created in early stages of wetland succession following restoration actions. In the case of bottomland hardwood forest restoration, studies have shown that birds associated with grasslands and scrub-shrub communities readily use these sites as they transition from open field to forested habitats (Twedt et al. 2002, Twedt and Best 2004). While there are still very few empirical studies that document wildlife response to WRP wetlands, this paper compiles existing data and identifies gaps in our understanding in this area.

Through WRP, Hay Lake in Arizona was restored to functional wetlands that filled with water during heavy rains in February 2005. (Rick Miller, Arizona Game and Fish Department)



Documented Wildlife Response to WRP Enrollments

Studies have shown how restoring wetlands results in recovery of wetland vegetation (Galatowitsch and van der Valk 1996, Sleggs 1997, Brown 1999); colonization by aquatic invertebrates (Reaves and Croteau-Hartman 1994, Dodson and Lillie 2001), fish (Langston and Kent 1997), and amphibians (Lehtinen and Galatowitsch 2001, Petranka et al. 2003); and use of restored habitats by wetland birds (Guggisberg 1996, Brown and Smith 1998, Brown 1999, Stevens et al. 2003, Brasher and Gates 2004) and other wildlife (see Rewa 2000a). While a number of investigations have been initiated to quantitatively document fish and wildlife use of WRP sites, few have been completed and published. Results from studies that are available indicate that wildlife response to WRP wetland sites is similar to wetlands restored through other programs.

Early unpublished reports also imply that in some instances, largely due to specific measures taken during the restoration process to maximize wildlife habitat values, wildlife response to wetlands restored through WRP has been greater than expected. Reports of significant wildlife response in areas where large wetland complexes are enrolled and restored are of particular note. Following are a few examples of informal reports of wildlife response to WRP sites from NRCS WRP contacts (L. Deavers, NRCS, personal communication):

- Restoration work on 1,500 acres of a 7,100-acre wetland complex enrolled in Indiana has attracted thousands of migrating sandhill cranes (*Grus canadensis*), large numbers of migrating ducks, and several species that are on Indiana's threatened and endangered species lists including the crawfish frog (*Rana areolata*), king rail (*Rallus elegans*), bald eagle (*Haliaeetus leucocephalus*), and Wilson's phalarope (*Phalaropus tricolor*).
- At a WRP site in northwestern Indiana, bird species have been sighted that have not been known to nest in Indiana for many years. Eighteen species that are on state threatened or endangered species lists have been sighted at this site.
- In 1998, a 2,800-acre area in South Florida was enrolled in WRP; the row crops that occupied the site have since been replaced by marsh vegetation. The resulting mosaic of vegetation types provides high-quality habitat for a diversity of wetland-dependent species including many listed species. The deep marsh habitat is being used by migratory waterfowl, including northern pintails (*Anas acuta*), mottled ducks (*Anas fulvigula*), ring-necked ducks (*Aythya collaris*), northern shovelers (*Anas clypeata*), American wigeon

(*Anas americana*), and blue-winged teal (*Anas discors*). These deep marsh areas also provide feeding opportunities for the federally listed Everglades snail kite (*Rostrhamus sociabilis*) and bald eagle. Shallow marsh areas provide habitat for many wading bird species, including the wood stork (*Mycteria americana*), a federally listed species, and the snowy egret (*Egretta thula*), little blue heron (*Egretta caerulea*), tricolored heron (*Egretta tricolor*), white ibis (*Eudocimus albus*), and limpkin (*Aramus guarauna*), all species of special concern in Florida.

- A 4,000-acre WRP wetland complex in Minnesota recently restored through the involvement of 12 separate landowners has induced the return of a tremendous amount of migratory and resident wildlife species. Dozens of wetland wildlife and upland species have been noted, including sandhill crane, ducks and geese, greater prairie-chicken (*Tympanuchus cupido*), numerous songbirds, moose (*Alces alces*), butterflies, and the federally threatened western fringed prairie orchid (*Platanthera praeclara*).
- WRP easements at Raft Creek in Arkansas have been noted for substantial wildlife response. These restored wetlands have been used by many ducks, shorebirds, and other birds that are indigenous to Arkansas as well as many species seldom seen in the state. As many as 50 brown pelicans (*Pelecanus occidentalis*) were observed to have spent part of the summer months at this site. This site has also been known to be host to an estimated 20% of all ducks that pass through Arkansas during some period of the migration season, and rare species have been sighted.
- Through WRP, a group of landowners in southeastern Oklahoma have restored a nearly 7,500-acre wetland complex adjacent to the Red River known as Red Slough. Red Slough is now recognized within the state and region as a birdwatcher's paradise. Within 2 years of restoration, 254 species of birds were recorded at the site. Birds only rarely seen in the state are becoming common during seasonal visits to Red Slough. Unusual or first-time records of birds nesting in Oklahoma, such as wood storks, white ibis, willow flycatchers (*Empidonax traillii*), roseate spoonbills (*Ajaia ajaja*), and black-necked stilts (*Himantopus mexicanus*) have been documented. Migratory and wintering waterfowl numbers at Red Slough and nearby wetlands have exceeded 100,000 birds. Other examples of use of this wetland complex by rare species include the first nesting record of common moorhens (*Gallinula chloropus*) in the county (Heck and Arbour 2001a), as many as 350 wood storks at the site at one time, the highest number ever recorded in Oklahoma (Heck and Arbour 2001b), and estimates of hundreds of yellow rails (*Coturnicops noveboracensis*) (P. Dickson, Louisiana Ornithological Society, personal communication).

Hicks (2003) studied wildlife use of early successional habitats provided by bottomland hardwood wetlands restored through WRP in the Cache River watershed in southern Illinois. Surveys conducted in 2002 and 2003 documented use of WRP wetlands by 18 species of waterfowl, 9 shorebird groups, 5 marsh bird species, and 8 wading bird species. Mean densities within each taxa were at least comparable between WRP and reference wetlands; mean waterfowl density on WRP sites in 2003 exceeded mean waterfowl density on reference sites. Species richness for shorebirds, wading birds, and marsh birds on WRP sites did not differ from reference sites (Hicks 2003). These data indicate that early successional wetland habitats provided by WRP enrollments following restoration are providing tangible benefits to local wildlife communities.

Documented waterfowl use of restored WRP wetland sites in the Oneida Lake Plain of central New York show similar results (M. R. Kaminski and G. A. Baldassarre, State University of New York, unpublished data). A 2-year field study (2003–2004) examining waterfowl production in these wetlands showed that mallard (*Anas platyrhynchos*) productivity in WRP wetland and upland sites was greater than on comparable non-WRP nesting sites. Although sample sizes were small, hen success rate on WRP restored wetlands (3 of 3 nests succeeded) and grasslands (3 of 6 nests succeeded) appeared to exceed hen success rate on non-WRP wetlands (2 of 4 nests succeeded) and grasslands (2 of 8 nests succeeded).



WRP has been a major tool for restoring wetlands for migratory birds in California's Central Valley. A diversity of microtopographic conditions provides both open water and emergent vegetation. (Alan Forkey, NRCS)

Harris (2001) studied bird use of 21 semi-permanent and spring-seasonal restored wetlands in California's Sacramento Valley, 5 of which were sites enrolled in WRP (P. A. Morrison, U.S. Fish and Wildlife Service, personal communication). This study found that these restored wetlands attracted diverse bird communities, with species richness greater on semi-permanent restored wetlands than on spring-seasonal sites. Wetland obligate bird species were associated with greater water depths and wetland size (Harris 2001).

Preliminary data from work investigating anuran amphibian use of WRP sites in Arkansas and Louisiana illustrate the potential value of these restored wetlands to amphibians. Sampling of 21 WRP sites in Avoyelles Parish, Louisiana, in 2004 detected 11 of 12 species expected to occur in the region, with 12 of the sites each supporting at least 3 species. Likewise, anuran call surveys in 2004 in Mississippi detected amphibians using 15 of 20 WRP newly restored sites sampled, detecting 12 of 14 potential species for the region (S. L. King, U.S. Geological Survey Louisiana Cooperative Fish and Wildlife Research Unit, unpublished data).

Uyehara (2005) investigated use of WRP wetlands and other wetlands by

the endangered Hawaiian duck (*Anas wyvilliana*), or Koloa, in Hawaii. Among the 48 total wetlands examined, Koloa were observed more frequently at WRP wetlands than on non-WRP wetland sites (81% vs. 41%). Uyehara (2005) concluded that WRP wetlands served as functional habitat patches for Hawaiian ducks within a matrix of uplands and stream habitats. She also concluded that clustering WRP wetlands around existing wetlands used by Koloa provides additional habitat value.

While wetlands restored through WRP appear comparable to other wetlands in their use by a variety of wildlife, greater habitat value for some wildlife species or groups has been documented where active wetland habitat management is involved. For example, waterfowl densities were 2–4 times greater on managed than non-managed wetlands studied in New York (M. R. Kaminski and G. A. Baldassarre, State University of New York, unpublished data), implying the potential value of periodic draw-down to improve habitat quality for migrating and breeding waterbirds. This finding, as well as that of Hicks (2003), demonstrates the importance of proper management of restored wetlands to achieving maximum wildlife benefits.

Knowledge Gaps

Many studies have been conducted that document local fish and wildlife response to various restored and created wetlands, primarily through documentation of habitat use (Rewa 2000b). Few of these studies document the effects of wetland restoration on species populations or how local restoration actions affect overall landscape functions. At the same time, threats to remaining wetlands are expected to increase in the coming century, presenting greater challenges for waterbirds and other wetland-dependent wildlife (O'Connell 2000, Higgins et al. 2002).

Wetland-restoration programs such as WRP are being looked upon as a means to help restore previously lost habitats for fish (Hussey 1994), waterfowl (Baxter et al. 1996), Neotropical migratory birds (Twedt and Uihlein 2005), and even some endangered species, such as the Louisiana black bear (*Ursus americanus luteolus*) (Guglielmino 2000). More than 1.6 million acres are currently enrolled in WRP. While the literature engenders confidence in the assumption that these acres are providing functional habitats, quantitative measures of how these enrollments are affecting fish and wildlife populations beyond local observations of habitat use are lacking.

Wetland restoration actions begin the time-dependent process of recovering previously lost wetland function (Mitsch and Wilson 1996). Most wetlands enrolled in WRP are relatively young in their development



Ephemeral wetlands at the Lake Valley WRP site in New Mexico provide breeding habitat for amphibians and other wildlife during summer monsoons and habitat for waterfowl during the winter.

(Matilde Holzworth)

of the full suite of wetland habitat values expected to be realized over time. Little is known on how the additional habitat being provided by new WRP enrollments and successional progression of existing enrollments offsets ongoing loss and degradation of remaining wetland and upland habitats in agricultural landscapes.

As noted above, WRP has the unique potential to establish large complexes of restored wetlands in agricultural landscapes, in some cases, changing the local habitat matrix from agricultural cropland to wetland habitat. This has great potential to positively affect amphibians, area-sensitive forest birds, and other species that are vulnerable to fragmentation of natural habitats (Lehtinen et al. 1999; Twedt et al., in press). Large wetland complexes located strategically along migratory pathways may also directly affect survival, distribution, and reproduction capability of waterbirds, waterfowl, and other migratory birds (Beyersbergen et al. 2004). Better measures of how WRP wetland complexes affect these species and groups are needed.

The need for effective monitoring to evaluate the effectiveness of ecological restoration has been the topic of interest in recent years (Block et al. 2001). Integration of effective ecological monitoring measures into WRP program implementation would facilitate compilation of fish and wildlife use data on a broader scale. Combining these data with landscape variables and wildlife population trend data from other sources may present an opportunity to more effectively quantify the effects of WRP enrollments on population dynamics for some species.

Efforts to Document Wildlife Benefits

The USDA is currently engaged in an effort to quantify the environmental benefits of its conservation program practices (Mausbach and Dedrick 2004). This effort, known as the Conservation Effects Assessment Project (CEAP), relies on the use of existing physical effects process models applied to a sample of cropland and Conservation Reserve Program field sites throughout the country to estimate soil- and water-related benefits nationwide. Work plans to address fish and wildlife benefits of conservation programs and practices and to address other land uses (e.g., wetlands and grazing lands) are also being developed to complement the national CEAP assessment.

The approach under development to quantify the environmental benefits of wetland practices has the potential to improve our understanding of the wildlife benefits derived from WRP in the future. Much of the WRP enrollment occurs in several geographic regions—the Mississippi Alluvial Valley, the upper Midwest, and California’s Central Valley

(Figure 1). In recognition of the distribution of WRP and other wetland restoration efforts, a series of regional data collection and modeling efforts are planned to estimate the wildlife habitat and other benefits obtained through wetland restoration (S. D. Eckles, NRCS, personal communication). These efforts are expected to produce quantitative estimates of conservation effects including response of some wildlife groups (e.g., amphibians and waterbirds) resulting from wetland restoration in various regions around the country. Output from this CEAP wetlands component is expected to produce predictive models capable of quantifying the contribution of WRP enrollments to sustaining select wildlife species populations in agricultural landscapes.

Conclusions

In some areas with significant enrollments, WRP is contributing to shifts in land-use patterns toward functional wetland ecosystems that occurred prior to conversion to agricultural use in the 20th century. Wetlands enrolled in WRP have great potential to provide valuable habitats to wetland-dependent and other fish and wildlife species on agricultural landscapes and beyond. While studies underway and recently completed are beginning to reveal the magnitude of this potential, most of the fish and wildlife-related benefits being generated by the more than 1.6 million acres enrolled in the program have yet to be quantified. Additional work is needed to better understand how wetlands restored through the program contribute to fish and wildlife habitat use patterns and population trends.

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