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Native Vegetation as a Method of Restoring Bird Habitat on Conservation Reserve Programs Lands

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The Conservation Reserve Program has repeatedly been demonstrated to provide habitat benefits for grassland birds (Allen 1994, Dunn et al. 1993, Kantrud et al. 1993). Established by the United States Congress as part of the 1985 Food Security Act (Farm Bill), the Conservation Reserve program was initially intended to reduce soil erosion by removing the most erodible soils from production. The program quickly took on the additional goals of controlling commodity production and improving wildlife habitat. Since 1985 the program has taken out of production some 36 million acres of cropland nationwide. Each farmer entering a CRP contract agrees not to plant crops on the contracted fields for 10 years. Instead one of about 20 conservation cover types is established on the land. About 85% of CRP acres have been planted in either tame (domestic) pasture grasses and legumes or in native grasses, with the rest planted in trees or a specified combination of vegetation types. Native grass cover was established on about 20% of CRP land nationwide (NRCS 1997). In 1996 a new Farm Bill extended the CRP for another ten years at the same rate of enrollment (up to 36 million acres nationwide). Among the benefits most stressed in the new rules is habitat enhancement. While it is clear that habitat benefits do result from CRP, it is less certain which conditions provide significantly better or poorer habitat benefits. From a habitat restoration perspective, the type of cover planted is an essential factor in the quality of habitat created--and the types of species that benefit--on CRP fields. Information on relative value of habitat types could increase the environmental effectiveness of the program and optimize the tremendous amounts of money and land invested in the CRP.

This paper reviews recent literature and some sample opinions of conservationists working with CRP lands in order to compare the benefits of native grass plantings to tame pasture grasses as a source of wildlife habitat and as a method to enhance grassland bird populations. The focus of this paper is Minnesota, whose relatively humid climate and high numbers of prairie potholes should support a wide range of grassland bird populations compared to western prairie states (see Johnson and Schwartz 1993). Birds are the focus of study in this paper because other taxonomic groups are essentially absent from the literature.

Characteristics of Native Grass Plantings on CRP Lands

Federal rules define what sort of fields are enrolled in the program and what sorts of cover types ("conservation practices") are planted. Principal requirements for acceptance into the program require that enrolled fields be recently cultivated and that they have specified environmental limitations such as steep or highly erodible soils. Thus nearly all CRP lands have newly established cover that is likely undergo substantial changes in stand density, structure, and species composition from year 1 to year 10 of the contract period. As rules have evolved over the years, recent versions have allowed enrollment of some areas of environmental concern or value beyond soil erosion. For example, 1996 rules allow consideration of poor-quality pasture, riparian zones, and wetlands for enrollment in the CRP (USDA 1997).

Farmers enrolling their land must also identify a conservation plan, which focuses on establishing one of the conservation practices defined by the federal rules. In return for removing the land from cultivation and planting vegetative cover, farmers receive annual rent payments, as well as cost-share assistance in purchasing and planting seed for the agreed-upon cover type. By far the most common conservation practice is CP1, consisting of cool season tame, or domestic, pasture grasses and legumes. CP2, native vegetation consisting chiefly of warm season grasses, ranks second in popularity. Table 1 shows the list of recommended species for both CP1 and CP2, and an extended list of approved species is provided in Appendix 1. The list of approved native prairie species for Minnesota is extensive, including some 21 grasses and 42 forbs. In general, though, only a few species of grass are planted, and forbs are normally ignored entirely (Berner 1997, pers. comm., Diver 1997, pers. comm.). To ensure that approved native species are reasonably suited to local conditions, species lists are developed by state Natural Resources Conservation Service (NRCS) offices for specified geographic and climate regions in each state. In addition federal rules recommend that local seed sources be used if possible. Federal-NRCS rules also define general planting dates for each vegetation type and region. For example, warm season grasses are to be planted in Minnesota from May 15 to June 15 south of Interstate 94, and from May 15 to July 1 north of the freeway. Fall dormant seeding is allowed after October 15. Planting guidelines also recommend maintenance procedures including weed control, reseeding, and maintenance mowing, although program rules forbid haying or grazing for profit (USDA 1989).

Federal rules do not specify planting methods, but for CP2 standard prairie restoration methods are usually used, including specialized seed drills and herbicide applications to control cool season weeds. Once planted, native grasses take about three years to establish. The rules specify that if a seeding fails the field must be replanted until grasses are successfully established. After the stand matures, maintenance usually involves only occasional mowing or burning, usually at a frequency of three to five years or more, depending on local climate and field conditions.

Table 1: Lists of recommended species

From the NRCS Technical Guide, section 4 (from USDA 1989). Plants are listed by the USDA designations Conservation Practice 1 (CP1) and Conservation Practice 2 (CP2). Source of list: USDA 1989. Taxonomic names taken from Ownbey and Morley 1991.

Cool season grasses/legumes (CP1)		**Warm season grasses (CP2)**	
alfalfa	*Medicago spp.*	perennial ryegrass	*Lolium perenne*
red clover	*Trifolium pratense*	switchgrass	*Panicum virgatum*
birdsfoot trefoil	*Lotus corniculatus*	big bluestem	*Andropogon gerardii*
sweetclover	*Melilotus spp.*	indiangrass	*Sorghastrum nutans*
alsike clover	*Trifolium hybridum*	sideoats grama	*Bouteloua gracilis*

smooth bromegrass	*Bromus inermis*	little bluestem	*Andropogon scoparius*
orchardgrass	*Dactylis glomerata*	green needlegrass	*Stipa viridula*
timothy	*Phleum pratense*	buffalo grass	*Buchloe dactyloides*
reed canarygrass	*Phalaris arundinacea*	blue grama	*Bouteloua gracilis*
red top	*Agrostis alba*		
creeping foxtail	*Alopecurus spp.*		
wheatgrass	*Agropyron spp.*		

In Minnesota, where there were 1.9 million acres of CRP in 1996, only about 5% of contract acres (107,000 acres) were planted in native grass cover (Osborn 1996). The average parcel in native grass is 26 acres in size, with a minimum of about 1 acre and a maximum of almost 700 acres (Minnesota Department of Agriculture, unpublished data). Minnesota has a significantly lower rate of native grass planting than in other prairie states such as North Dakota, South Dakota, and Nebraska. The difference in amounts of native grasses planted probably reflect a range of cultural, social, economic, and other factors that have not been investigated in detail in Minnesota. An important reason for the low interest in native grass is the high cost of seeds and specialized equipment needed for warm season grass establishment. In addition, many farmers are unenthusiastic about warm season grasses because they know that for the first year, or perhaps several years, fields look extremely weedy. But, after about three years, native grass plantings may look better than cool season grass stands, and over seven to ten years the warm season grasses tend to have healthier stands and higher species diversity than cool season plantings (Berner 1997 pers. comm., Diver 1997 pers. comm., Winter 1997 pers. comm.).

CRP as Habitat: Use by Breeding Birds

Over 83% of all CRP acres are in the Great Plains, where native grasslands historically supported some 260 species of breeding birds. Among these, though, only 19 species have "strong affinities" to dry grasslands (without wetlands or nearby woodlands), and only 9 reside exclusively on prairie grass ecosystems (Allen 1994; Appendix 2). These numbers suggest that grassland habitat is less critical for general bird diversity than other environments such as wetlands and forests. However grassland habitat is an issue of significant concern because many prairie birds, especially specialists relying on large tracts of continuous grassland, have declined in recent years. Evidence from the Breeding Bird Survey (BBS) shows that 60% of bird species observed on 30 western Minnesota CRP fields had declined since 1966 (Hanowski 1995; see also Allen 1994, Herkert 1994). Kantrud et al. (1993), using the same BBS data for the entire mid-continent (from the Mississippi River to the Rocky Mountains), also found significant declines among birds that use CRP fields, and therefore presumably rely on CRP for nesting, cover, or feeding (Table 2). Breeding Bird Survey data analyses are usually restricted to species common enough to be significantly sampled. However there are more uncommon bird species that make use of CRP, including non-resident and non-grassland birds such as curlews, godwits, and sandhill cranes (pers. obs.).

Table 2: Population trend rates among species more common in CRP than in cropped fields

from Breeding Bird Survey data, after Kantrud et al. 1993. Taxonomic names from Peterson 1969.

Declining		**Stable**	
lark bunting*	*Calamospiza melanocorys*	red-wing blackbird	*Angelaius phoeniceus*
grasshopper sparrow*	*Ammodramus savannarum*	western meadowlark	*Sturnella neglecta*
clay-colored sparrow	*Spizella pallida*	savannah sparrow	*Passerculus sandwichensis*
bobolink	*Dolichonyx oryzivorus*	brown-headed cowbird	*Molothrus ater*
barn swallow	*Hirundo rustica*	common yellowthroat	*Geothlypis trichas*
dickcissel	*Spiza americana*	sedge wren	*Unidentified*
Baird’s sparrow	*Ammodramus bairdii*	eastern kingbird	*Tyrannus tyrannus*
		mourning dove	*Zenaidura macroura*

* decline >50%

Increasing	
western kingbird	*Tyrranus verticalis*

An important factor in the quality of CRP habitat is field size. Swanson (1996) found evidence that many grassland birds, like forest birds that have been more extensively studied with respect to habitat fragmentation, require a minimum area of contiguous habitat. Swanson cites a Missouri study (Samson 1980) that found grasshopper sparrows uncommon in prairies less than 25 acres and upland sandpipers entirely absent from prairies the same size. Swanson found the density and diversity of grassland-dependent species significantly lower in small tracts than in large fields. Although there is utility in small preserves (Shafer 1995), Herkert (1994) found that small grasslands support mainly habitat generalists, especially edge-dwelling species. Kantrud et al. (1993) note the same problem of field size, citing nest predation as the main risk factor associated with small prairie areas. This study found that small grassland birds’ nests less than 45 meters from an edge had substantially lower reproductive success and that woody margins allowed more predators and brood parasites (brown-headed cowbirds) to reach interior of a grassland.

In addition to these landscape factors, time may be important to CRP habitat quality. Kimmel and Berner (1996) found that shorter-term farm conservation programs were often associated with species declines, but they suggest the 10-year length of CRP contracts benefits birds by maintaining some habitat continuity.

Comparisons of Native Grass and Tame Grass

Little information is available in the published literature about differential use of contrasting cover types. Most surveys that look at CRP treat all cover types together (e.g. Hanowski 1995, Kimmel and Berner 1996, Kantrud 1993, Dunn et al. 1993). Exceptions to this rule include Johnson and Schwartz (1993) and the Midcontinent Ecological Science Center report on CRP and wildlife (1994). From 1990 to 1992 Johnson and Schwartz surveyed between 240 and 371 CRP fields ranging from eastern Montana to western Minnesota. Their study indicated some differences in breeding bird presence by conservation cover type, however the geographic range was so large that distinctions between cover types may be insignificant compared to the influences of climate, terrain, and settlement patterns. Over the course of just three years there may also be natural stochastic population variability that masks the behavior of other variables. Consequently, although this is one of the more thorough studies to take contrasting cover types into account, its results are not extremely helpful in generalizing the impact of native grass plantings on bird populations.

The Midcontinent Ecological Science Center (1994) report included a review of habitat suitability index values on CRP for ring-necked pheasants, meadowlarks, and bobwhite quail with respect to stand age, generalized geographic region, and cover type. Like Johnson and Schwartz's study, this report suggests substantially different success rates for different species in different geographic regions over time. Interestingly, pheasant habitat was much better in tame grass than in native grass in the central Plains regions, although in the Midwest pheasant habitat in native grass improved substantially over the seven years studied. Habitat suitability for meadowlarks improved overall in tame grasses over seven years, but showed extremely variable success in the native grass fields studied. Bobwhite quail habitat suitability remained poor in both cover types.

Clearly these two studies are a small and ambiguous sample to use in comparing habitat improvement in tame and native grasses. More useful insights on habitat suitability differences might come from anecdotal information from people who have worked intensively with CRP and wildlife.

Conversations with four professional conservationists and biologists working with wildlife and with CRP suggest that the most important difference between CP1 (tame grass and legumes) and CP2 (native grass) is stand structure. The stiff stems of native grasses remain upright in the winter and early spring, providing winter residents with cover from predation and weather. Standing remnant vegetation in early spring also provides earlier nesting cover for migrant species (Berner, 1997 pers. comm. Winter 1997, pers. comm., Patterson and Best 1996.) Berner (1997, pers. comm.) suggests that native and tame grasses also age differently. In the first few years after planting the two are similar in their habitat benefits, except that cool season grasses provide better food sources in early spring, since insects appear earlier in the spring growth of the cool season grasses. After a few years, though, the stiff stems of native grasses provide significantly better cover than the limp stems of tame grasses. Cool season grasses tend to mat more as they age, possibly providing progressively poorer cover. The loss of diversity in cool season plantings may be even more important. As alfalfa and other poor competitors disappear, cool season grasses can turn into a brome monoculture unless reseeding is done regularly. Berner also feels that cool season grasses might benefit from more frequent disturbance than warm season grasses; he suggests that grazing or mowing every two to three years might help retain cover quality and diversity on tame grass plantings.

Benefits of cool or warm season grasses depend at least partly on the bird species in question, as well as on landscape factors such as habitat area, diversity, and maturity (Swanson 1996, Herkert 1994; see Appendix 3). For example Berner points out that pheasants can nest early if there is standing cover; but they get a good early food source from insects in the cool season grasses, so that a mix of cover types might be optimal for pheasants. Early-arriving migrants probably benefit in the same way from an early season combination of cover and food source. Later migrants might rely more on both food sources and cover provided later by warm season grasses, but there appears to be no direct evidence for this yet.

In CRP fields near wetlands, where upland areas can provide important nesting cover, the availability of native grasses could be especially significant. Kantrud et al. (1993) noted that blue wing teal, mallards, gadwalls, northern pintail, northern shovelers, green-wing teal, American wigeon all nest in CRP fields adjacent to wetlands. This observation could suggest that native grass cover should especially be encouraged in areas with wetland. Currently, at least in Minnesota, there is no pattern of strategically placed native grass planting (Minnesota Department of Agriculture, unpublished data), and there are no systematic efforts to encourage farmers to plant native mixes.

Conclusions

Little data is available concerning differences in habitat quality or effectiveness between cover types on CRP. The general assumption is that native cover on CRP fields provides the same benefits as native or restored prairie, principally cover. This study has found no evidence of feeding advantages in native grasses over tame grasses, although it seems likely that seed eating birds might benefit from native seeds, as well as from forbs that might be available in CRP lands planted in warm season grasses. Certainly if native forbs were included in the seeding mix they ought to favorably impact habitat conditions. However because forb planting is expensive, and because CRP contracts are intended to last only ten years, prairie forbs are usually absent from CRP. More substantial evidence has been collected showing that grassland specialist bird species require large contiguous areas than that they require, overall, specific native vegetation species.

There are several likely reasons for the lack of comparative studies between tame grass and native grass cover on CRP lands. First, gathering any reliable data on CRP generally takes a great deal of time and effort, and simply establishing general trends for the entire program has been a more urgent project than distinguishing one conservation practice from another. Second, it seems a reasonable assumption that if CRP is good for birds generally, native vegetation on CRP must be excellent. Hence the relative benefits of tame and native grasses appear to be rarely scrutinized. The general assumption is that native grass cover on CRP produces approximately the same benefits as restored prairie (Berner 1997, pers. comm; Winter 1997, pers. comm.). Greater attention is given to other factors such as parcel size and amount of woody edges, both of which can affect nesting success among grassland birds. Third, in the heavily agricultural regions conservationists may be happy to see *any* acreage taken out of production, and maximizing enrollment has been more important than critical assessment of differential benefits between fields.

Despite reasons for not studying the differences between conservation practices in the early years of the CRP, there are several reasons to justify such research now. A fairly solid body of literature already exists to demonstrate that the program does produce habitat benefits, but little is known about how CRP lands enhance which populations and why. The existing literature has contributed to an increased emphasis on habitat benefits in the new rules, but there are still few mechanisms to direct enrollments to conservation plans that will actually produce the intended habitat benefits. With the program recently extended for at least another ten years it seems appropriate to develop an informed basis to maximize benefits by targeting or focusing on effective conservation practices. For all these reasons work is needed to test the assumption that native grasses are significantly more beneficial than tame grasses. Supportive data could be used to argue for greater emphasis on native grass in future CRP sign-ups. If significant differences are demonstrated, perhaps more could be done to encourage the best kinds of native plantings. Species combinations and landscape arrangements, for example, could be selected for selected habitat priorities. An effective strategy might be to try to retain sites already in native grasses instead of letting one contract expire and starting a new one somewhere else, so that mature habitats cannot develop. Or perhaps native grass benefits are only significantly greater in areas large enough to support grassland specialists, so that large tracts or fields containing wetlands should be specially targeted for native grasses. If significant differences between the two cover types cannot be demonstrated, then it is important to find out why.

Finally, research is needed to demonstrate whether characteristics of different cover types benefit some species more than others. If CP1 benefited pheasants and reduced bobwhite quail or bobolink habitat, while CP2 had the inverse effect, then planting of native grasses could be encouraged where bobolink or bobwhites were species of special concern. This sort of species targeting would be a useful application of CRP land and financial resources. Habitat benefits have become a major justification of the CRP, sometimes with larger payments or easier sign-up rules where farmers agree to plant their CRP in a cover type designed to benefit wildlife. But the use of native vegetation is haphazard, dependent almost entirely on the farmer’s enthusiasm and patience. Without documentation no one knows how true assumptions about native grass on CRP really are, and there is no way to tell for certain which resident species benefit--or do not benefit. The program will be investing billions of dollars in some 36 million acres of land over the next ten years. Perhaps targeting resources toward building native or falling populations would be a more environmentally useful application of CRP resources than simply enhancing already strong populations such as cowbirds, redwing blackbirds, mallards, and pheasants.

Appendix 1. Native Grasses and forbs listed by the Natural Resources Conservation Service as approved for planting under the Conservation Reserve Program.

Rules recommend geographic ranges for most species. Source of list: USDA 1989. Taxonomic names taken from Ownbey and Morely 1991.

Grasses

Wet Prairies	Blue-joint	*Calamagrostis canadensis*

Mesic Prairies	Slender wheatgrass	*Agropyron trachycaulum*	Prairie junegrass	*Koeleria cristata*
	Big bluestem	*Andropogon gerardi*	Stonyhills muhly	*Muhlenbergia cuspidata*
	Little bluestem	*Andropogon scoparius*	Richardon's muhly	*Muhlenbergia richardsonis*
	Side oats grama	*Bouteloua gracilis*	Switchgrass	*Panicum virgatum*
	Hairy grama	*Bouteoua hirsuta*	Indian grass	*Sorghastrum nutans*
	Kalm's brome	*Bromus kalmii*	Cord grass	*Spartina pactinata*
	Northern reedgrass	*Calamagrostis inexpansa*	Prairie dropseed	*Sporobolus heterolepis*
	Canada wild rye	*Elymus canadensis*	Porcupine grass	*Stipa spartea*
	Sweet grass	*Hierochloe odorata*	Green needlegrass	*Stipa viridula*
Dry Prairies	Prairie sandreed	*Calamovilfa longifolia*		

Forbs

Wet Prairies	White ladyslipper	*Cyprepedium candidum*		
	Gentian	*Gentiana spp.*		
	Yellow Star-grass	*Hypoxis hirsuta*		
	Rattlesnake root	*Prenanthes racemosa*		
Mesic Prairies	Prairie dandelion	*Agoseris glauca*	Prairie lily	*Lilium philladelphicum*
	Leadplant	*Amorpha cansescens*	Yellow flax	*Linum sulcatum*
	Thimbleweed	*Anemone cylindrica*	Puccoon	*Lithospermum spp.*
	Smooth aster	*Aster laevis*	Lobelia	*Lobelia spp.*
	Buffalo bean	*Astragalus caryocarpus*	False gromwell	*Onosmodium molle*
	Wild indigo	*Baptisia spp.*	Lousewort	*Pedicularis spp.*
	Indian paintbursh	*Castilleja spp.*	Beard-tongue	*Penstemon spp.*
	Tickseed	*Coreopsis palmata*	Prairie clover	*Petalostemum spp.*
	Plains larkspur	*Delphinium virescens*	Prairie phlox	*Plox pilosa*
	Rattlesnake master	*Eryngium yuccifolium*	Tall cinquefoil	*Potentilla arguta*
	Prairie smoke	*Geum triflorum*	Indian breadroot	*Psoralea esculenta*
	American licorice	*Glycyrrhiza lepidota*	Mountain-mint	*Pycanthemum virginianum*
	Maximilian's sunflower	*Helianthus maximiliani*	Compass plant	*Silphium laciniatum*
	Long-leaved bluets	*Houstonia longifolia*	Bird's foot violet	*Viola pedatifida*
	False boneset	*Kuhnia eupatoriodes*	Alexander	*Zizia spp*
	Blazing star	*Liatris spp.*	Death camas	*Zygadenus elegans*
Dry Prairies	Pasque flower	*Anemone patens*		
	Silky aster	*Aster sericeus*		
	Purple coneflower	*Echinacea angustifolia*		
	Loco-weed	*Oxytropis lambertii*		
	Silver scurf pea	*Psoralea argophylla*		

Appendix 2: Non-wetland species primarily associated with North American Grasslands.
Source: Allen 1994.

Strongly associated grassland species

Mississippi kite	*Ictinia mississippiensis*
Northern harrier	*Cirucs cyaneus*
Swainson's hawk	*Buteo swainsonii*
Prairie falcon	*Falco mexicanus*
Greater prairie chicken	*Typanuchus cupido*
Lesser prairie chicken	*T. pallicinctus*
Sharp-tailed grouse	*T. phasianellus*
Upland sandpiper	*Bartramia longicauda*
Burrowing owl	*Athene cunicularia*
Short-eared owl	*Asio flammeus*
Horned lark	*Eremophila alpestris*
Dickcissel	*Spiza americana*
Clay-colored sparrow	*Spizella pallida*
Vesper sparrow	*Pooecetes gramineus*
Savanna sparrow	*Passerculus sandwichensis*
Grasshopper sparrow	*Ammodramus savannarum*
Henslow's sparrow	*A. henslowii*
Eastern meadowlark	*Sturnella magna*
Western meadowlark	*S. neglecta*

Exclusive grassland species

Ferruginous hawk	*Buteo regalis*
Mountain plover	*Charadrius montanus*
Long-billed curlew	*Numenius americanus*
Sprague's pipit	*Anthus spragueii*
Lark bunting	*Calamospiza melanocorys*
Cassin's sparrow	*Aimophila cassinii*
Baird's sparrow	*Ammodramus bairdii*
McCowen's sparrow	*Calcarius mccownii*
Chestnut-collared longspur	*C. ornatus*

Appendix 3, **Summary of upland grassland bird nesting habitat requirements**.[a] Source: Swanson 1996, p. 26

Herbaceous vegetation

Species	*Sensitivity* [b]	*Height (cm)*	*Cover (%)*	*Litter (%)*	*Bare ground(%)*	*Shrub cover(%)*
Upland sandpiper	High	26(12-45)	84(75-100)	15(5-25)	10(4-25	<1
Bobolink	High	49(35-65)	88(78-98)	16	4(2-5)	2
Eastern meadowlark	Moderate	48(38-66)	86(74-97)	29	4(2-5)	4
Western meadowlark	Moderate	44	91(81-100)	7(0-14)	3(0-5)	<1
Dickcissel	Low	63	74	17	9	<1
Savannah sparrow	High	54(42-66)	63(22-93)	16	17(2-29)	<1
Grasshopper sparrow	Moderate	43(30-57)	75(51-98)	16	14(2-23)	4
Henslow's sparrow	High	57(20-88)	87(74-99)	24	2	2
Vesper sparrow	Low	45(20-62)	75(47-97)	17	17(2-39)	4
Lark sparrow	Unknown	13	59	-	37	4
Ring-necked pheasant	Unknown	48(18-70)	56(43-68)	28(23-34)	24(19-29)	-

[a]Average and range of values from literature cited in text.

[b]High = occurrence highest on grassland tracts greater than or equal to 50 ha; moderate = occurrence highest on tracts greater than 10 ha; low = occurrence similar on tracts of all sizes (From Herkert et al. 1993).

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