Conservation Reserve Program (CRP)

Grassland Bird Use of Conservation Reserve Program Fields in the Great Plains

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Western meadowlark (K. Hollingsworth)

Abstract
The area enrolled in the Conservation Reserve Program in the Great Plains is enormous: nearly 18 million acres, or more than 7 million hectares, in Montana, North Dakota, South Dakota, Wyoming, Nebraska, Colorado, Kansas, Oklahoma, and Texas. This change in land use has had a huge influence on grassland bird populations. Many, but certainly not all, grassland species flourish in CRP habitats. Responses to the program vary not only by species, but by region, year, vegetation composition in a field, and whether or not a field was hayed or grazed. Further, the large scale of CRP has allowed researchers to begin to address other important conservation questions, such as the effect of the size of habitat patch and the influences of landscape features. Although the CRP provisions of farm bills have been beneficial to grassland birds, it is critical that gains in grassland habitat induced by the program not be offset by losses due to sodbusting.

Grasslands Are Imperiled, Considered the Nation's Most Threatened Ecosystem
Grasslands have been termed the nation's most threatened ecosystem (Samson and Knopf 1994, Noss et al. 1995). The absolute areal losses of grassland have been extensive. Losses of native grassland totaled 99.9 percent for tallgrass prairie in many states and 70-80 percent for mixed-grass prairie. Remaining grasslands and the wildlife that depend on them also have suffered from fragmentation (the division of grassland into smaller patches, surrounded by inhospitable habitats), as well as invasion and planting of woody vegetation (Johnson 1996).

Fortunately, in the Great Plains of the United States, the majority of land enrolled in the Conservation Reserve Program has been planted to grasses, often mixed with legumes. The result has been an enormous conversion of

cropland in the landscape to perennial grassland (Johnson et al. 1993). This change has helped mitigate the loss of natural grasslands to some extent, at least insofar as CRP provides habitat for grassland birds.

Major Declines in Grassland Bird Populations Are Associated with Grassland Losses

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Associated with the conversion of prairie to cropland on a large scale has been a concomitant change in the communities of birds and other animals that rely on grassland habitats. Historical accounts tell of rich abundances of prairie wildlife that now can only be imagined (e.g., Dinsmore 1994). Widespread and systematic surveys of most bird species did not begin until the mid-1960s, with the advent of the North American Breeding Bird Survey (Robbins et al. 1986). (The Breeding Bird Survey, an annual survey conducted in spring since 1966, enlists volunteer birders who count birds according to prescribed methods at designated locations throughout the United States and southern Canada.) Thus, extensive quantitative evidence of changes in grassland bird populations exists for only the past 30 or so years, well after most grassland losses occurred. Nonetheless, the Breeding Bird Survey indicates that many grassland birds have fared poorly, even during that period. In fact, no other avian habitat group or guild has as many declining populations (Peterjohn and Sauer 1999).

Croplands and Haylands Are Unsuitable for Most Grassland Birds

The cropland that largely replaced prairie is avoided by many bird species, which cannot find the necessary habitat structure in cultivated fields. Most birds that do nest in cropland suffer reproductive failure because of frequent agricultural operations (Rodenhouse and Best 1983). Likewise, hayfields often are used by grassland birds, but mowing operations can be very detrimental to the birds and their nests (Bollinger et al. 1990, Frawley and Best 1991). Both cultivated fields and hayfields are likely to be population "sinks" (*sensu* Pulliam 1988), in that reproduction in those areas is not sufficient to offset mortality and thereby to maintain populations.

Many Remaining Grassland Habitats Are of Reduced Quality

Remaining grasslands tend to occur as small patches scattered about the landscape (fragmented), mere remnants of the vast expanses of prairie extant before European settlement. Birds are vulnerable to fragmentation effects, above and beyond habitat loss. Fragmentation reduces the size of habitat patches, increases exposure of birds to often-deleterious edge effects, and isolates habitat patches from one another. These influences are discussed later in somewhat more detail.

Further, settlement of the northern Great Plains by Europeans also brought major increases in woody vegetation. Ever-present winds induced settlers to plant tree claims to protect farmsteads and shelterbelts to reduce soil erosion in fields. Also, inadvertent increases of woody vegetation resulted from fire suppression (McNicholl 1988).

Grasslands invaded by woody vegetation typically contain *more* bird species than those without (Arnold and Higgins 1986). Importantly, however, these species tend to be edge or generalist species, which use a variety of habitats; among these species are brown thrasher, gray catbird, song sparrow, American robin, and common grackle. Such species have plentiful habitat elsewhere, and their populations are robust. Concomitantly, the addition of trees may reduce the quality of habitat for true grassland species, such as Sprague's pipit and Baird's sparrow. These prairie species have much more restricted habitats and breeding ranges and require maintenance of open grasslands for their survival.

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Woody vegetation can influence grassland birds in several ways. First, it reduces the total area of grassland and fragments it. Second, it precludes certain species from using grassland areas that remain (Whitmore 1981, Kahl et al. 1985). Third, trees and shrubs provide perches for raptors, other avian predators, and cowbirds and travel lanes for mammalian predators. Fourth, species attracted to the woody vegetation may forage in adjacent grasslands and compete with prairie species.

CRP Provides Suitable Habitat for Many Species

Because of the plentiful winds and highly erodible soils, the Great Plains has been a priority area for the Conservation Reserve Program. As of September 1999, the enrollment in CRP in Montana, North Dakota, South Dakota, Wyoming, Nebraska, Colorado, Kansas, Oklahoma, and Texas totaled nearly 18 million acres (more than 7 million hectares). The majority of those lands were planted to introduced or native grasses, the former typically mixed with legumes. Grasslands established under the program offer the potential to mitigate some of the detrimental effects that have occurred to native grassland. Several studies have found CRP fields to be highly attractive to breeding grassland birds. The species that most commonly breed in CRP fields vary geographically, however.

One evaluation of bird use of CRP habitats has been conducted annually since 1990 on several hundred fields in four northern Great Plains states (Johnson and Schwartz 1993*a*, *b*; Johnson and Igl 1995). In the early years of that study, Johnson and Schwartz (1993*a*) found grasshopper sparrows to be fairly common in all nine counties in which they surveyed (Table 1). In contrast, lark buntings, western meadowlarks, and horned larks were com-

mon or abundant in the western counties but rare or absent in the eastern counties. The opposite trend was evident for savannah sparrows, clay-colored sparrows, bobolinks, common yellowthroats, and sedge wrens.

Hanowski (1995) presented information on breeding birds of 30 CRP fields in western Minnesota during 1993 (Table 2). The species composition in those fields was generally similar to that presented by Johnson and Schwartz (1993*a*).

Delisle and Savidge (1997) studied the breeding-bird use of 10 CRP fields in southeastern Nebraska. Their most common species were dickcissel and grasshopper sparrow (Table 3). Densities they reported are not strictly comparable to other studies, because they are expressed as individuals, not indicated pairs, per 100 hectares.

Horn (2000) counted birds on 46 CRP fields in eastern and central North Dakota during 1996 and 1997. He reported the number of birds detected per point count, rather than estimated densities (birds/unit area), and found brown-headed cowbirds and clay-colored sparrows to be the most common species (Table 4).

Birds Favor CRP Habitats over Cropland and Certain Other Lands

Johnson and Igl (1995) compared densities of birds in CRP fields and in croplands, the habitat replaced by CRP. Their comparison was for 1992-93 in North Dakota, when breeding birds in both kinds of habitat were surveyed. They also projected the change in population size of several species if CRP had reverted to cropland (Table 5). Most species were projected to decline in number with the anticipated loss of CRP; statewide populations of some species would decline by 15 percent or more. Analogously, in southeastern Wyoming, Wachob (1997) found higher densities of grassland birds in CRP fields and native rangeland than in croplands.

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Cunningham (2000) observed that CRP fields provided much more habitat for grassland birds in southwestern Minnesota than did public lands such as wildlife management areas, waterfowl production areas, scientific and natural areas, and state parks. The CRP fields she studied supported greater densities of certain true grassland birds, such as savannah sparrows, than did the public lands.

Numbers of Grassland Birds Can Vary Markedly from Year to Year

It is important to recognize that the species composition of birds using CRP fields can change dramatically from year to year, depending on climatic variation, succession of vegetation communities within CRP fields, and fluctuations in the numbers and distributions of birds. Johnson et al. (1997) surveyed breeding birds annually in several hundred CRP fields in four northern Great Plains states during 1990-96. Ecological succession had taken place in those grassland habitats during that time. Also, the region was experiencing drought conditions early in the survey period, but it received above-average precipitation in the latter years of the study. Bird populations responded to these changes in different ways. While many species had similar densities in 1990-91 and 1995-96, several species increased in number fairly steadily throughout that period. They included common yellowthroat, bobolink, and clay-colored sparrow, all of which favor tall or dense vegetation (Table 6.1). After the drought terminated in mid-1993, several species increased abruptly, including northern harrier, Wilson's phalarope, and savannah sparrow, and some mushroomed, such as sedge wren and Le Conte's sparrow (Igl and Johnson 1999). Numbers of horned larks, chestnut-collared longspurs, and lark buntings tended to decline (Table 6.2). These latter species prefer sparser, more open habitat.

Le Conte's sparrow (R. Batie)

Also showing annual variation were Delisle and Savidge (1997), who noted that grasshopper sparrow densities declined each year in the CRP fields in Nebraska that they surveyed. They attributed that change to a buildup of litter and dead vegetation.

The Birds Must Reproduce, Too

Providing habitat during the breeding season is not beneficial to birds if they are unable to reproduce successfully in that habitat. The breeding season is the part of the annual cycle that most strongly influences the population size of birds. Assessing the reproductive rate is much more challenging than determining population size; grassland birds are notoriously secretive in their breeding habits. Such behavior is necessary to avoid drawing the attention of a wide range of species that depredate nests in grasslands. Because of the difficulty of finding nests, reproductive success has not been well studied in CRP habitats in the Great Plains.

The nesting studies that have been conducted indicate that birds are at least as successful in CRP fields as in other habitats. Berthelsen and Smith (1995) found a number of nongame bird nests incidental to their upland game bird study in Texas. Most common species recorded were red-winged blackbirds, grasshopper sparrows, Cassin's sparrows, and western meadowlarks. Nest success values were higher than those typically reported in other studies in the agricultural Midwest.

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Koford (1999) found nests of red-winged blackbirds, grasshopper sparrows, and savannah sparrows to be most common in CRP fields in his North Dakota study sites, while in Minnesota sites the most numerous species were red-winged blackbirds, bobolinks, grasshopper sparrows, and savannah sparrows. He found fledging success of ground-nesting birds in CRP fields was lower than on waterfowl production areas but not significantly so.

Clawson and Rotella (1998) studied fates of artificial nests in Montana, comparing those in CRP, linear strips of nonnative grassland (such as roadsides), and remnant patches (usually rather small) of native vegetation. They reported highest rates of nest success in CRP fields.

The Size of a CRP Field and Landscape Features Influence Bird Use

The size of a grassland patch and its surrounding landscape can markedly influence the use of that site by grassland birds.

The size of a grassland patch and its surrounding landscape can markedly influence the use of that site by grassland birds. Some patches may be too small to be colonized by certain species, or birds using smaller patches may suffer more from competition or predation than do birds in larger patches. Also, smaller patches have a relatively greater proportion of their area near an edge, so edge effects can be more pronounced in smaller patches (e.g., Johnson, submitted). Edge effects are phenomena such as avoidance, predation, competition, or brood parasitism that operate at different levels near a habitat edge than in the interior of a habitat patch (e.g., Faaborg et al. 1993, Winter and Faaborg 1999). Brown-headed cowbirds are brood parasites; they lay their eggs in nests of other birds and leave them for the host birds to raise, usually to the detriment of the host's own young. Cowbirds use elevated perch sites to find nests to parasitize; such perches are more frequent along edges of grasslands because of the presence of trees, fence posts, and the like. Isolation from other grassland patches is a landscape feature that can affect either the use by birds or the fate of their nests in a patch.

Each of these factors—patch size, amount of edge, and isolation—can affect (1) the occurrence or density of birds using a habitat patch; (2) reproductive success, through either predation rates or brood parasitism rates; or (3) competition with other species (Johnson and Winter 1999, and Johnson, submitted).

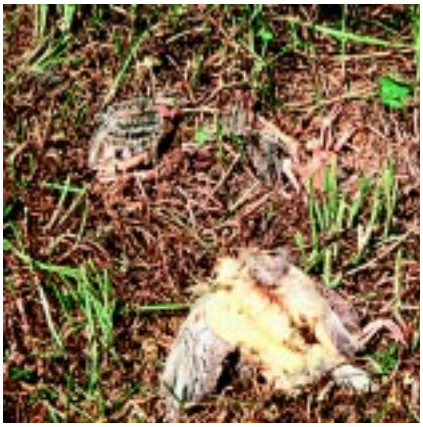
Johnson and Igl (2001) related the occurrence of species and their densities to patch size in CRP fields. They conducted 699 fixed-radius point counts of 15 bird species in 303 CRP fields in nine counties in four states in the northern Great Plains. Northern harrier, sedge wren, clay-colored sparrow, grasshopper sparrow, Baird's sparrow, Le Conte's sparrow, and bobolink were shown to favor larger grassland patches in one or more counties. In contrast, two edge species, mourning dove and brown-headed cowbird, tended to favor smaller grassland patches.

Horn (2000) sampled 46 CRP fields in North Dakota during 1996 and 1997. He reported bobolinks, grasshopper sparrows, and red-winged blackbirds were more common in large grassland patches than in smaller ones. In contrast, brown-headed cowbirds preferred smaller fields.

In southeastern Wyoming, Wachob (1997) noted that sharp-tailed grouse favored larger CRP patches for nesting but not for brood-rearing. Also, leks were more common closer to CRP fields and in areas with extensive CRP within 0.6 mile (1 km).

What Effect Does Haying Have?

In many counties, CRP fields have been released for haying or, less commonly, grazing in some years, due either to drought or to excessive precipitation. Johnson, Igl, and Schwartz (1998) assessed densities of breeding birds in hayed versus idled CRP the year after disturbance. Because they used the same fields in all years, they had essentially a before-and-after, treatment-and-control design. They found that a few species responded positively the year following haying. These were horned lark, chestnut-collared longspur, and lark bunting, all species that favor short and sparse vegetation. Many more species, however, responded with reduced densities the year following haying. Among these were vesper sparrow, sedge wren, common yellowthroat, bobolink, clay-colored sparrow, dickcissel, and Le Conte's sparrow.



Nest mortality caused by haying (L. Igl)

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Horn and Koford (2000) reported that sedge wrens and, possibly, clay-colored sparrows, Le Conte's sparrows, red-winged blackbirds, common yellowthroats, and grasshopper sparrows were less common in mowed than in unmowed portions of 12 CRP fields in North Dakota the year after mowing. Savannah sparrows showed the opposite tendency, being more common in the mowed portions.

Winter Use of CRP Fields

Although the breeding season is the most critical time of year for most species, birds also need suitable habitat during the migration periods and winter. Few studies have examined bird use of CRP habitats in the Great Plains during those time periods. King and Savidge (1995) reported use in Nebraska by American tree sparrows, ring-necked pheasants, red-winged blackbirds, western meadowlarks, horned larks, and northern bobwhites. Delisle and Savidge (1997) noted only American tree sparrows, ring-necked pheasants, and meadowlarks (eastern and western meadowlarks were not distinguishable) wintering on their Nebraska study areas. For Kansas, Best et al. (1998) indicated that American tree sparrows, ring-necked pheasants, meadowlarks, northern bobwhites, and dark-eyed juncos were fairly common in CRP fields.

What Else Do We Need to Know?

Although we have learned a lot about CRP and its value to grassland birds, a number of issues merit further investigation.

Although we have learned a lot about CRP and its value to grassland birds, a number of issues merit further investigation. Among these are landscape effects. Studies of CRP fields (Johnson and Igl 2001) and of other grassland habitats (reviewed by Johnson, submitted) have shown that patch size can influence use of grassland habitats. Also potentially important are influences of the landscape in which a CRP field is embedded. An ongoing evaluation conducted by the U.S. Geological Survey's Northern Prairie Wildlife Research Center, with support from the Natural Resources Conservation Service's Wildlife Habitat Management Institute, will relate the breeding populations of birds in CRP fields to features such as the size of the field, the area of grassland habitat (e.g., native prairie) contiguous to the field, the amount of wetland in the landscape surrounding the field, and the amount of woody vegetation near the field. It will address questions such as: Are a few larger CRP fields more beneficial to birds than several smaller fields? Does a CRP field near an already-established grassland support more birds than a similar field that is isolated? Do CRP fields near wetlands provide more benefits than those farther away? How does woody vegetation near a CRP field affect the value of the field to breeding birds?

More information is needed about specific vegetation influences. CRP plantings vary in seeding mixture, how well they germinate and persist, ecological succession, and other factors. Delisle and Savidge (1997) found in Nebraska that grasshopper sparrows and dickcissels were as common in CRP fields of cool-season grasses and legumes (CP1) as in fields of warm-season grasses (CP2). Bobolinks, however, were more common in CP1 fields, whereas common yellowthroats and sedge wrens were more common in CP2 fields. Johnson and Schwartz (1993b) indicated how several species responded to differences in vegetation composition. A study scheduled to begin in 2001 by the Northern Prairie Wildlife Research Center, with support from the U.S. Fish and Wildlife Service, will address some issues relating to planting mixtures in the northern Great Plains.

The effects of haying on the reproductive success of birds need to be determined. Johnson et al. (1998) looked at the effects of mowing on breeding populations the following year, but little is known about the total effects on reproduction during the year of mowing. It is clearly devastating to birds that are still nesting, so the actual effect depends on the date of mowing. Pressures continue to mount to mow earlier, before the quality of CRP vegetation as forage diminishes, but earlier mowing is much more detrimental to breeding birds than is mowing after most of the nesting activities have been completed.

A Critical Concern: What's Happening with Native Prairie?

Conservation Reserve Program grassland fields are clearly much more beneficial to a wide variety of breeding birds than are the cropland fields they replaced. Tracts of untilled native prairie, however, are tremendously important to grassland birds, and support many species that rarely, if ever, use cropland or even CRP fields, such as Sprague's pipit and Baird's sparrow. Maintaining what native prairie remains should be a high priority for the conservation of birds (as well as many other animal and plant species). It is critical that farm programs do not directly or indirectly encourage conversion of native prairie to cultivation while seeking to restore perennial grassland to existing areas of cropland.

North Dakota CRP (USGS, NPWRC)

Unfortunately, evidence indicates that native grasslands are being lost at the same time as the Conservation Reserve Program is reestablishing grassland. Carl Madsen and Kurt Forman, U.S. Fish and Wildlife Service, have compiled information provided by the U.S. Department of Agriculture on grassland conversion in the northern Great Plains. In Beadle County, southeastern South Dakota, for example, they observed that between 1985 and 1995 46,810 acres (18,944 ha) were enrolled in CRP. But that change was offset by 29,561 acres (11,963 ha) of land that was newly cultivated in that county. For the state of South Dakota in total, 1,776,383 acres (718,884 ha) were enrolled in CRP by 1995. However, during that period (1985-95), 707,896 acres (286,478 ha) of grasslands were converted to cropland.

Losses of rangeland continue, and even at an accelerated pace. In Aurora County, South Dakota, newly cultivated areas totaled 185 acres (75 ha) in 1996, and increased to 2,677 acres (1,083 ha) in 2000. Tillage of rangeland is being encouraged by new varieties of crops, many of them genetically modified, such as Roundup-ready (use of trade names does not imply endorsement by the U.S. government) corn and soybeans.

Natural Resources Inventory data tell similar stories of losses of grassland. In North Dakota, rangeland diminished by 822,700 acres (332,938 ha) between 1982 and 1997; pastureland declined by 222,400 acres (90,003 ha) during the same period. Those losses probably offset many of the gains in wildlife habitat provided by the 2,801,500 acres (1,133,739 ha) enrolled in CRP in North Dakota by 1997. Similarly, losses of rangeland between 1982 and 1997 totaled 1,131,100 acres (457,745 ha) in South Dakota, 1,120,600 acres (453,496 ha) in Montana, and 546,200 acres (221,042 ha) in Nebraska. These changes in land use undoubtedly have had a negative influence on the populations of many grassland bird species.

Conservation Reserve Program fields clearly are of greater value to breeding birds in the northern Great Plains than are croplands that they replaced. Nonetheless, the continuing loss of native grasslands is a critical concern.

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Those native grasslands provide habitat for a wide variety of breeding birds, including many species that do not use cropland or even CRP fields to any extent. Further, native rangeland often occurs in large patches, and thus is less susceptible to many of the problems associated with fragmentation that were described earlier. Recent farm bills make positive contributions to wildlife habitat though the Conservation Reserve Program. Those contributions would be greatly enhanced if they also discouraged further cultivation of existing grassland and fostered the preservation of that habitat. A balanced and comprehensive program is needed.

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Table 1. Average density of breeding birds (indicated breeding pairs per 100 ha) in Conservation Reserve Program fields, in nine northern Great Plains counties, 1990-91 average (Johnson and Schwartz 1993*a*).

	Great Plains Roughlands			Missouri Coteau			Drift Prairie		Black Prairie
Species	Fallon MT	Butte SD	Hettinger ND	Sheridan MT	Kidder ND	McPherson SD	Eddy ND	Day SD	Grant MN
Lark bunting	22	34	53	56	10	19	0	0	0
Grasshopper sparrow	12	10	27	23	18	38	34	18	9
Red-winged blackbird	1	2	22	4	25	26	19	33	19
Western meadowlark	13	13	9	7	7	8	6	3	1
Horned lark	10	20	7	15	3	5	2	1	0
Savannah sparrow	0	0	9	5	6	3	8	14	12
Brown-headed cowbird	2	1	8	12	5	8	6	5	1
Clay-colored sparrow	0	0	1	6	2	2	12	12	7
Bobolink	0	0	5	2	2	2	6	10	16
Common yellowthroat	0	0	0	0	2	2	3	13	14
Sedge wren	0	0	0	0	0	0	1	10	17
Chestnut-collared longspur	0	1	3	10	2	4	0	0	0
Dickcissel	0	0	0	0	0	1	0	11	4
Baird's sparrow	1	1	0	9	1	1	1	1	0

Table 2. Average density (pairs per 100 ha) of most common breeding birds in 30 CRP fields in western Minnesota (Hanowski 1995).

Species	Average density
Bobolink	50
Red-winged blackbird	49
Clay-colored sparrow	38
Savannah sparrow	35
Sedge wren	26
American goldfinch	17
Brewer's blackbird	17
Common yellowthroat	16
Common grackle	13
Tree swallow	11
Brown-headed cowbird	10
Grasshopper sparrow	10
Vesper sparrow	9
Song sparrow	8
Western meadowlark	7
Mourning dove	6

Table 3. Average density (individuals per 100 ha) of most common breeding birds in 10 CRP fields in southeastern Nebraska (Delisle and Savidge 1997).

Species	Average density
Dickcissel	167
Grasshopper sparrow	52
Brown-headed cowbird	28
Red-winged blackbird	26
Common yellowthroat	14
Sedge wren	14
Bobolink	13
Northern bobwhite	8
Mourning dove	8
Meadowlark	8
Ring-necked pheasant	6

Table 4. Average density (birds per 100 point counts) of most common breeding birds in 46 CRP fields in North Dakota (Horn 2000).

Species	Average density
Brown-headed cowbird	102
Clay-colored sparrow	91
Sedge wren	78
Le Conte's sparrow	67
Savannah sparrow	59
Common yellowthroat	57
Bobolink	57
Red-winged blackbird	52
American goldfinch	17
Song sparrow	11
Grasshopper sparrow	5
Western meadowlark	5

Table 5. Projected change in breeding population in North Dakota due to termination of Conservation Reserve Program (Johnson and Igl 1995); all counts are in 1,000s.

Species	Population in CRP	Population in Crop	Change	Statewide population	Percent change
Lark bunting	211	21	–190	1,113	–17
Grasshopper sparrow	206	12	–193	945	–20
Red-winged blackbird	187	18	–170	1,421	–12
Savannah sparrow	94	10	–84	445	–19
Western meadowlark	80	16	–64	1,260	–5
Brown-headed cowbird	74	33	–41	1,380	–3
Bobolink	73	31	–42	388	–11
Clay-colored sparrow	54	0	–54	593	–9
Common yellowthroat	27	0	–27	286	–9
Horned lark	20	316	296	3,042	10
Sedge wren	16	0	–16	61	–26
Baird's sparrow	10	2	–8	225	–4
Dickcissel	10	1	–9	52	–17
Ring-necked pheasant	8	1	–8	84	–9
Sharp-tailed grouse	7	1	–6	88	–7

Table 6.1. Average density (pairs per 100 ha) of breeding birds in CRP fields in northern Great Plains: species that increased in number (Johnson, Igl, and Schwartz 1997).

Species	1990-91	1995-96
Savannah sparrow	6	20
Clay-colored sparrow	5	12
Bobolink	5	9
Common yellowthroat	4	6
Sedge wren	3	11
Le Conte's sparrow	0	16

Table 6.2. Average density (pairs per 100 ha) of breeding birds in CRP fields in northern Great Plains: species that declined in number (Johnson, Igl, and Schwartz 1997).

Species	1990-91	1995-96
Lark bunting	21	4
Red-winged blackbird	16	11
Horned lark	7	1
Chestnut-collared longspur	2	0
Eastern kingbird	2	1
Dickcissel	2	