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Prairie Grouse Population Response to Conservation Reserve Program Grasslands: An Overview

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Introduction

The Conservation Reserve Program (CRP) of the Federal Food Security Act of 1985, resulted in seeding 34.8 million acres (14 million ha) of marginal croplands to permanent vegetation, mostly grasses. Reports of positive avian population responses to CRP grassland are numerous and include benefits to songbirds (e.g., Reynolds and others, 1994; King and Savidge, 1995; Johnson and Igl, 1995; Best and others, 1997); ducks (e.g., Kantrud, 1993; Reynolds and others, 1994); and pheasants (*Phasianus colchicus*) (e.g., Berthelsen and others, 1989; King and Savidge, 1995; Riley, 1995). These positive responses are particularly significant when considered in the context of long-term decline of many species of grassland birds (Knopf, 1994). Although over 80% of the 31 million acres (12.5 million ha) of general signup CRP grasslands occurs in states with populations of greater prairie-chicken (*Tympanuchus cupido*), lesser prairie-chicken (*T. pallidicinctus*), or sharp-tailed grouse (*T. phasianellus*), little information on the responses of prairie grouse to CRP grasslands has been published.

This paper summarizes documented responses of prairie grouse to CRP grasslands and supplements this with field observations of natural resource professionals working throughout the ranges of prairie grouse. We obtained the latter through telephone interviews of state and federal wildlife biologists, and resource conservationists with the Natural Resources Conservation Service (NRCS) in 20 states who had first-hand knowledge of prairie grouse relations to CRP grasslands in their respective regions. States included were Alaska, Colorado, Idaho, Illinois, Kansas, Michigan, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, Wisconsin, and Wyoming. Scientific names of vegetation follow the U.S. Department of Agriculture (USDA) Plants web database. Stand heights refer to maximum heights of the vegetation at the end of the growing season.

Greater Prairie-Chicken

Positive greater prairie-chicken (hereafter GPC) responses were indicated in parts of five of the eight states where CRP grasslands were available to the species (table 1). GPC responded positively to a variety of CRP seedings, including native warm-season grass mixtures as well as introduced cool-season stands. Little or no CRP grasslands occurred near GPC populations in Oklahoma and Wisconsin, or near Attwater's prairie chickens (*T. cupido attwateri*) in Texas.

By the mid-1990's, biologists observed substantial increases in GPC numbers in northwest and west-central Kansas. The increase in west-central Kansas was particularly striking since GPC, previously rare in this region, became common where CRP grasslands were established near [0–2 miles (0–3 km)] extensive complexes of native rangeland. In western Kansas, CRP stands were seeded with multiple-species mixtures of native warm-season grasses, often dominated by little bluestem (*Schizachyrium scoparium*) with significant amounts of sideoats grama (*Bouteloua curtipendula*) and/or switchgrass (*Panicum virgatum*), and lesser amounts of other species. These stands reach 14–32 inches (35–80 cm) in height.

A moderate positive response by GPC, with some range expansion, occurred in southwestern Nebraska. Here, CRP stands were originally seeded to native warm-season grass mixtures dominated by tall grasses that included big bluestem (*Andropogon gerardii*), Indiangrass (*Sorghastrum nutans*), and switchgrass. Sideoats grama and sand lovegrass (*Eragrostis trichodes*) are common on some sites. Most of these stands reach 24–40 inches (60–100 cm) in height. Taylor (2000) reported a significant increase in the population of GPC in Southeastern Nebraska concurrent with establishment of CRP grasslands. About 80% of these stands were seeded with smooth brome (*Bromus inermis*) and reach 12–24 inches (30–60 cm).

In western Minnesota, Toepfer (1988) documented GPC nesting in CRP stands, and Merrill and others (1999) found GPC leks associated with areas containing above average amounts of CRP grasslands. Most of the original seedings consisted of smooth brome and alfalfa (*Medicago sativa*) that reached 20–28 inches (50–70 cm). Populations of GPC in Minnesota increased significantly in response to CRP grasslands that roughly doubled available habitat. However, this increase was limited because alfalfa disappeared from many stands, in effect creating smooth brome monocultures. Minnesota CRP stand quality varies considerably, depending on seeding mixtures and subsequent management (Svedarsky and others, 1997). Plant diversity, and GPC benefits, could be enhanced by controlled fire, using clean-disked firebreaks,

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Table 1. Summary by state[1] and region of identified responses of greater prairie-chickens to available grasslands established during the first decade of the Conservation Reserve Program. Abbreviations used are as follows: CS = cool season; WS = warm season; Intr = introduced species; Natv = native species; Mix = multiple-species mixture; and Mono = one species of grass seeded. Grasses seeded refers to the most common type(s) of CRP seedings in the designated region.

State	Region	Grasses seeded	Forbs	Stand heights[2] (cm)	Range expansion	Population increase
Colorado	Northeast	CS Intr Mono	None	10–15	None[3]	None
Illinois	South	CS Intr Mix	None	30–90[4]	None	None
Kansas	West	WS Natv Mix	None	35–80	Strong	Strong
Kansas	Central/East	WS Natv Mix	None	80–150	None	None
Minnesota	West	CS Intr Mono	Intr[5]	50–70	Moderate	Strong
Missouri	West	CS Intr Mono/Mix	None	45–70	None	None
Nebraska	Southwest	WS Natv Mix	None	60–100	Moderate	Moderate
Nebraska	Southeast	CS Intr Mono	None	30–60	Moderate	Strong
North Dakota	East	CS Intr Mono/Mix	Intr[5]	50–100	Moderate	Moderate
South Dakota	East	CS Intr Mix	Intr[5]	50–70	Moderate	Moderate

[1]Little or no Conservation Reserve Program grassland occurred near greater prairie-chicken populations in Oklahoma and Wisconsin, or near Attwater's prairie chickens in Texas.

[2]Stand height refers to maximum height of vegetation at the end of the growing season (1 cm = 0.4 inches).

[3]A slight initial range expansion was not sustained.

[4]Lower height was maintained due to mowing.

[5]The forb component diminished over time where seeded with smooth brome.

with mowing, haying, or grazing as alternatives (Svedarsky and others, 1998).

Populations of GPC increased significantly, with moderate range expansion, in eastern North Dakota. A restored GPC population near Grand Forks depends on a complex of about 37,000 acres (15,000 ha) of grassland, about 70% of which is enrolled in the CRP. Much of the CRP grasslands in this area were seeded to a salt-tolerant mixture of tall wheatgrass (*Thinopyrum ponticum*), western wheatgrass (*Pascopyrum smithii*), and sweet clover (*Melilotus* spp.). Populations of GPC previously restricted to the Sheyenne National Grasslands have also expanded onto CRP grasslands originally seeded to a smooth brome, alfalfa, and sweet clover. Stands of CRP in eastern North Dakota range from 20–40 inches tall (50–100 cm).

In eastern South Dakota, GPC populations also increased and moderately expanded their range. Most stands seeded early in the CRP were dominated by intermediate wheatgrass (*Thinopyrum intermedium*), but many also contained smooth brome or tall wheatgrass. Alfalfa and/or sweet clover were seeded in many stands, but these diminished over time, particularly where seeded with smooth brome. Cool-season stands available to GPC reach 20–28 inches (50–70 cm) in height.

Very little CRP grassland is present near two small, intensively managed populations of GPC in southern Illinois. However, one group of GPC utilizes about 1,000 acres (400 ha) of CRP containing mixtures of tall fescue (*Lolium arundinaceum*), orchardgrass (*Dactylis glomerata*), and redtop (*Agrostis gigantea*). The stands, often mowed to <12 inches (30 cm), can reach 30–36 inches (75–90 cm).

Populations of GPC showed minimal responses to available CRP grasslands in areas of three states. In contrast to the case in semi-arid western Kansas, there is little indication CRP grasslands benefited GPC in central and eastern Kansas. Biologists believe the greater [32–60 inches (80–150 cm)] height and density of mixed native-grass stands in these higher precipitation regions is excessive for GPC. Inadequate management has allowed trees to invade many CRP stands, diminishing their value for GPC and other grassland birds.

In Missouri, CRP grasslands have not produced a population response by GPC, where about 40% of the original stands were single-species seedings of tall fescue. Most such stands reach 18–24 inches (45–60 cm) but become too dense for GPC or most other grassland birds. Much of the remainder of Missouri's CRP was composed of lightly-seeded orchardgrass or orchardgrass-dominated mixtures that reach 24–30 inches (60–75 cm). In northern Missouri, GPC have nested in CRP consisting of smooth brome, orchardgrass, and timothy (*Phleum pratense*), with some legumes.

Insufficient stand height apparently prevented a sustained GPC population response to CRP in northeastern Colorado.

Numbers of GPC did not increase, but may have expanded their distribution slightly following initial establishment of smooth brome CRP stands. However, these stands diminished in vigor 2–3 years after establishment in this semi-arid region and subsequently reached only 4–6 inches (10–15 cm) in height.

With the 16th and subsequent CRP signups, new seeding mixtures were utilized and vegetation composition in existing stands enhanced. Native warm-season grass mixtures with significant compliments of forbs became more prevalent for new CRP seedings. Such stands reach 16–24 inches (40–60 cm) in semi-arid Colorado and are considered a significant habitat improvement for GPC over earlier stands established under the CRP. In western Kansas and southwestern Nebraska, interseeding of forbs (both introduced and native) into existing stands and addition of forbs to new seeding mixtures is also expected to significantly benefit GPC by increasing invertebrate availability (Fields, 2004) and improving habitat structure. J.E. Toepfer (oral commun., 2004) indicated GPC were attracted to new CRP stands dominated by little bluestem in Minnesota, and had nest success comparable to that recorded in native prairie. New CRP stands of native warm-season grass mixtures in eastern South Dakota and Missouri are considered typically to be too tall [60–80 inches (150–200 cm)] to benefit GPC without grazing.

Lesser Prairie-Chicken

The lesser prairie-chicken (hereafter LPC) is a "candidate" species for Endangered Species Act (ESA) listing. Positive LPC responses to CRP grasslands were indicated in portions of two of the five states encompassing the species' range (table 2). Population responses of LPC were highly variable, ranging from virtually none in states where exotic CRP warm-season monocultures were prevalent to a strong positive response in western Kansas where native warm-season mixtures were standard.

Very few LPC were present north of the Arkansas River in west-central Kansas prior to the CRP, but Rodgers (1999) attributed a strong population increase and substantial range expansion to grassland establishment under the CRP. Spring listening surveys (1998–2004) identified 215 LPC leks in west-central Kansas, particularly where extensive CRP grasslands were near [0–2 miles (0–3 km)] larger native rangeland complexes (R.D. Rodgers, unpub. data, 2004). Expansion of LPC range has brought this species together with GPC in a zone of overlap about 40 miles (60 km) wide for the first time since the early twentieth century. Stands in CRP in western Kansas consist of warm-season native mixtures dominated by little bluestem, with significant components of sideoats grama and switchgrass, and lesser amounts of other species. These CRP stands reach greater height [14–32 inches (35–80 cm)] than is generally provided by native range and have been used extensively by LPC for nesting (Fields, 2004), roosting, and loafing. In this region, LPC leks generally occur in the shorter vegetation of native pastures, but are often near CRP stands.

About 70–80% of the original CRP seedings in eastern New Mexico consisted of dense, single-species stands of weeping lovegrass (*Eragrostis curvula*), yellow bluestem (*Bothriochloa ischaemum*), or Caucasian bluestem (*Bothriochloa bladhii*). A few counties seeded mixtures that included sand dropseed (*Sporobolus cryptandrus*), sideoats grama, and blue grama (*Bouteloua gracilis*). Populations of LPC have generally not increased in response to the monocultures noted, but have increased slightly in range and population, in an area north of Clovis, where mixed stands are more prevalent.

Early CRP stands in southeastern Colorado were seeded to warm-season native mixtures, but were so heavily dominated by sideoats grama as to be, in effect, monocultures. Sand dropseed and sand lovegrass were dominant species on sandy soils. In Colorado, LPC have been observed roosting and loafing in Colorado CRP grasslands. A few leks have been associated with these stands, perhaps contributing to slight range expansion. However, LPC populations do not appear to have increased.

Lesser prairie-chicken populations have not increased in response to CRP grasslands in Oklahoma. Single-species seedings of Caucasian bluestem, yellow bluestem, and weeping lovegrass, all old-world species, made up about 70% of the early seedings and typically reach 14–24 inches (35–60 cm) in height. Seedings on sandy soils were mainly native warm-season mixtures consisting of sand bluestem (*Andropogon hallii*), indiangrass, switchgrass, little bluestem, and sideoats grama. Sometimes LPC roost in and, occasionally, nest in old-world species CRP in Oklahoma, but research indicated a greater nesting preference for warm-season mixed stands (Sutton Avian Research Center, unpub. data).

Texas Panhandle CRP grasslands were similar to those in adjacent Oklahoma and New Mexico. Most stands consisted of single-species seedings of exotic warm-season species, including weeping lovegrass, yellow bluestem, Caucasian bluestem, or klinegrass (*Panicum coloratum*). Use by LPC of these CRP stands was limited. No population response was evident. Broods of LPC have used margins of these CRP stands where they adjoin native rangeland.

Generally, new CRP seedings and enhancements that occurred with the 16th and subsequent signups have placed greater emphasis on native warm-season mixtures with significant forb components. In southeastern Colorado, new seedings may include up to 16 species of native grasses, forbs and shrubs. Other states in the LPC range also use native grass mixtures with forbs for new CRP seedings, although these seedings still represent <50% of new stands in Oklahoma. For a period, USDA required existing CRP enhancements in Oklahoma, New Mexico, and Texas by destroying 51% of the existing exotic monoculture and reseeding to native mixtures. In Kansas, where native mixtures were seeded at the beginning of the CRP, interseeding of alfalfa (which persists well in these warm-season stands) and native forbs has been the primary method of stand enhancement.

Table 2. Summary by state and region of identified responses of lesser prairie-chickens to available grasslands established during the first decade of the Conservation Reserve Program. Abbreviations used are as follows: WS = warm season; Intr = introduced species; Natv = native species; Mix = multiple-species mixture; and Mono = one species of grass seeded. Grasses seeded refers to the most common type(s) of CRP seedings in the designated region.

State	Region	Grasses seeded	Forbs	Stand heights[1] (cm)	Range expansion	Population increase
Colorado	Southeast	WS Natv Mix[2]	None	25–50	Slight	None
Kansas	West	WS Natv Mix	None	35–70	Strong	Strong
Oklahoma	Northwest	WS Intr Mono	None	35–60	None	None
New Mexico	East	WS Intr Mono	None	35–90	None	None
New Mexico[3]	East	WS Intr/Natv Mix	None	35–90	Slight	Slight
Texas	Panhandle	WS Intr Mono	None	35–90	None	None

[1]Stand height refers to maximum height of vegetation at the end of the growing season (1cm = 0.4 inches).

[2]Although seeded as mixtures, most stands became so heavily dominated by sideoats grama that they were, in effect, monocultures.

[3]Lesser paririe-chickens have responded positively to mixed Conservation Reserve Program stands in an area north of Clovis, New Mexico but introduced monocultures are also present in the area.

Sharp-Tailed Grouse

Sharp-tailed grouse (hereafter STG) appear to have benefited more from the CRP than either species of prairie chicken. Positive STG responses, in both population and range expansion, occurred in parts of 10 of 12 states where CRP was available to the species (table 3). Little or no CRP grassland is proximate to prairie STG (*T. p. campestris*) populations in Michigan or Wisconsin. The greatest benefits to STG were obtained with mixtures of cool-season grasses and forbs.

Plains STG (*T. p. jamesi*) populations exhibited strong increases, with moderate range expansion, in response to CRP grasslands in a contiguous region that include portions of southeastern Wyoming, northeastern Colorado, and the Nebraska Panhandle (fig. 1). Wachob (1997) found STG using CRP grasslands more than any other habitat type for nesting and brood rearing. In southeastern Wyoming, most early seedings were planted to smooth brome and/or crested wheatgrass (*Agropyron cristatum*) that gradually crowded out alfalfa or sweet clover seeded with them. However, STG hens and broods selected stands with the greatest vegetative diversity, particularly those with abundant forbs. Early CRP stands in the Nebraska Panhandle were commonly seeded to mixtures that included crested wheatgrass, smooth brome, and intermediate wheatgrass, with either alfalfa or sweet clover. In adjacent northeastern Colorado, early CRP stands were more variable and included smooth brome monocultures, cool-season mixtures, and some native warm-season mixtures. In this 3-state region, CRP grasslands vary from 8–30 inches (20–75 cm) in height. Wachob (1997) strongly advocated inclusion of alfalfa in new CRP seedings and management that encouraged early-succession vegetation.

Conservation Reserve Program grasslands provided varying degrees of benefit to STG in different regions of Montana. Most original CRP seedings in Montana included crested wheatgrass, either seeded alone or with alfalfa or sweet clover. These stands typically reach 10–18 inches (25–45 cm). As occurred elsewhere, crested wheatgrass tended to out-compete and exclude forbs seeded with it. However, some early CRP seedings, more commonly in northeastern Montana, were seeded to a combination of western wheatgrass and intermediate wheatgrass, with sweet clover and/or alfalfa. Plains STG have responded most positively in northeastern Montana where such diverse stands [12–36 inches (30–90 cm)] are more abundant, but STG numbers have also improved moderately in southeastern Montana in response to CRP grasslands. Clawson and Rotella (1998) demonstrated high potential nest survival in Montana CRP stands when compared to other habitats.

Plains STG population response to CRP grasslands in the Dakota's has been positive, but perhaps less pronounced than STG responses noted above. The addition of CRP grasslands in southeastern North Dakota has allowed populations to increase moderately and extend their distribution into areas that were predominantly cropland. In eastern South Dakota, STG have similarly increased and extended their range. Much of the CRP grassland in both states was originally seeded to smooth brome with alfalfa and sweet clover. Such stands typically reach 20–28 inches (50–70 cm). Legumes diminished, over time, due to competition with smooth brome. In South Dakota, available warm-season mixed CRP stands reach 60 inches (150 cm) exceeding heights preferred by STG. However, STG have been observed using such stands for thermal cover during extreme winter conditions.

Although many counties in northwestern Minnesota reached CRP maximum enrollments, prairie STG populations in the region have only increased slightly. About 80–90% of the CRP stands in the region were originally seeded to smooth brome and alfalfa, reaching 20–42 inches (50–105 cm). Alfalfa virtually disappeared from these stands a few years after seed-

Table 3. Summary by state[1] and region of identified responses of sharp-tailed grouse to available grasslands established during the first decade of the Conservation Reserve Program. Abbreviations used are as follows: CS = cool season; Intr = introduced species; Natv = native species; Mix = multiple-species mixture; and Mono = one species of grass seeded. Grasses seeded refers to the most common type(s) of CRP seedings in the designated region.

State	Region	Grasses seeded	Forbs	Stand heights[2] (cm)	Range expansion	Population increase
Alaska[3]	East	CS Intr/Natv Mix	Intr	30–90	Slight	Slight
Colorado[4]	Northeast	CS Intr Mono/Mix	None	65–75	Slight	Moderate
Colorado[5]	Northwest	CS Intr Mono	Intr	25–50	None	Moderate
Idaho[5]	Southeast/West	CS Intr Mix/Mono	Intr[7]	45–60	Moderate	Strong
Minnesota[6]	Northwest	CS Intr Mono	Intr[7]	50–105	None	Slight
Montana[4]	Northeast	CS Intr Mix	Intr	30–90	Moderate	Strong
Montana[4]	Southeast	CS Intr Mono	Intr[7]	25–45	None	Moderate
Nebraska[4]	Panhandle	CS Intr Mix	Intr	20–40	Moderate	Strong
North Dakota[4]	Southeast	CS Intr Mono	Intr[7]	50–70	Moderate	Moderate
Oregon[5]	Northeast	CS Intr Mix/Mono	Intr[7]	45–60	None[8]	None[8]
South Dakota[4]	East	CS Intr Mix	Intr[7]	50–70	Slight	Moderate
Utah[5]	Northern	CS Intr/Natv Mix	Intr	45–75	Strong	Strong
Washington[5]	East	CS Intr Mono	None	40–90	None	None
Wyoming[4]	Southeast	CS Intr Mono/Mix	Intr[7]	45–60	Moderate	Strong

[1]Little or no Conservation Reserve Program grassland occurred near prairie sharp-tailed grouse populations in Michigan and Wisconsin, or near Columbian sharp-tailed grouse in Montana or Wyoming.

[2]Stand height refers to maximum height of vegetation at the end of the growing season (1 cm = 0.4 inches).

[3]Alaska subspecies (*T. p. caurus*).

[4]Plains subspecies (*T. p. jamesi*).

[5]Columbian subspecies (*T. p. columbianus*).

[6]Prairie subspecies (*T. p. campestris*).

[7]The forb component diminished over time where seeded with smooth brome or crested wheatgrass.

[8]Oregon's sharp-tailed grouse consists of a small, recently reintroduced population.

ing. Hybrid poplar (*Populus* spp.) plantations were established on some CRP grasslands, substantially altering not only the specific CRP field, but also diminishing the open character of the surrounding prairie landscape. A few poplar plantations were established on existing prairie STG leks, resulting in abandonment. This use of hybrid poplar was the only case encountered where CRP plantings were clearly detrimental to prairie grouse.

Columbian STG (*T. p. columbianus*) have benefited from CRP grasslands to such an extent that state wildlife agencies in Colorado (Hoffman, 2001), Idaho (Mallet, 2000), and Utah (Utah Division of Wildlife Resources, 2002) consider the CRP integral to Columbian STG conservation. The greatest benefits to this subspecies were derived from stands with several species of cool-season grasses and strong components of introduced and native forbs.

In northwestern Colorado, 26% of all known Columbian STG leks were in CRP, although such stands comprised just 3% of the area (Hoffman, 2001). Many CRP stands in this region are dominated by smooth brome and reach 10–20 inches (25–50 cm). Heavy winter snows tend to flatten such stands, making them more suitable for leks, but few hens nested in them with nest success typically low (Boisvert, 2002). Diverse stands that include bunchgrasses, forbs, and mountain shrubs were recommended for this region (Boisvert, 2002).

Populations of STG in both southeastern and western Idaho increased sharply in response to establishment of CRP grasslands (Mallet, 2000). Over 80% of 172 new STG leks located in southeastern Idaho from 1995–1998 were in CRP (Mallet, 2000). Sirotnak and others (1991) reported proportionally greater numbers of Columbian STG in CRP grasslands than expected, based on habitat availability. Nest success in non-native vegetation (mostly CRP stands) was good (45%), but lower than in native vegetation (Apa, 1998). More diverse CRP stands often included three cool-season grasses and three

Figure 1. The Colorado Division of Wildlife has implemented two transplant programs to reintroduce plains and Columbian sharp-tailed grouse into formerly occupied habitats in northeastern and southwestern Colorado where Conservation Reserve Program grasslands are a prominent component of the landscape.

legumes, and reached 18–24 inches (45–60 cm). These stands mimic native bunchgrass communities providing valuable nesting and brood habitat for Columbian STG. Fewer STG benefits were derived from the one to two species seedings of crested wheatgrass, sometimes with intermediate wheatgrass, that made up about half of Idaho's CRP stands. Such stands reach 18–30 inches (45–75 cm).

Results in Utah were similar to those in Idaho. Columbian STG populations increased substantially and distribution increased approximately 400% as CRP stands reconnected previously isolated populations (Utah Division of Wildlife Resources, 2002). Most of these CRP grasslands were originally seeded with a combination of intermediate wheatgrass, tall wheatgrass, and basin wild rye (*Leymus cinereus*) with a strong component of forbs, including alfalfa.

About 14, 000 acres (6,000 ha) of CRP grasslands represent an important part of the habitat mosaic for a small, reintroduced population of Columbian STG in northeastern Oregon. All active leks are located in CRP fields, but most nesting occurs in native bunchgrass pastures. Clumpy CRP stands [12–28 inches (30–70 cm)] of orchardgrass, red clover (*Trifolium pratense*), and alfalfa are used by STG in late summer when native grasslands become dormant. Stands of CRP originally seeded to smooth brome and alfalfa are not used by STG. These stands flatten under winter snows and the alfalfa has not persisted.

Most of the CRP stands originally available to Columbian STG in Washington consisted of sparse monocultures of crested wheatgrass [16–36 inches (40–90 cm)]. These CRP stands are used by STG, but their numbers have not increased. McDonald (1998) noted extensive use of such CRP stands in spring and summer, but considered these patches to be ecological traps since they attracted STG nesting, but nest success was low (18%). He recommended such stands either be removed and replanted to mixtures of native grasses and forbs, or augmented with native species.

In Alaska, the presence of about 30,000 acres (12,000 ha) of CRP grasslands in the Delta Agricultural Project 125 miles (200 km) southeast of Fairbanks has produced range expansion and perhaps some population increase in the local populations of Alaska STG (*T. p. caurus*). These CRP stands [12–36 inches (30–90 cm)] consist of a mixture of introduced and native grasses, including smooth brome and Arctared fescue (*Festuca rubra*), plus alsike clover (*Trifolium hybridum*). Persistent woody invasion has been controlled with mowing or fire at 3 year intervals.

With the 16th and subsequent signups, states throughout the STG range have diversified their CRP seeding mixtures. These improved mixtures contain a minimum of four species, including at least one forb. Some newer mixtures contain as many as seven species of grasses, up to six species of forbs, and one to three species of native shrubs. In addition to introduced cool-season species, many states are adding native plants, including warm-season species, to CRP mixtures. The use of smooth brome and crested wheatgrass has been deemphasized.

Summary

Many examples of positive population responses by prairie grouse to CRP grasslands were evident. Some of these successes include GPC in the Central and Northern Great Plains; LPC in western Kansas; Plains STG in much of the western Great Plains; and Columbian STG in parts of the Intermountain West. The greatest benefits to prairie grouse occurred where CRP stands were established near pre-existing grasslands, thus augmenting the coverage and habitat diversity of the grassland complex. In other cases, it is equally evident prairie grouse populations did not significantly benefit from the establishment of CRP grasslands. Examples of minimal response include GPC in eastern Kansas, Missouri, and northeast Colorado; LPC in Texas and Oklahoma; and STG in Minnesota. In some cases, prairie grouse exhibited some use of CRP grasslands, but showed little or no population improvement.

Common threads run through successes and failures, both among different prairie grouse species and across their extensive geographic ranges. Grasslands in CRP ranging from 12–30 inches (30–75 cm) in height, appear most valuable to prairie grouse. Stands <12 inches (<30 cm) generally provide inadequate concealment and weather protection. Prairie grouse appear intolerant of excessive stand heights, although vegetation >30 inches (>75 cm) does sometimes provide thermal cover in severe winter conditions. Prairie grouse apparently benefit most from multi-species CRP grasslands that are structurally diverse, in both height and growth form. Vigorous components of forbs, especially legumes, greatly enhanced habitat quality for prairie grouse.

Single-species CRP seedings or stands that effectively became monocultures, with few exceptions, provided minimal

benefits to prairie grouse. Monocultures of crested wheatgrass, smooth brome, tall fescue, weeping lovegrass, yellow bluestem, or Caucasian bluestem were commonly established in the early years of the CRP. This pattern was partly due to inadequate availability and greater expense of more desirable seed mixtures. The Environmental Benefits Index, introduced with the 16th CRP signup, invoked changes in seeding mixtures and existing-stand enhancements that should generally, but not always, benefit prairie grouse. Homogenous stands still remain prevalent in many regions. Aggressive cool-season grasses, notably smooth brome and crested wheatgrass, gradually excluded desirable legumes initially seeded with them. Some grasses, particularly smooth brome, flatten under heavy snow cover, further limiting their habitat quality.

The relative value of CRP grasslands to prairie grouse was not determined simply by the use of native, as opposed to introduced, species. Positive prairie grouse population responses to introduced species occurred if the introduced species attained desirable heights and, particularly, if they contributed to a diverse habitat structure, as did alfalfa.

Recommendations

Seeding mixtures used in the CRP should include many species to produce a diverse, clumpy structure. Plantings should include forbs, particularly legumes, and where STG or LPC are present, native shrubs may be considered. Bunchgrasses should generally be favored over sod-forming grasses. Introduced species should not be excluded, but their inclusion in CRP seedings requires greater consideration of their growth form and persistence, their effect on other species planted, landowner acceptance, and invasive potential. Appropriate introduced species, like alfalfa, can be particularly valuable where they provide an ecological substitute for structurally important but commercially unavailable native species, even for "declining habitat" restorations (CP25). Aggressive species (e.g., smooth brome, crested wheatgrass, tall fescue, Caucasian bluestem, yellow bluestem, weeping lovegrass) that may crowd out other components of the mixture must be avoided.

Potential heights attained under typical CRP conditions should be considered in selecting grasses and forbs for seeding mixtures. Stands of CRP intended to benefit prairie grouse should range from 12–30 inches (30–75 cm) tall at maturity, roughly shin-to-thigh high. In higher-precipitation regions, ungrazed CRP stands of native tall grasses can reach excessive heights, unsuitable for prairie grouse. In such cases, species with lower growth potential may provide greater benefits to grassland wildlife. Weak-stemmed species that flatten easily under heavy snows (e.g., smooth brome) should be avoided.

There is a recognized need for better CRP grassland management. Without periodic disturbance, CRP stands become less vigorous, forb abundance may dwindle, excess litter can accumulate, and trees may invade, each diminishing the capacity of these stands to support prairie grouse. Stand management should be mandatory, but associated costs could be covered or shared by USDA, provided payments occur only after required management (e.g., burning, disking) is performed and verified. Flexibility should be provided to implement practices that facilitate appropriate CRP management (e.g., clean-tilled firebreaks prior to controlled burns). Periodic soil disturbance (livestock or mechanical) of CRP stands is appropriate, but its frequency should occur in accordance with regional conditions (higher precipitation – more frequent; lower precipitation – less frequent).

Although emergency CRP haying has negative short-term implications for wildlife, especially if permitted too frequently, the practice has not produced long-term negative effects on CRP grasslands in the Northern Plains (Allen and others, 2001). Since excess litter removal is critical for successful legume interseeding in established CRP stands (M.W. Vandever and others, unpub. data, 2005), emergency haying or grazing could provide an opportunity to enhance stand quality. Stand improvement could be encouraged by forgiving the 25% payment reduction required for emergency CRP haying or grazing, if the landowner subsequently enhances the affected area.

Ecologically appropriate CRP stand enhancement should be required for future reenrollment of non-enhanced or unsuccessfully enhanced fields. Conspicuous in this regard are the 11 million acres (4.5 million ha) of established CRP grasslands reenrolled through the 15th general signup on which stand-quality enhancement was not performed. Reenrollment in the CRP or enrollment of these grasslands in other federal programs should be contingent on rectifying problems (e.g., invading trees) that stem from prior avoidance of management.

Incentives that encourage tree plantings on CRP grasslands must be discontinued. Tree plantings hinder grassland management and create focal points from which undesirable tree invasion spreads. The declining status of grassland birds (Knopf, 1994) and evidence that even minimal encroachment by trees into grasslands produces significant losses in grassland bird abundance (Coppedge and others, 2001; Rosenstock and van Riper, 2001) dictate that such tree plantings stop. Where woody cover is considered essential to address conservation issues, native shrubs are appropriate.

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