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Reviewed work(s):

Source: *The Journal of Wildlife Management*, Vol. 69, No. 1 (Jan., 2005), pp. 1-13

Published by: [Allen Press](#)

Stable URL: <http://www.jstor.org/stable/3803580>

Accessed: 07/03/2012 17:49

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NORTH AMERICAN GRASSLAND BIRDS: AN UNFOLDING CONSERVATION CRISIS?

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Abstract: The widespread and ongoing declines of North American bird populations that have affinities for grassland and grass–shrub habitats (hereafter referred to as grassland birds) are on track to become a prominent wildlife conservation crisis of the 21st century. There is no single cause responsible for the declines of grassland birds. Rather, a cumulative set of factors such as afforestation in the eastern United States, fragmentation and replacement of prairie vegetation with a modern agricultural landscape, and large-scale deterioration of western U.S. rangelands are the major causes for these declines. The North American Bird Conservation Initiative (NABCI) is a set of comprehensive and coordinated strategic actions modeled on the Joint Venture initiatives that were used to successfully implement the North American Waterfowl Management Plan. The NABCI is emerging as a potential broad-scale solution for conserving populations of grassland birds. Coordinating grassland bird conservation efforts with initiatives to stabilize and increase upland game birds that have strong affinities for grassland habitats—such as quail and prairie grouse—presents additional opportunities to leverage funding and resources that will positively impact virtually all species of North American grassland birds.

JOURNAL OF WILDLIFE MANAGEMENT 69(1):1–13; 2005

Key words: Breeding Bird Survey, grassland birds, grass–shrub birds, Joint Venture, North American Bird Conservation Initiative, North American Waterfowl Management Plan, Partners in Flight, prairie grouse, quail.

A crisis seems to be unfolding in North American wildlife management. This crisis involves more than a score of bird species that have affinities for grassland and grass–shrub habitats. These birds have been experiencing continental-scale population declines for decades. If these declines continue, we will likely witness another eco-sociopolitical train wreck comparable to what stakeholders have experienced with the spotted owl (*Strix occidentalis*) and salmon (*Salmo* spp.) population declines in the Pacific Northwest. Currently, the Florida grasshopper sparrow (*Ammodramus savannarum floridanus*) is listed as a federally Endangered Species, and the mountain plover (*Charadrius montanus*) is listed as a Candidate Species under the federal Endangered Species Act. If several or more species of grassland birds become listed as threatened or endangered, there will be considerable potential for economic stress and adversarial interactions among agencies and stakeholders who have livelihoods associated with the sustainable management of these species.

PURPOSE AND PERSPECTIVE

Our purpose for this essay is to draw attention to the plight of North American grassland birds, and describe some emerging national and state-wide strategies that can be used to avert this unfolding crisis. Despite the enormous scope of this problem, there is room for optimism if solutions are considered from the perspective of past wildlife management successes in North America. The North American model of wildlife management has been tremendously successful at restoring game and nongame species that were once at the brink of extinction. The same kinds of strategies that were used to restore deer, turkeys, waterfowl, raptors, and other declining, threatened, and endangered species can be used to stabilize and increase populations of grassland birds. The combinations of resource policy, agency and non-governmental organization (NGO) priorities, cultural and economic incentives, as well as the attention of stakeholders and the general public, are powerful forces when it comes to solving vexing wildlife conservation problems. When these forces are aligned and marshaled correctly, they are among the most effective tools of modern wildlife management. These are the tools that

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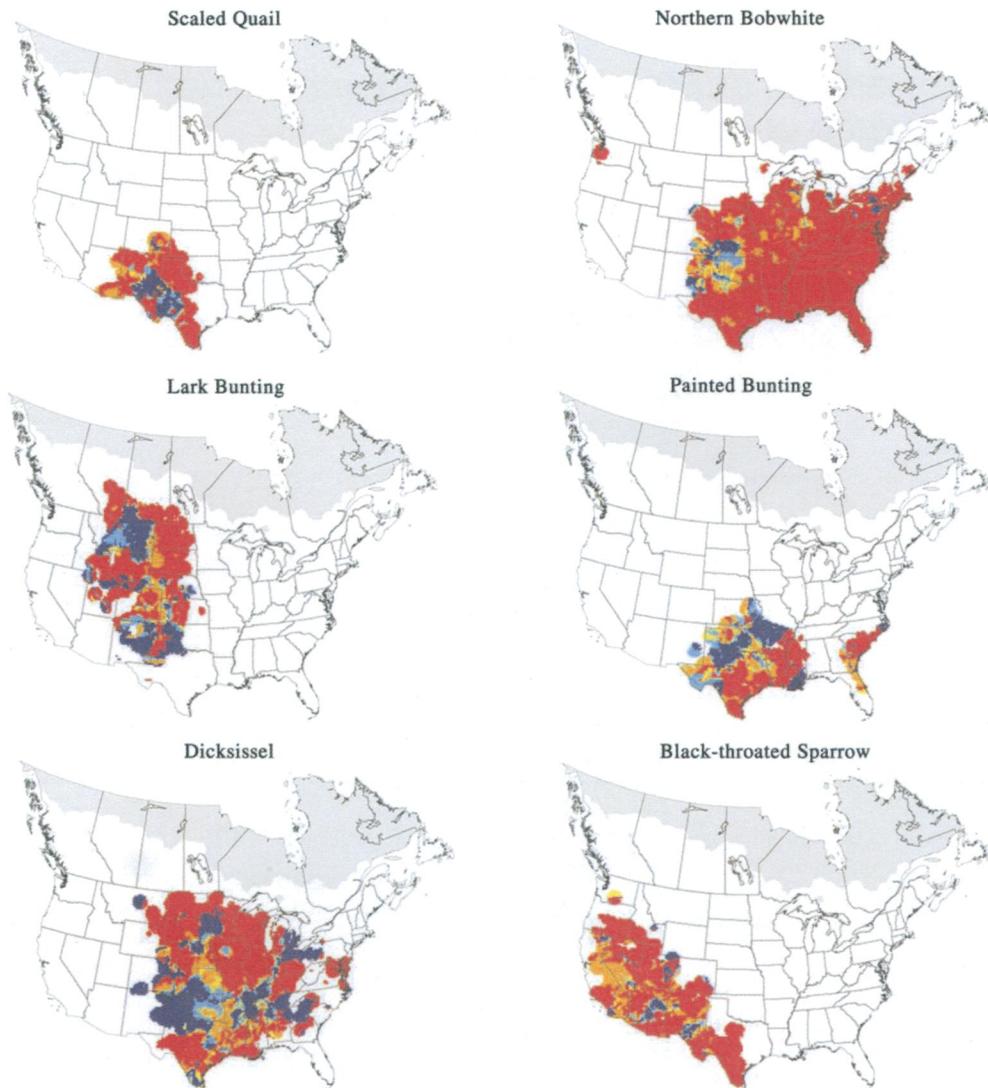


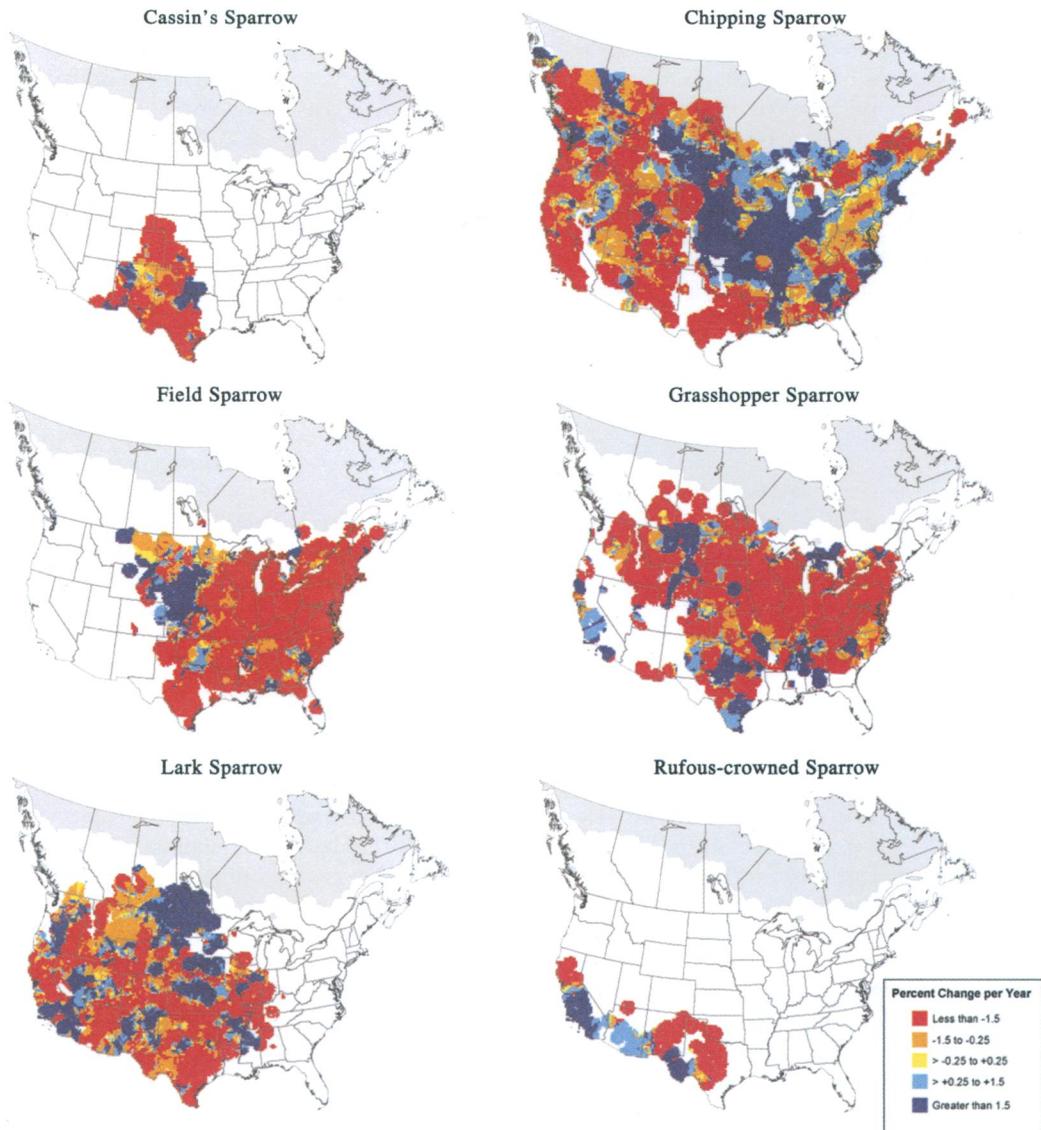
Fig. 1. Long-term (1966–2003) trends in selected species of grassland and grassland–shrub birds in North America: scaled quail (*Callipepla squamata*), northern bobwhite (*Colinus virginianus*), lark bunting (*Calamospiza melanocorys*), painted bunting (*Passerina ciris*), dicksissel (*Spiza americana*), black-throated sparrow (*Amphispiza bilineata*). Next page: Cassin's sparrow (*Aimophila cassini*), chipping sparrow (*Spizella passerina*), field sparrow (*Spizella pusilla*), grasshopper sparrow (*Ammodramus savannarum*), lark sparrow (*Chondestes grammacus*), and rufous-crowned sparrow (*Aimophila ruficeps*). Data from North American Breeding Bird Survey, provided by USGS Patuxent Wildlife Research Center.

will be required to stabilize and increase populations of grassland birds—and hopefully avert an impending conservation crisis.

EXTENT AND NATURE OF THE DECLINES Cumulative Effects of Changing Land Uses on Grassland Birds

The extent and nature of grassland bird declines have been well documented in recent sci-

entific literature (e.g., Peterjohn and Sauer 1999, Vickery and Herkert 1999, Askins 2000, and the citations therein). The advent of landscape-scale monitoring systems such as the North American Breeding Bird Survey (BBS) revealed the recent (approx 3-decade) status of birds that have an affinity for grassland and grass–shrub habitats (Fig. 1). However, the declines of North American grassland birds probably began about the time that John Deere's steel plow first broke prairie sod



in the 19th century. Since the mid-1800s, it has been estimated that loss of grassland ecosystems in most areas of North America has exceeded 80% (Knopf 1994, Noss et al. 1995). Furthermore, less than 0.1% of tallgrass prairie remains where soils and topography has been conducive to crop production (Samson and Knopf 1994). The conversion of the North American Prairie to an agriculture-dominated landscape remains a key part of the problem facing grassland birds. However, the problems facing grassland birds extend far beyond the prairie biome.

A widespread deterioration in rangeland ecosystems and intensive, industrial silviculture that has

replaced millions of hectares of fire-maintained open, park-like southern pine forests with dense, closed-canopy plantation forests also contribute significantly to the current plight of grassland birds. Afforestation of the eastern states is also a major factor responsible for grassland bird declines. If strategies to stabilize and increase populations of declining grassland birds are to be successful, they must involve the suite of agricultural, prairie, rangeland, and forest landscapes in North America.

Afforestation, Fragmentation, Deterioration

Afforestation.—The declines in North American grassland birds are related to many factors. For

example, afforestation has created a lack of early successional and old-field habitats in the eastern United States. This is the primary problem facing grassland bird populations in this region (Askins 2000: Chapter 1). The decline of grassland birds in the eastern United States has not been viewed as a major conservation problem by some authorities because they argue that these birds were not a significant part of the native avifauna that inhabited the eastern United States prior to European invasion and settlement (Askins 2000:3–6). It has been hypothesized that the forest clearing activities of European colonists created grassland habitats which became occupied by grassland birds that originated in Midwestern prairies and the Great Plains. An alternative hypothesis is that eastern forests contained a significant component of grassland areas within the landscape matrix, and these areas provided habitat for grassland birds over an evolutionary time frame (Askins 1999). Aspects of these different hypotheses are described below.

Millions of hectares of forest were cleared for agriculture throughout the eastern states. Over time, the early agricultural activities of European settlers in the eastern United States gradually diminished. The cleared acreage that was left idle was recolonized by woody vegetation. Grassland bird populations began to decline as open areas dominated by herbaceous and grassland vegetation were invaded by trees and shrubs. The grassland bird decline continued as forest fragments coalesced into continuous forest. The declines continue today. Along with these relatively recent cultural impacts on eastern forests, considerable evidence suggests that substantial grasslands existed prior to European settlement of the eastern United States (Kurten and Anderson 1980). The historical accounts of various European colonists indicate that extensive grasslands existed prior to European settlement throughout the eastern United States. Some were clearly functional grassland ecosystems that had existed for thousands of years while many others represented areas that had been created and maintained by Native American cultures to facilitate crop production and hunting activities. Thus, grassland habitats were not uncommon in the eastern United States before Europeans arrived although it appears that most grassland vegetation communities were located closer to the coasts than farther inland.

The fossil record provides evidence that grasslands were an important vegetation type of the

eastern United States. Remains of animals from the Pleistocene, which were associated with grassland ecosystems, have been identified in Pennsylvania (Kurten and Anderson 1980). Finally, although numerous grassland bird species such as horned lark (*Eremophila alpestris*), dickcissel (*Spiza americana*) and meadowlarks (*Sturnella neglecta*) have expanded their western ranges to the eastern United States, eastern populations of several other grassland bird species are sufficiently distinct from western populations which indicates that these eastern populations have been reproductively isolated from western populations for thousands of years. Nevertheless, populations of at least 15 grassland bird species in the eastern United States are declining, and will continue to decline, unless remedial measures are implemented (Askins 1999).

Fragmentation.—As one moves from east to west, the causes of the grassland bird declines are related to prairie fragmentation and rangeland deterioration (Herkert 1994, Nick and Rotenberry 1995, Johnson 1996, George and Dobkin 2002). Consequently, a major factor affecting grassland birds over millions of hectares of the United States is that the modern agricultural landscape now typically offers little or nothing in the way of habitat for grassland birds. These changes have profoundly influenced populations of grassland birds over the past century, especially in and around cropped areas (Best et al. 1995, Freemark and Kirk 2001, Murphy 2003, Peterjohn 2003). The fragmentation of the North American prairie by various land uses has clearly caused population declines for many grassland bird populations (Knopf 1994).

Johnson and Temple (1986) and Johnson (2001) found that small grassland fragments cannot support bird species that require large continuous habitats. Similarly, research conducted by Herkert (1994) and Vickery et al. (1994) showed that numerous species of grasslands birds are intolerant of small patches of grassland habitat and are much more likely to utilize large patches. However, patch size or habitat area alone is not the only factor that determines whether fragmented landscapes can sustain viable populations of grassland birds. The spatial distribution of patches within a fragmented landscape is another factor that determines how grassland birds will utilize the landscape. For example, Shriver and Vickery (1999) found that the configuration of the remnants of the original prairie of Florida were insufficient to maintain

populations of the federally endangered Florida grasshopper sparrow.

O'Connor et al. (1999) concluded that, compared to other land birds, grassland birds are differentially susceptible to habitat fragmentation. Habitat patch size and configuration have become particularly important in the secondary cropland and woodland habitats that have replaced native prairies. O'Connor et al. (1999) found that when breeding grassland birds utilize such secondary habitats, they face obstacles that they likely would not encounter had they established breeding territories in primary habitats. Secondary highly fragmented habitats have more edge and elevated rates of nest predation (Vickery et al. 1992, Burger et al. 1994, Rosenblatt et al. 2001). These areas also tend to have increased rates of brown-headed cowbird (*Molothrus ater*) parasitism (Davis and Sealy 2000, Koford et al. 2000, Morrison and Hahn 2002), which has been documented in fragmented landscapes with a high degree of edge. Therefore, lower productivity in addition to the habitat loss associated with increased fragmentation is also contributing to grassland bird declines.

Rangeland Deterioration.—The ecological deterioration of western U.S. rangelands has been ongoing and pervasive for more than a century (Knick et al. 2003). Numerous factors such as overgrazing, drought, lack of fire, woody plant, and exotic grass invasions have combined to create a critical mass of negative effects that show our management of these ecosystems may not be sustainable. Roadbuilding also degrades rangelands by altering hydrology and exacerbating erosion of fragile soils.

This scenario is especially true for >150 million hectares of overgrazed public rangelands in the American West (Wuerthner and Matteson 2002). However, grazing per se has not always been the problem for grassland birds that it was 150 years ago. Historic grazing regimes by native animals maintained a disturbance regime that sustained grassland bird populations for millennia. Replacement of native grazers with confined, exotic livestock, breaking the fire cycle, invasion by exotic grasses, and roadbuilding that alters natural hydrologic regimes are major factors that, when considered from a cumulative perspective, created many of the grassland bird conservation challenges we currently face. Early livestock grazing of native prairies was very destructive because domestic animals, primarily cattle, but also sheep and goats in certain places, were stocked at den-

sities that far exceeded the natural carrying capacity of prairie ecosystems. Furthermore, overstocked grasslands were continuously grazed for years. Continuous grazing exacted an even greater toll on the prairie fragments that became increasingly prevalent as more and more native prairie was converted to cropland and barbed wire confined cattle to smaller areas than were available on the open range.

The grassland bird communities that inhabited the pristine grasslands of western North America required landscapes composed of a mosaic of distinct vegetation communities that were created and maintained by disturbances such as grazing by native species and fire. Grazing was therefore a natural phenomenon that helped maintain habitat for many grassland bird species (Askins 2000). Bison (*Bison bison*) herds consisting of tens of thousands of individuals effectively applied rest-rotational grazing on millions of hectares of prairie in North America. When combined with fire, this disturbance dynamic maintained a mosaic of successional distinct plant communities that helped fulfill the habitat requirements of the grassland bird community. Similarly, the continuous grazing of prairie dogs (*Cynomys* spp.) that maintained colonies over hundreds of thousands of hectares provided essential habitats for numerous grassland bird species. In 1 South Dakota study, grassland birds were almost twice as abundant in a prairie dog colony than on adjacent mixed-grass prairie where prairie dogs had been eliminated (Agnew et al. 1986, Askins 2000:59–64).

However, the near extirpation of bison during the late 1800s and efforts to eradicate prairie dogs that are ongoing, removed natural grazing systems that shaped the evolution of the Great Plains (Koford 1958) and the grassland bird communities. These beneficial grazing forces were replaced with intensive grain crop production systems or the artificial and excessive grazing regimes imposed by 19th century livestock producers.

On the arid rangelands west of the Great Plains where bison were largely absent, and where crop production was not as prevalent, excessive livestock grazing, major changes in the fire regime, and water wells that lowered the water table were the major disruptive forces that severely damaged grasslands in a surprisingly short period of time. For example, the largely undisturbed semi-arid grasslands of southeastern Arizona were so degraded by livestock between 1860 and 1880 that entire valleys were denuded of grass, which

caused sheet, rill and gully erosion on a massive scale. This also reduced ground water accumulation to the point that most perennial streams became ephemeral by the late 1800s (Bahre 1995). Moreover, native grass cover was reduced to such an extreme that a botanist from the Arizona Agriculture Experiment Station noted that one had to travel several miles in some valleys before it was possible to find a mature grass specimen sufficient for herbarium purposes, unless a plant could be located in a place that was protected from grazing (Bahre 1995).

The abuse of southeastern Arizona grasslands almost ruined the cattle industry when a severe drought occurred during the early 1890s and cattle starved by the tens of thousands (Bahre 1995). What occurred in southeastern Arizona after cattle were introduced has been repeated on western rangelands throughout the United States. Consequently, millions of hectares of public and private land that was once grassland is now shrub land because livestock grazing has removed the fine fuel needed to carry the fires that prevented shrub invasions. This allowed invading shrubs to be largely freed from the competition of herbaceous vegetation for water and nutrients.

Livestock grazing of rangelands in North America has clearly impacted the abundance and composition of bird communities that inhabit these rangelands. For example, Saab et al. (1995) reviewed the responses of 43 grassland, riparian, and shrub-steppe bird species to grazing and reported that 17 species responded negatively to livestock grazing, 18 displayed neutral responses and only 8 species responded positively. They also noted that more than half of the 34 shrub land-associated bird species they examined displayed positive or neutral responses to grazing, which is probably a reflection of the transformation of grasslands to shrub lands that has occurred since livestock were introduced in large numbers to western rangelands. Unsurprisingly, grassland bird populations have declined simultaneously with an increase in shrub-associated species (Sauer et al. 2002). Grazing per se is not the problem. Rather, the problem is too many cattle on the same area for too long a period of time.

The current decline of grassland bird populations occurring on the rangelands of North America clearly can mostly be attributed to historic livestock grazing (Saab et al. 1995) and the woody plant invasions that have resulted from these impacts of livestock on grassland ecosystems. The elimination of fine fuels, primarily grasses, that

carry fire, and subsequent growth and expansion of woody shrub vegetation, was a potent combination for landscape change from grassland to shrubland (Johnston 1963). The declines in grassland birds, and petitions to list as endangered or threatened hunted grassland birds such as sage grouse (*Centrocercus* spp.) and prairie chickens (*Tympanuchus* spp.), are further evidence that our ability to sustain these systems with current land uses is open to question (Morrow et al. 2004).

STRATEGIES FOR STABILIZATION

Stabilizing and Increasing Grassland Bird Populations

Vickery et al. (1999b) stated that the loss of native grassland habitat has been so extensive over such a large area that restoration of grasslands throughout the United States probably is the most effective way of stabilizing grassland bird declines and increasing populations for many species. They added that habitat restoration is probably now critical to the persistence of species such as upland sandpiper (*Bartramia longicauda*) and Florida grasshopper sparrow. Successful restoration will require a focused effort to identify remaining habitat and implement habitat management activities that maximize the production of multiple species (Vickery et al. 1995, Askins 2000).

Issues in the Eastern States

In the eastern United States, many areas of grassland bird habitat have been identified. Efforts are underway to ensure that the vegetation components of such habitats are properly managed so limiting factors that are keeping populations depressed can be eliminated or at least mitigated. Some of the most important grassland bird habitats in the eastern United States occur on airport installations owned by the U.S. military or local municipalities (Askins 1999). The grassland habitats at many airports support abundant, diverse and productive grassland bird populations because management activities have been implemented that benefit these species (Melvin 1994). One of the most significant management activities accomplished on airports for breeding grassland bird communities regards mowing operations, which are scheduled so that nesting, brooding, and fledging activities are minimally impacted.

Convincing farmers who own hayfields to implement strategies such as timing mowing operations

after the peak breeding activities have passed could result in the improvement of many thousands of hectares of grassland bird habitat in the eastern United States. Financial incentives from Farm Bill programs may be a mechanism to subsidize farmers to not cut, or defer cutting, hay. However, such efforts have yet to be confirmed as proven conservation strategies for grassland birds.

In addition to airports and hayfields, reclaimed surface mines in many eastern states represent habitats that have been maintained with herbaceous vegetation and support viable breeding grassland bird populations. Grassland bird advocates should also consider working with dairy farmers to modify dairy herd grazing regimes in a manner that improves habitat for eastern grassland bird communities (Temple et al. 1999). Finally, thousands of additional hectares of breeding grassland bird habitat could be created if federal, state, and NGO wildlife biologists forged cooperative management programs with the forest product industry that resulted in the creation and management of herbaceous openings of sufficient size in the forests of the eastern United States. How to incorporate these management alternatives in the context of modern, industrial forestry will remain a major challenge. Alternative income sources to compensate for lost revenue from areas that could otherwise be growing trees will need to be identified. These types of situations and challenges are prime opportunities for Joint Venture initiatives described below.

Providing Sufficient Habitat Area

Area sensitivity is another issue that must be addressed in order to stabilize current grassland bird declines. Clearly, habitat fragmentation is reducing the utility of landscapes throughout the United States to provide habitat for grassland birds. This issue seems to be particularly important for grassland bird populations in the eastern and midwestern United States, as well as the Great Plains. Area sensitivity problems seem to be especially acute where grassland birds are forced to settle in secondary habitats such as agricultural and woodland areas. Rehabilitating pastures and old fields with management actions such as prescribed fire so that resulting habitats are attractive to many grassland bird species would be desirable (Vickery et al. 1999a). In addition, strategically adding Conservation Reserve Program (CRP) area to highly fragmented landscapes would likely increase grassland bird use of these areas and reduce the predation and brood parasitism rates

that are associated with habitat edge (O'Connor et al. 1999, Morrison and Hahn 2002).

Johnson and Igl's (2001) recent study of area sensitivity among several species of grassland birds in the Northern Great Plains demonstrated how important it is to evaluate grassland bird habitat requirements from a broad perspective. They found that area sensitivity varied among species and often varied within species depending on where in their study region a species was located. Johnson and Igl's (2001) study indicated that making generalizations about area sensitivity and habitat use for grassland birds from a single local study site is very risky because erroneous conclusions are likely when one attempts to expand local findings to other regions. Studies similar to Johnson and Igl's (2001) research need to be conducted elsewhere throughout the Americas. Such studies are particularly important for wintering grassland bird communities since winter life history requirements remain vague for most species of migratory grassland birds on their winter ranges.

Grazing and Ecosystem Processes: Getting It Right in the Western States

Hypotheses have been developed that predict grassland bird population declines would probably stabilize over large areas of western rangelands if livestock management activities on public lands were modified in a manner that permitted the rehabilitation and/or restoration of native grassland habitats. Based on work in Arizona, Bock et al. (1993) advocated substantially increasing the acreage of public rangeland from which livestock are excluded. Saab et al. (1995) concurred and suggested that current livestock management on most public lands does not maintain vegetation communities that support a diverse bird community. They maintain that the rotational grazing often utilized by federal land management agencies is conducted at either frequencies too high to support grazing-intolerant bird species or conducted in a manner that does not create the heavily grazed conditions favored by grazing-tolerant species. However, simply reducing or eliminating grazing will not be sufficient to stabilize and/or restore grassland bird populations. Restoring ecosystem processes by using prescribed fire, renovating historical hydrological regimes, and gaining control of invasive exotic plant species will also be required. Saab et al. (1995) also recommended discouraging the application of short-duration grazing on public

rangeland because short-duration grazing was originally touted as a means to increase livestock production while simultaneously improving rangeland condition, though little scientific evidence exists to support the claim that rangelands actually improved. In addition, Saab et al. (1995) suggested revising the current CRP regulations in a manner that encourages landowners to maintain program acreage in permanent native grass cover because current regulations in some instances allow landowners to convert CRP acreage to crop production when agricultural commodity prices are attractive. Saab et al. (1995) also recommended that fire should be reintroduced to many rangelands where it has previously been excluded because fire is a natural ecological process that once maintained the integrity of grassland ecosystems. We concur with these sensible and practical management recommendations. However, widespread areas infested with cheatgrass (*Bromus tectorum*) represent significant management challenges because fire enhances stands of this invasive exotic species.

Perspectives of Multispecies and Guild Approaches to Management

Grassland bird populations on western rangelands could also be improved by adopting a multi-species management approach instead of relying on the single species approach that labels individual bird species as increasers or decreaseers based on their response to livestock grazing (Ryder 1980). Such a system is currently advocated particularly where federal or state endangered species or species of management concern are priorities. Knopf (1994) argued that focusing on the responses of individual species to livestock grazing and then classifying species as an increaser or decreaseer based on their response ignores the dynamic nature of ecological processes. He suggested that monitoring the species composition of bird communities occupying grazing management units is a superior alternative because the composition of a bird community oscillates dynamically in response to an array of disturbances during a specific period of time. Patterns of precipitation and fire events represent 2 of the potential site-specific disturbances that could interact with livestock grazing to determine the composition of a bird community occupying a grazing management unit. Knopf (1994) believed that establishing a number of grazing response guilds based on discrete ecological commonalties would enable avian ecologists and land managers

to more efficiently evaluate the impacts of grazing on habitat types that are important to specific guilds. However, for the guild concept to work effectively in a management context, detailed information about the habitat requirements for all species within a guild must be known. Such a factor is often overlooked when the guild concept is considered for multispecies management (Block et al. 1986, 1987).

A multispecies management approach offers an alternative that would likely benefit more grassland bird species than a single species management approach that characterizes numerous management programs today. This is why grassland bird conservation needs to be addressed in the context of game birds that share habitat affinities with many other species of grassland birds. So-called "single species management" for particular game birds has the potential to benefit many other species of grassland birds.

Knopf (1994) also noted that few studies have been accomplished that properly evaluate the impacts of livestock grazing on grassland bird communities. Because livestock grazing on public lands is such a sensitive issue and has generated considerable conflict between the livestock industry and environmentalists, most field studies that attempt to quantify grazing impacts are short-term rather than long-term. As a consequence of too many short-term studies, research design often suffers and the data collected fail to adequately address the management issues. Thus, Knopf (1994) argued that more rigorous scientific research should be conducted in numerous areas throughout North America to better understand how grassland bird communities respond to livestock grazing.

Livestock Grazing and the Elimination of Fire

Since historic livestock grazing and the elimination of fire has helped transform grasslands into shrub lands (Johnston 1963), restoring grasslands on significant areas of shrub lands would likely improve grassland bird populations. For instance, Fitzgerald and Tanner (1992) reported that grassland bird populations increased after roller-chopping was used to restore shrub-infested prairies in Florida. Moreover, Fulbright and Guthery (1996) evaluated the impact of mechanical habitat management on south Texas bird communities and concluded that grassland bird communities would benefit from mechanical operations if brush were removed in sufficient amounts in the right configuration. The area sen-

sitivity displayed by many grassland bird species should be considered before brush management programs are implemented because sufficiently large openings must be created in landscapes dominated by shrub lands in order to maximize the utility of treated areas to a grassland bird community. Also, as is the case with grassland habitats, restoring ecosystem processes such as fire and natural hydrological regimes in brush and shrublands, along with controlling and/or replacing invasive exotic plant species, will be required for the successful conservation of birds that have affinities for these habitats.

Role of Stakeholders

Any successful strategy for stabilization, and ultimately recovery, of declining wildlife populations involves stakeholders. Grassland birds have a diverse group of stakeholders that includes birders, bird hunters, private landowners, state and federal agencies, municipalities, ranchers, and NGOs. Presently, the organization and communication among many of these grassland bird stakeholders is relatively inchoate. For example, many birders hold bird hunters in disdain—and vice versa—although both groups have passionate interests in bird conservation. Additionally, private landowners often view government resource agencies as a potential threat. The effectiveness of NGOs is profound in many areas, and weak in some others. Despite these problems, voices for conservation of land birds, including grassland birds, are becoming louder and more in tune with the problems. This positive development has been a function of the growth, maturity, and success of programs such as the North American Waterfowl Management Plan (NAWMP) and Partners in Flight (PIF) during the past decade. These and related programs have now come together under the North American Bird Conservation Initiative (NABCI) (Fitzpatrick 2002). This is a very positive development for promoting the conservation of grassland birds and the recovery of their declining populations.

Joint Venture Initiatives

During the past 2 decades, the Joint Venture model has been a highly successful strategy for stabilizing duck populations under the aegis of the NAWMP. Joint Ventures are essentially science-based regional cooperative efforts among government agencies and the private sector. Joint Ventures can be efficient delivery systems for achieving bird conservation goals and action.

Fitzpatrick (2002) provided an excellent forward-looking historical perspective about how the Joint Venture system from NAWMP can be applied to the NABCI. The positive implications of these developments for grassland bird conservation are enormous.

The Playa Lakes Joint Venture (PLJV) is an excellent example of how initial waterfowl management objectives seamlessly expanded into broader objectives that have been positive for grassland birds. The initial objective of the PLJV in Texas was to stop draining playa lakes so waterfowl and wetland birds could use them. Subsequently, conservation measures expanded to include maintenance and/or restoration of grassland vegetation surrounding playa lakes. This simple conservation strategy has had widespread benefits for grassland birds throughout the PLJV management region.

Upland Game Birds and Grassland Bird Conservation

As mentioned earlier, there is a huge cultural gulf between many birders and bird hunters. This gulf must be bridged if attempts to stabilize and increase populations of grassland birds will be successful. Aldo Leopold and his family are an obvious example of people comfortable and competent in both of these pursuits (Meine and Knight 1999). More grassland bird stakeholders need to share this view.

Quail are grassland birds. The northern bobwhite (*Colinus virginianus*) and scaled quail (*Callipepla squamata*) are declining like many other species of grassland birds (Fig. 1). Maintaining and/or restoring habitat to stabilize and increase populations of wild quail will provide habitat that will support many other species of grassland birds. This is also the case for prairie grouse, which is also extensively hunted.

Quail hunting is big business in large regions of the United States. In south Texas, for example, ranches with reputations for good-to-excellent quail hunting (i.e., consistently producing encounters with >3–4 coveys per hour of quail hunting) are leased at rates of >\$20–35 per hectare per year by quail hunters. Many quail hunters are also leasing grazing rights in addition to hunting rights, so that they can influence how much grass—and therefore quail nesting habitat—remains on the ground. This often adds >\$10 per hectare per year in lease costs. In contrast, a well-run cattle operation in south Texas will net an average profit of about \$6–9 per

hectare per year in 1998 dollars (Rhyne 1998). Furthermore, from the perspective of the landowner, income from annual quail hunting leases is drought-proof, while profits from cattle operations are not. This is because people typically lease hunting rights on ranches for several years. They understand that quail numbers will be higher during wet periods than during dry ones.

Hunting leases are the tip of the economic iceberg when it comes to quail hunting and management. Dollars spent on bird dogs, shotguns, hunting trucks, horses, guides, and staff at hunting camps all contribute to struggling rural economies in places where some of the best quail habitat remains, as well as in places where the best opportunities to restore quail- and grassland bird-habitat exist. Additionally, federal excise taxes from hunting licenses, guns, and ammunition make the quail and bird hunting economy an automatic source of funds to help grassland birds. If special quail hunting stamps are required—as they are in many states and should be in others—this will add to the coffers of management funds that can help grassland birds.

The key to using upland game birds as a tool for grassland bird conservation is to convince people that a link exists between the sustainable management of habitat for species like quail (Kuvlesky 2005), prairie grouse (Sevdarsky et al. 2003), and other species of grassland birds. For example, the results of Flanders' (2003) research in South Texas recently provided such a link by showing that exotic grass invasions had a negative impact on not only passerine populations, but on bobwhite populations as well. Overall bird abundance was 32% greater on native grass sites compared to exotic grass sites. Several species of breeding birds, including bobwhites, were 26% to 70% more abundant on native grass sites than exotic grass sites. The threat that exotic grass invasions pose to breeding birds inhabiting rangelands represents an issue that potentially links both nonconsumptive bird enthusiasts and quail hunters. It is an issue that both groups can rally around to achieve a common goal.

If quail are declining in patterns that are similar to other grassland birds (Fig. 1), then their recovery should also benefit many other species of grassland birds. Quail habitat management and grassland bird conservation is a win-win proposition no matter how you look at it. Birders and bird hunters need to put aside their philosophical differences and realize the importance of this synergistic relationship.

A Texas Example

Texas has recently developed a statewide quail conservation initiative (Texas Quail Technical Support Committee 2003). A unique aspect of the Texas Quail Conservation Initiative (TQCI) is that it stakes out important middle ground between the NAWMP Joint Ventures, which of course focus on ducks, and the NABCI, which is directed at "All Birds, All Habitats" (Fitzpatrick 2002). The TQCI is designed to address quail conservation and population recovery in Texas across 6 Bird Conservation Regions using the Joint Venture model (Fig. 2). A council of stakeholders who have an ability to wield positive political influence to promote quail- and grassland bird-conservation leads the TQCI. A committee of biologists, researchers, and managers, supports the Texas Quail Council. Researchers, biologists, and managers provide technical guidance for establishing program priorities based on the best available science (Fig. 2).

The advantage of the Joint Venture model for bird conservation is that it has a proven track record of success. The downside is that it typically takes a decade or more for individual Joint Venture initiatives to develop a critical mass of on-the-ground deliverables. For example, Fitzpatrick (2002) listed a series of all-bird management goals for 2012 using the Joint Venture model. While this is commendable, it also begs the question of what can be done during the short term while the various Joint Venture initiatives take shape and gain momentum. The TQCI addressed this dilemma with a 3-step plan: (1) Use public wildlife management areas to demonstrate state-of-the-art examples of quail habitat and population management, (2) encourage and support landowner incentives, cooperative management, and technical assistance efforts through Federal Farm Bill subsidies and other programs, and (3) grow and nurture the Joint Venture process to promote quail and grassland bird conservation in all bird conservation regions in Texas (Fig. 2). Steps 1 and 2 can be implemented immediately to achieve short-term management successes and create enthusiasm while the new Joint Venture initiatives for quail and grassland birds grow and strengthen.

Cultural and Economic Incentives

Grassland bird populations have declined and are on track to become a conservation crisis because resource economics of crop, fiber, and meat production have overwhelmed ethical land use on a grand scale. While there is no question that our prodigal society requires such resources

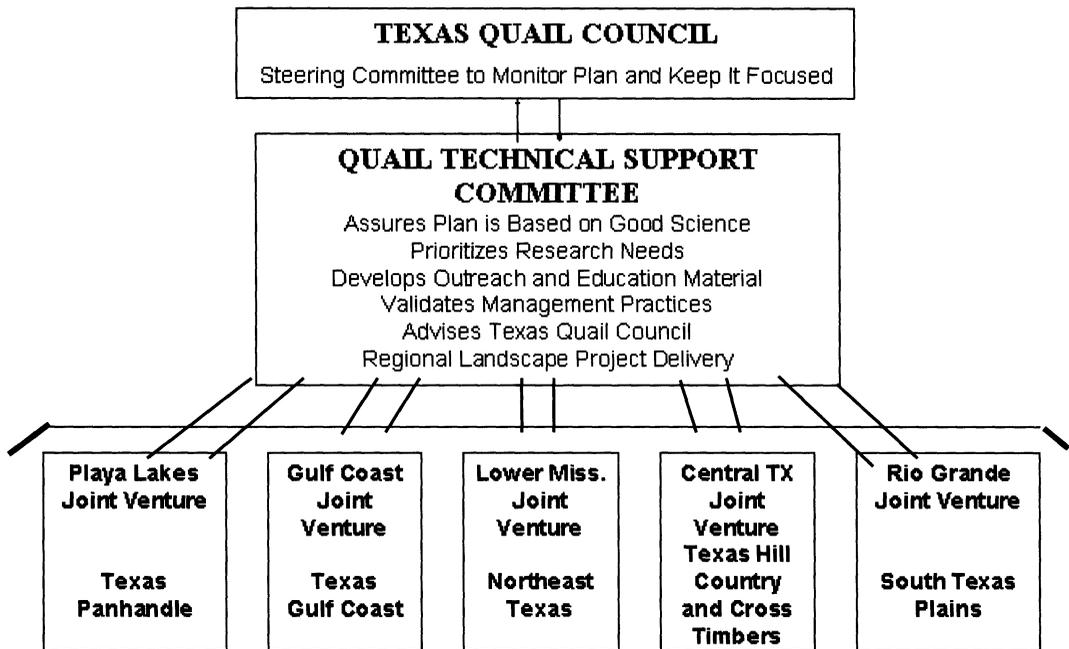


Fig. 2. Diagram of organizational relationships between the Texas Quail Conservation Initiative and Joint Venture efforts to promote land and grassland bird conservation in Texas. From Texas Quail Technical Support Committee (2003).

(Leopold 1978), we need to produce them in a manner that sustains and protects key elements of biodiversity such as grassland birds along with the habitats required to support their populations. Despite these inexorable trends, the emerging efforts to restore grassland birds by combining NABCI efforts with statewide plans to stabilize and increase upland game birds indicates that the land ethic remains a strong and important component of renewable resource management and conservation. These efforts may also finally overcome stalled and sputtering attempts (Brennan 2002) to stabilize and increase wild quail populations during the past decade.

A Generational Management Perspective

Fitzpatrick (2002) outlined a decade-long agenda to conserve land birds in North America. This is just the beginning. Such efforts will extend far beyond 2012. We predict that successful efforts to stabilize and increase grassland bird populations will be realized by the next generation of resource managers, after most of the current generation of wildlife professionals have retired. For example, an historical perspective of the North American wildlife management model shows that white-tailed deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo*), and peregrine falcon

(*Falco peregrinus*) restoration efforts typically took about 1–1.5 human generations to emerge, develop critical mass, and achieve success. There is no reason to think the situation will be different for grassland birds.

A Crisis Averted?

The stabilization and increase of grassland bird populations will require healing sick landscapes. There is no question that vast areas of the North American continent are suffering from a chronic ecological malaise. A diagnostic epidemiologic symptom of this landscape-scale illness is the widespread decline of grassland birds. This unfolding conservation crisis can be averted if the North American wildlife management model is directed toward its solution. We see positive signs that this is beginning to happen. We hope it continues and develops into a positive outcome for the sustainability of grassland birds.

ACKNOWLEDGMENTS

D. Doan-Crider compiled and edited Fig. 1 with information that was kindly provided by J. E. Fallon and J. R. Sauer of the USGS Patuxent Wildlife Research Center. We sincerely appreciate the thousands of hours contributed by the Breeding Bird Survey participants who collected the data on

which these maps were based. R. M. Perez provided Fig. 2, which was generated as part of his yeoman efforts to develop the Texas Quail Conservation Initiative. The manuscript benefited from review comments by R. A. Askins, F. C. Bryant, G. S. Butcher, T. E. Fulbright, D. H. Johnson, and D. A. Hewitt. We appreciate the invitation of Editor-in-Chief Morrison to contribute this paper to *JWM*. This is publication number 05-100 from the Caesar Kleberg Wildlife Research Institute.

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Associate Editor: Morrison.