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EMERGING TRENDS IN MIDWEST BOBWHITE CULTURE

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ABSTRACT

We begin the 21st century with the Midwestern northern bobwhite (*Colinus virginianus*) range reduced to a small portion of its historic distribution. This precipitous decline occurred largely during the last quarter of the 20th century, coincident with widespread intensive agricultural land use, unchecked natural plant succession, and frequent severe weather. Various bobwhite enthusiasts of the 1960s–1980s era including Klimstra, Dumke and Stanford had evaluated agricultural land use trends and predicted the near demise of bobwhites that we now lament. Alarmed upland bird hunters have repeatedly spurred policy makers and administrators into action. However, because bobwhites still are only an incidental product of modern agriculture, the potential for reversing declining population trends is limited. Moreover, as society and the wildlife profession become progressively less interested in consumptive uses of wildlife, the political will to appropriate agency resources for bobwhites *per se* is disappearing. Such a pattern has been seen in the Midwest where bobwhite conservation has become a marginal issue on the periphery of the species' range (e.g., Ia., Wis., Mich., Ont.). This paradigm shift is occurring in much of the bobwhite's historic range where habitat and bird populations remain at low levels. The result is that bobwhite culture as we know it (i.e., research, management, and hunting) will decline and be replaced by ecosystem conservation. At the state and national level (e.g., North American Bird Conservation Initiative, Conservation and Reinvestment Act), potential funding for restoration and management of savannas, prairies, agroecosystems, etc., can provide habitat for bobwhites. Bobwhite enthusiasts should embrace this change, and participate in the process to ensure that the needs of bobwhites are included. Importantly, our knowledge base for bobwhites is relatively strong and should bolster efforts to include needs of bobwhite in ecosystem management.

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Key words: abundance, access, agriculture, artificial propagation, attitude, biodiversity, *Colinus virginianus*, history, hunting, Midwest, *Phasianus colchicus*, ring-necked pheasant, socioeconomic, urban, wildlife profession

INTRODUCTION

“Perhaps it is time, indeed past time, to come to grips with some basic questions regarding the bobwhite's future” (Roseberry and Klimstra 1984:194). Fifteen years later, in remarks at Quail IV, John Roseberry (2000:244) reluctantly concluded that “. . . in the face of an ever-expanding human presence on the landscape, only a relatively few wildlife species will ultimately thrive, and the bobwhite will probably not be one of them.” Indeed, as we begin the 21st century the ill-health of bobwhite populations in the Midwest, especially toward the north, is even clearer. To better understand the future of bobwhite in the Midwest, I review trends in bobwhite abundance, bobwhite hunting and management, society, the wildlife profession, and agriculture. It appears there is potential for improvement in living conditions for bobwhites based on emerging, but complicated land use trends; however, the nature of professional bobwhite conservation will change as efforts on the species' behalf are absorbed into a larger, ecosystem approach to habitat restoration and management.

BOBWHITE CONSERVATION

Bobwhite Abundance

Bobwhite flourished in the Midwest following European settlement and the beginnings of agriculture.

Historical accounts in Wisconsin indicate a tremendous peak in the mid-1800s, followed by a long-term decline (Schorger 1944). Bobwhites were abundant and easy to catch in northern Missouri during this time, and men commonly herded large flocks into walk-in nets from horseback. The journal of attorney Alexander Slayback (1844) (paraphrased) reveals the catch: “Jan. 10th, Went Partridge hunting—caught 77; Jan. 11th, caught 41; Jan. 12th, Partridge hunting again—caught 91; Jan. 22nd, Went Partridge hunting—caught 103. Caught 28 at one drive. I have wasted several days hunting partridges lately but I think I will not waste much more time.” Such large catches made bobwhites popular for commercial trapping and shipment to the east coast. In Beloit, Wisconsin a shipment of 12 tons (ca. 55,000 birds) was reported in 1850 (reviewed by Kabat and Thompson 1963), and Nebraska trappers shipped 1 load of 18,700 bobwhite in 1875 (Nebraska Game and Fish Department 2001). This era of extreme exploitation did not last long, and during the late 19th century, and early 20th century depressed bobwhite abundance reduced hunting. For example, Wisconsin bobwhite hunting was discontinued during 1895–1931 (Kabat and Thompson 1963). Kozicky (1993:3) concluded that the great Midwest bobwhite peak of the 1800s “is a glamorous relic of the past, a relic we wish to fully understand but that we can only reproduce on a small scale.”

Population surveys by individual states since the

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Table 1. Long-term (1966–1999) population trends and relative abundance (mean birds/route) for northern bobwhite based on the North American Breeding Bird Survey (Sauer et al. 2000).

Region	Trend	P-value	Abundance
Illinois	-1.9	0.00	21.45
Indiana	-2.3	0.00	18.73
Iowa	-3.8	0.00	7.84
Kansas	-1.0	0.17	30.49
Michigan	-7.0	0.05	4.95
Missouri	-2.0	0.00	37.43
Nebraska	-1.1	0.27	8.82
Ohio	-6.2	0.00	10.62
Ontario	-19.2	0.05	1.67
Wisconsin	-1.0	0.41	1.67

1950's reveal wide annual fluctuations from drought, flooding, and severe winter weather, and a long-term downward trend. The most uniform survey for states in the Midwest is the North American Breeding Bird Survey. The long-term (1966–1999) trend is negative, with rates varying by latitude and longitude (Table 1). Northern-midwestern states (Mich. and Oh.) and Ontario, Canada showed the largest declines (-6.2 to -19.2%), and central-west states (Ind., Ill., Wis., Mo., Kans., Io., Nebr.) declined <3.9%.

Midwest bobwhite abundance reached its last notable peak in the late 1960s. This peak coincided with reduction in the Soil Bank Program (United States Department of Agriculture), which had peaked in 1961, but had dropped considerably by 1966 (Dahlgren 1988). Roseberry and Klimstra (1984:155) observed that the late 1960s peak was in phase with a 10-year cycle. Severe winter-weather in the late 1970s greatly reduced any potential large upswing cycle. For Illinois, Edwards (1972:180) proved to be prophetic in his evaluation of bobwhite abundance during 1955–1970: “my personal view is that we will never again see bobwhite as abundant in Illinois as they were in 1968 and 1969.” Indeed, by 1999 many Midwest states had recorded historic low bobwhite abundance (e.g., Mo., Dailey and Heidy 1999; Ind., McCreedy 2000).

The precipitous long-term decline during the last quarter of the 20th Century has been blamed on intensive agricultural land use (Klimstra 1982, Brady 1985, Roseberry and Sudkamp 1998). Modern agriculture provides few benefits to bobwhite with numerous negative aspects (e.g., large field size, monocultures, pesticides, less waste grain, overgrazing, pastures and hayfields dominated by exotic grasses). Intensive commodity production has been particularly egregious because the potential for bobwhite is negatively impacted in 2 ways. First, farm products that benefit bobwhite (e.g., grain, grass) are almost totally removed by efficient machinery and intensive harvest of grass. Second, the methods for producing the products (e.g., pesticides, fall plowing, double cropping, large field size) diminish overall living conditions for bobwhite. Depressed bobwhite abundance in the 1990s in some Midwest states also coincided with abnormally wet breeding seasons (e.g., massive flooding in Mo. and Mississippi River watersheds in 1993 and 1995).

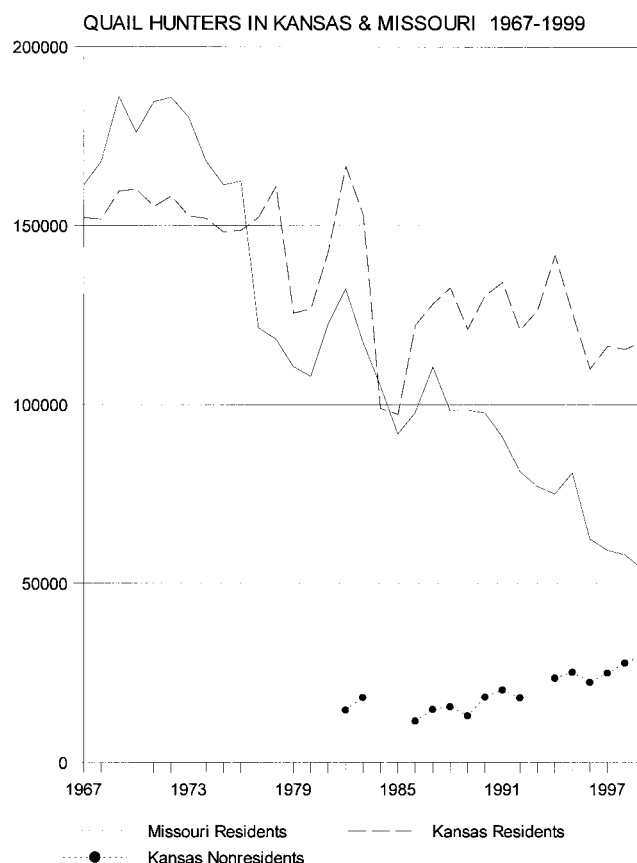


Fig. 1. Number of licensed quail hunters in Missouri and Kansas during 1967–1999. Missouri data from Missouri Department of Conservation files, Columbia, and Kansas data from Roger Applegate, Kansas Department of Wildlife and Parks, Emporia.

Hunting

Bobwhite harvest and the number of hunters varies widely across the Midwest. Ontario does not have a bobwhite hunting season and Michigan only recently reinstated its season. Annual harvest ranges from <3,000 (e.g., Wis. 1999 season, Dhuey 2000) to 1.3 million in Kansas during the 1999–2000 season (Roger Applegate, Kansas Department of Wildlife and Parks, personnel communication). The largest modern-day harvest occurred in Missouri during the 1969–70 season when 3.9 million bobwhite were harvested (Sheriff and Kulowiec 1996). Along with recent low harvest, hunter participation has been down, with the number of resident bobwhite hunters ranging from 890 in Wisconsin in 1999 (Dhuey 2000) to 117,600 in Kansas during 1999–2000 (Roger Applegate, Kansas Department of Wildlife and Parks, personnel communication); the next highest bobwhite hunter count is much lower, 52,500, in Missouri (Dailey and Heidy 2000). Kansas has the reputation as the best bobwhite hunting state in the Midwest, and attracted 30,000 non-resident bobwhite hunters in 1999 (Fig. 1). Bobwhite hunters come from many states to Kansas and the state might be attracting hunters that have abandoned their home states' bobwhite hunting. Although all Midwest states have lost bobwhite hunters since the 1960s, the downward trend in Kansas was shallower. The relative

strength of bobwhite hunting in Kansas is shown in Figure 3, in this case relative to a neighboring state, Missouri. The potential effect of these trends on future bobwhite conservation is discussed later in the paper.

Special Interest Groups

One index of interest in upland game birds is participation in special interest groups such as Quail Unlimited, Inc. (QU). Examination of the QU fiscal report for 1999–2000 reveals strong membership in the Midwest relative to the rest of the country (Quail Unlimited 2000). The top 10 states in membership include Kansas (ranked number 1), Missouri (5), Indiana (7), and Illinois (9). The majority of membership nationally is in eastern Kansas and western Missouri, with the major cities of Topeka, Wichita, and Kansas City boasting a membership of 1,324; this would rank as 4th on the state membership list with Kansas and Missouri removed. Whether these groups accurately represent the “voice” of bobwhite hunters is unknown. For example, in Missouri and Kansas in 1999, QU membership of <2,000 per state was <2.5% of the states’ resident bobwhite hunter populations.

Translocation and Artificial Propagation

“Have those of us in the wildlife management profession forgotten artificial propagation is a tool of wildlife management?” (Kozicky 1993:4). Midwest biologists have a rich history of manipulating game birds to meet hunter demand. Bobwhite managers typically use artificial propagation or translocation of wild birds because landscape isolation and severe winter weather have extirpated or greatly reduced populations. Large scale restoration via artificial propagation has been abandoned because it is expensive, ineffective, and ecologically indefensible (Roseberry et al. 1987). Restoration in localized areas via propagation or translocation remains viable (Roseberry et al. 1987, Griffith et al. 1989). High cost, and lack of success with translocation in Indiana (Brian R. Frawley, Michigan Department of Natural Resources, personnel communication) and West Virginia (Crum 1993), demonstrate the serious challenges of this management tool.

As bobwhites have become increasingly scarce, uses of propagated bobwhites for dog training, and private and commercial hunting have increased. Kozicky (1993), a longtime advocate of artificial propagation to meet recreational demand, argued for increased study of development of wild behavior in pen-raised bobwhites. However, businesses generally prefer to use ring-necked pheasants (*Phasianus colchicus*) and chukars (*Alectoris chukar*), and not bobwhites, because of the former species’ tendency to behave as single units, or in small groups of a few individuals. There are several advantages of hunting these alternative game birds. They are safer, with a typical hunt encounter involving only 1–2 targets in relatively predictable flight, versus a covey of bobwhite flying in many directions. For a dollar-conscious hunter, this behavior is also more attractive, reasoning that 10 pheasants flushed in separate events would provide more pre-

dictable recreation than a covey of 10 bobwhite flushing chaotically. From a marketing perspective, relative to bobwhite, these species offer an exciting hunt with the pheasants and/or chukar being colorful, noisy and larger targets. State natural resource agencies, likewise, could use similar criteria in selecting game birds for programs designed to recruit and/or retain hunters.

Pen-raised bobwhites are no longer used for hunting by state agencies in the Midwest, however, pen-raised pheasants are still being used for put-and-take hunts or to supplement wild populations prior to hunting seasons (e.g., Illinois Department of Natural Resources, Ohio Department of Natural Resources, Nebraska Game and Fish Department, Wisconsin Department of Natural Resources). In summary, it appears that Midwest game bird enthusiasts will be less reliant on propagated bobwhites than will be their southern counterparts, partly because of alternate, suitable game birds. Furthermore, as discussed later, as the influence of a decreasingly small hunter constituency wanes, the will to translocate wild bobwhites and/or to artificially propagate bobwhites will disappear.

Riding the Wave

At the turn of the 21st century bobwhite conservation has swelled once again with an abundance of research and conservation efforts. In 1997, John Roseberry (2000:243) described the roller-coaster that bobwhite conservation had been on since the 1920s and spoke favorably of the resurgence that began in 1992 at Quail III. There, in a strategic planning session, Lenny Brennan (1993:167) summarized the dismal state of bobwhite populations and called for a turn around: “The prognosis can be reversed if wildlife professionals and natural resource policymakers do a complete about-face and begin to make bobwhite management and research a priority.” Bobwhite conservation efforts have indeed turned around with a plethora of programs including experimental restoration in Georgia, Virginia and Missouri, creation of the Southeast Bobwhite Technical Committee as part of the Southeastern Association of Fish and Wildlife Agencies, and increased emphasis on research, in particular the establishment of 2 endowed chairs in bobwhite ecology in Oklahoma and Texas.

As we go about this business, it’s critical that we not operate in a vacuum. Experience from the periphery of the bobwhite’s range teaches us that we must be realistic about the challenges of a landscape unsuitable for bobwhite and of a people not interested in rectifying the situation. Moreover, the societal trend to disfavor consumptive use of wildlife indicates that the current resurgence could be relatively short-lived. On the bright side, society’s tendency to provide more support for conservation in general should benefit conservation of species such as bobwhite.

EMERGING TRENDS IN SOCIETY AND NATURAL RESOURCE MANAGEMENT

The nature of future bobwhite conservation will be determined by a complex of interrelated factors in-

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cluding loss of rural populations and values, benefits to society of bobwhite hunting, behavior of bobwhite hunters, hunting participation, bobwhite abundance, ecological thought, etc.

A More Urbanized and Nonconsumptive Philosophy in Society

In the United States in 1990, about 190 million people lived in urban areas and 60 million lived in rural areas. During 1950–1990, urban populations nearly doubled and rural populations grew less rapid, resulting in a decline in the fraction of the population living in rural areas from about 33% to about 25% (The H. John Heinz III Center for Science, Economics and the Environment 1999).

In Missouri, the farm population declined 50% during 1970–1990 to 180,100 (Seipel et al. 1995). As the United States becomes less rural, the nature of attitudes toward hunting grows increasingly negative. In Illinois, 47% of survey respondents disapproved of state programs to maintain or increase game animals, and 79% of respondents 18–34 years old valued wildlife the same as pets and people (Mankin et al. 1999). A majority of survey respondents in Missouri (Missouri Department of Conservation 1996) and Illinois (Mankin et al. 1999) approved of hunting for food, but disapproved of hunting for “sport” or trophies. It’s unknown how bobwhite hunting might be viewed, although compared to deer hunting, the latter is more of a pursuit of food. Harvested bobwhites, on the other hand, provide a tiny fraction of the average hunter’s sustenance. For example, if we assume that the cooked meat of a bobwhite weighs 50 g, the average Missouri hunter (about 10 bobwhite bagged per season) consumes about a pound of bobwhite flesh annually. Bobwhite hunting is also at a disadvantage if society holds that hunting in general is not acceptable, except in rare situations, (e.g., when hunting benefits society). Deer harvest provides benefits to society by providing food and reducing damage to property and life. It’s doubtful the youth surveyed in Illinois would view bobwhite hunting as anything other than sport, (i.e., not a necessity of life).

Hunting is a declining part of American society, with urbanization, lack of time, negative societal attitudes, etc., contributing to the downward trend. The proportion of the United States population that hunts declined during 1955–1996 with a high of 11.2% in 1960 and a low of 7% in 1996 (United States Department of the Interior 1997: Table B-3 and page 30, respectively). Furthermore, hunters are a smaller proportion of the population of large cities, the places where media and political power are concentrated. In 1996, only 3% of residents in cities with populations >1 million hunted, 7% hunted from cities with populations of 250,000 to 999,999, 9% hunted from cities with 50,000 to 249,999, and 15% hunted from cities with <50,000 residents. In Illinois, 11% of urban and 29% of nonurban residents hunt or trap (Mankin et al. 1999). The status of hunting is better in some parts of the bobwhite’s range with 14% of west-north-central

residents (states of Mo., Kans., Ia., Minn., Neb., N.D., and S.D.) hunting, 8% of east-north-central (Wis., Mich., Ill., Ind., Oh.) and west-south-central (Okla., Ark., Tex., La.) hunting, 10% of east-south-central (Ky., Tenn., Miss., Ala.) and 6% of south Atlantic (Fla., Ga., S.C., N.C., W. Va., Va, Md.) hunting (United States Department of the Interior 1997:27).

Even more ominous for the future support of bobwhite conservation are the negative attitude and dwindling interest in hunting by American teens and young adults. For the United States population 16–17 years old, only 9% hunted in 1996 (United States Department of the Interior 1997:29). In the southeastern United States, Burger et al. (1999) found that the average age of bobwhite hunters was 38 years.

A particularly alarming aspect of the lack of young hunters is that university students, our future wildlife managers and researchers, increasingly do not hunt (Hodgdon 1999). In the Midwest, the University of Wisconsin-Madison, and the University of Missouri-Columbia, offer training in hunting in an attempt to familiarize students with this fundamental management tool. Mere familiarity with hunting, however, is not the traditional background of agency biologists. It is clear from my own experience with >70 temporary research assistants (minimum of Bachelors Degree) over the past 14 years that trained biologists that hunt are a minority. It is likely that future professionals will have less interest in game bird management and will not relate well to hunters.

Clearly, the balance of power in the United States is concentrated in the hands of people with relatively distant ties to consumptive use of natural resources. As trapping and hunting have been criticized over the past few decades, the first step taken by agencies, outdoor writers, hunting groups, etc., was to change hunter behavior using education (e.g., hunter safety instruction) to improve the perception of hunting. The degree of society’s tolerance for hunting, or game programs, is dependent on the taxa being hunted (people are more sensitive to death of mammals than birds), ethics, perception of fair chase, benefits to society, etc. Society has begun to eliminate the more objectionable aspects of consumptive recreation as evidenced by the loss, or near loss, of trapping, lion hunting or fox hunting in California, Colorado, Oregon, Washington, and Great Britain. These losses of professional jurisdiction over management demonstrate that game enthusiasts cannot take public support for granted. Burger (1988: 18) noted the precarious situation we are in: “While largely apathetic, nonhunters have the capacity to shift the balance of public sentiment in either direction, suddenly and overwhelmingly.” Unfortunately, bobwhite enthusiasts have recently shown a dark side when predators were illegally poisoned in the southeastern United States. At a minimum this has alerted the rest of society to the nature of bobwhite hunting and management. Research on predator control puts bobwhite conservation on a slippery slope, as noted in a discussion of predation by Leopold and Hurst (1994): “Therefore, most citizens will not appreciate the need to increase game bird abundance through predator con-

trol, instead assigning aesthetic and ecological, rather than recreational and utilitarian, values to wildlife.” Indeed, the perception of bobwhite hunters being greedy, at the expense of all fauna except bobwhites, could negatively affect major conservation initiatives beneficial to bobwhites, and it could ultimately doom the sport. With today’s conservation initiatives (e.g., Conservation Reserve Program [CRP], North American Bird Conservation Initiative, Conservation and Reinvestment Act [CARA]) involving a diverse coalition of interests (e.g., Sierra Club, Audubon Society), bobwhite conservationists have to be particularly sensitive to the views of society.

Environmentalism: Do Bobwhites Fit?

Other societal views, some originating in environmental concerns, have a potentially negative effect on the future of bobwhite habitat management. Askins (2001), in an article entitled, “Sustaining biological diversity in early successional communities: the challenge of managing unpopular habitats,” pointed out that society’s embrace of conservation of climax forest resulted in disdain for habitats manipulated by man, in this case early-successional forest stages created by logging. Bobwhite habitat management is seemingly unpopular, too, with long-held concepts of edge management for bobwhite being contrary to the ecological movement to avoid fragmented forests (Roseberry 1993). We have an example of such philosophy in Missouri, where unpopular habitats include hedgerows in grasslands. Hedgerows were created by farmers, and thus are viewed as “unnatural” in a landscape “intended” to have an open vista; further benefits of hedgerow removal are believed to be realized for area-sensitive grassland birds. In some cases, bobwhite hunters objected because of their experience finding bobwhite in these hedgerows; hedgerow removal could diminish habitat carrying capacity for bobwhite (Kabat and Thompson 1963, Roseberry and Klimstra 1984: 30). Regardless, lower value is being placed on tangible resources and constituents (i.e., bobwhite and bobwhite hunters), apparently in pursuit of something more “natural.” Bobwhite habitat management in general poses potential environmental risks. Management for early-successional habitats can impact the environment in several ways including burning of fossil fuels for cultivation, soil erosion from disturbance of ground, and air pollution from fire. Prescribed fire is the most sensitive issue, and societal tolerance for degradation of air quality will likely decline as human industrial activity increases and pressure on air quality intensifies. Existing restrictive regulations for air quality at the state and federal level have led to legislation protecting the right to use prescribed fire to perpetuate natural plant communities; Florida for example, has such a law.

Effects of a Diverse Constituency and Funding Base

During the last quarter of the 20th century support for conservation was broadened beyond traditional hunting and fishing fees to include sales taxes in Mis-

souri and Arkansas, automobile license plate revenue and tax check-offs in several states, and national initiatives such as CARA. Hunters and game-oriented resource professionals were delighted that all citizens were now supporting conservation programs. Indeed this is a good change providing funding for comprehensive natural resource programs and ultimately an improved environment. Also, during this period participation in conservation by nontraditional special interest groups grew tremendously with organizations such as National Audubon Society, Sierra Club, etc., becoming influential with local initiatives and national policy. The implications for game management of broadening agency funding and constituency bases were articulated by the Society for Animal Rights, Inc. (Favre and Olsen 1979): “If change of perspective is ever going to arrive at the game agencies, funding and political pressure are going to have to come from new sources. Only if these special interest agencies are forced into the political mainstream of social and financial debate will the broader issues be faced.”

Missouri: The New Paradigm in Midwest State Agencies

The effect on resource management of diversified funding and constituent bases can be seen from the experience of the Missouri Department Conservation (MDC) and its 25-year-old tax-supported program. Since 1977 MDC has received funding from a one-eighth of a cent sales tax. Of the typical annual budget of >\$130 million, about 25% is derived from hunting and fishing permits. Although hunters also pay the sales tax, their overall contribution is still small because only about 13% of Missourians hunt (United States Department of the Interior 1997, Table 50). This reversal in funding has broadened MDC’s emphasis from traditional constituents, primarily hunters and anglers, to more casual participants in outdoor activities. Simultaneous with this shift, ecosystem management was being espoused as the appropriate approach to conservation. Over the past decade MDC debated the relative merits of ecosystem and game management. Much of this debate focused on bobwhite management because intensive habitat management is expensive and unpopular in some circles. The fate of MDC’s bobwhite restoration was brought to the forefront in 2001 when a statewide comprehensive plan was devised. MDC’s internal administrative review revealed several of the key issues of those opposed to a bobwhite program. Foremost, some administrators argued that natural resource agencies should be engaged in ecosystem management, and not narrowly-focused programs for a single species. Bobwhite proponents countered that species-specific programs are conducted for rare and endangered animals; however, the goals of a game bird program are different because the aim of such programs is to achieve huntable numbers of animals, a population level higher than that required for population viability. Bobwhite advocates have also argued that the species could serve as a “poster-species” or icon, in efforts to affect improved wildlife

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management on private lands; however, plan detractors remain unconvinced of the merit of a species plan. It is clear in Missouri that diminishing bobwhite hunter numbers (>160,000 annually in 1970s, 100,000 in 1980s, <50,000 in 2000) have influenced attitudes; one administrator commented that the agency should be less sensitive to bobwhite hunters because they represent a “declining interest group.” Similarly, for the Wisconsin Department of Natural Resources, Petersen et al. (2000) noted that although substantial resources had been committed to bobwhite management up to the 1980s, future funding was in doubt largely because the agency’s priorities are tied to harvest, and bobwhite harvest was in a seemingly permanent slump.

Kansas: The Traditional Paradigm in Midwest State Agencies

A stark contrast to Missouri’s system can be found next door in Kansas. Kansas and plains states to the north differ from their eastern counterparts in that they are largely rural in character and rely more on economic benefits generated from hunting, especially from nonresident hunters. Kansas Department of Wildlife and Parks (KDWP) is funded largely by hunting and fishing permit fees, and its Strategic Plan reflects that funding base: “In the 21st century, management of the state’s harvestable wildlife resources for consumptive recreation will continue to be a primary focus of the Department.” (Kansas Department of Wildlife and Parks 2000). Kansas Department of Wildlife and Parks is aggressively working to shore up its upland hunting tradition and to cultivate hunting via a hunter retention and recruitment program and by providing access to private land for hunting. The newly developed KDWP Hunter Recruitment and Retention program (*Kansas Hunting: Carry on the Tradition—Ensure the Future*) offers a comprehensive approach aimed at raising hunting participation to 15% of the state’s populace. However, the Missouri Department of Conservation’s mission statement reflects its diverse funding base and mentions hunting only in reference to the fact that its funding base no longer comes primarily from hunting licenses: “To provide opportunity for all citizens to use, enjoy, and learn about fish, forest, and wildlife resources.” (Missouri Department of Conservation 2000). Such differences have fostered a false impression among Missouri hunters that Kansas offers more to game bird hunters. Although MDC doesn’t offer as many programs targeted specifically at bobwhite hunters, the abundance of public hunting land in northern and western Missouri, and an aggressive private land management program, both made possible partly by the sales tax, provide substantial, but fewer tangible benefits to bobwhite hunters. Hunting success, measured as average daily bag (daily limit of 8), is nearly the same for Kansas (2.34 in 1980s, 2.19 in 1990s) and Missouri (2.32 in 1980s, 2.07 in 1990s).

Research Changes

The changing nature of bobwhite conservation, particularly research, was discussed at Quail III by

John Roseberry in a paper entitled “Bobwhite and the New Biology.” One important needed change recommended by Roseberry was less study of “site management skills and approaches” and more research on population ecology and the spatial structure of habitats (Roseberry 1993:17). Similarly, Guthery (1997:291) criticized the tendency for micromanagement of bobwhite and the redundancy of bobwhite research (“Numerous papers have dealt with management practices such as grazing, prescribed burning . . . and combinations of 2 or more of these practices.”) and called for testing of unifying principles he had conceived. By 2001, the rarity of bobwhite research in scholarly scientific journals (*Science*, *The Journal of Wildlife Management*, *Ecology*, etc.) and the plethora of unrepliated and descriptive studies in the Quail IV proceedings indicate that we are still largely stuck in the old paradigm of bobwhite conservation. That view was articulated at the first National Bobwhite Symposium by Komarek (1972:375): “Today in some circles, we seem to have lost the premise that the purpose of game research, particularly where it is financed by the sportsman’s dollar, is that these people who furnish the funds ‘naturally desire a practical outcome to the investigation.’ Thus it is heartening to me that in spite of the discussions now going on in those circles as to the merits of ‘pure’ game research versus management research, that at least in bobwhite management there is no such hiatus.” The roots of what Komarek refers to as ‘pure’ game research were from the Midwest and included the likes of Errington, Hamerstrom, Kabat, Thompson, Klimstra, and Roseberry. Long-term research such as practiced by these men did not come easy. In the 1940s, Pittman-Robertson funding for Paul Errington’s research was threatened and at the 13th North American Wildlife Conference, the role and nature of research was being debated. In support of Errington’s long-term studies, Aldo Leopold (1948:44) provided his perspective on the balance between applied and basic research: “Much of the confusion about wildlife research arises, I think, from a false premise as to its purpose. It is often assumed that its sole purpose is to produce bigger crops. I challenge whether this should be the sole purpose, or even the main purpose. I suspect that too much emphasis on bigger crops is the least likely way to get bigger crops.”

For state natural resource agencies, 21st century bobwhite research will increasingly be less about producing bigger crops of bobwhite, largely because the political will for such intensive management is disappearing. More importantly for bobwhite conservation, and ultimately for the fate of hunting, as populations of bobwhite become more fragmented, the need to understand population viability will spur basic research of population genetics, sink-source dynamics, exploitation by hunters and cyclic population phenomena (Roseberry 1993).

Ecosystem Management

So, if our traditional state bobwhite programs are dwindling, how will bobwhites figure in future agency

programs? They will be absorbed by ecosystem management. What should bobwhite enthusiasts do? Embrace ecosystem management, and participate in the process to ensure that needs of bobwhite are included.

Bobwhites have historically been a prominent part of only one national initiative, the United States Department of Agriculture Conservation Reserve Program. Bobwhite habitat requirements have been directly incorporated into the CRP. Beyond the CRP, the success of attempts to develop a national-level focus on bobwhites and upland game birds has largely been limited to planning and information transfer (e.g., North American Game Birds: Developing a Management and Research Agenda for the 21st Century; the Quail III Strategic Management Plan, Quail III/IV Symposia). Federal funding of these efforts was infinitesimal, totaling less than \$30,000. Unlike migratory wildlife, bobwhite conservation efforts are highly fragmented with little or no national focus or federal funding. Significant new opportunities for federal support of upland game bird initiatives now exist. To improve bobwhite conservation, the directors of the Southeastern Association of Fish and Wildlife Agencies (SEAFWA) created the Southeast Quail Study Group and called for formulation of a national quail plan (Northern Bobwhite Conservation Initiative, NBCI) for implementation within the North American Bird Conservation Initiative (NABCI), a program of the International Association of Fish and Wildlife Agencies (IAFWA). The NBCI is being developed by bobwhite biologists around the country under the direction of Ralph Dimmick, University of Tennessee. Northern bobwhites are considered a NABCI priority species within several Bird Conservation Regions (BCR) that occur in the Midwest (e.g., BCR 22-tall-grass prairie, BCR 24-central hardwood forest, BCR 19-central mixed grass prairie). Game bird enthusiasts also have a formal position in NABCI, the Resident Game Bird Working Group. Partners in Flight (under the authority of the IAFWA) considers northern bobwhite a priority species in most Midwestern ecological regions.

In order to ensure successful implementation of bobwhite conservation in the NABCI, bobwhite enthusiasts from all levels, public and private, need to increase their involvement at the local, state and regional level. Several states have already created plans to facilitate implementation of the NABCI. Importantly, we have an excellent understanding of bobwhite ecology compared to what's known for species of primary focus in some initiatives, (e.g., rare Henslow's sparrows in grasslands); this advantage should increase the chance of achieving effective habitat practices.

Numerous ecosystems, or natural plant communities, in the Midwest can provide habitat for bobwhites. The largest in area are the tall-grass prairies and oak-savannas. Midwestern tall-grass prairie and savanna ecosystems are a tiny fraction (<90%) of their historic range (Noss et al. 2001). The outstanding exception is the Flint Hills region of Kansas, which also happens to be a stronghold for bobwhites. Grasslands within the range of bobwhites in other Midwest states, however, exhibit extreme (99%) loss (Noss et al. 2001).

Oak savannas are typified by widely spaced trees and/or shrubs with a dominant understory of graminoids and forbs. Savannas are perpetuated by fire, and consequently species such as northern bobwhites that thrive in the early-successional habitats created by fire, benefit from savanna restoration (Callahan 1996). Savannas are one of the rarest plant communities in North America, with about 2% of the original 11 million presettlement hectares in the Midwest remaining (Nuzzo 1986). The amount of presettlement savanna varied widely among states, with tremendous potential for positive change for bobwhite in some cases. For example, Missouri's presettlement savannas covered about 15% of the state, or some 2.6 million ha; the current area is 2,024 ha (Mike Leahy, Missouri Department of Conservation, personnel communication). Interest in savanna restoration is increasing as evidenced by the publication of the Proceedings of the Midwest Oak Management Workshop, Eastern Illinois University, in 1991.

Natural plants and natural plant communities are being restored throughout the Midwest by numerous public agencies and private organizations. Efforts range from miles of narrow roadside plantings in Iowa to larger tracts, containing 2,000–4,000 ha, in Missouri, Illinois and Iowa. A plethora of community types exist (shortleaf pine woodlands, glades, etc.) that could provide habitat for bobwhites. The extent of restoration of natural communities could be limited by cost, amount of public land, willingness of private landowners to implement, air quality concerns regarding prescribed fire, etc.

AGRICULTURAL TRENDS

Given that agriculture will dominate land use in the Midwest in the 21st century, the importance of bobwhite conservation in agroecosystems cannot be overstated. John Roseberry, in concluding remarks at Quail IV (2000:244) posed the situation this way: "Given enough time, space, and opportunity, I think we have sufficient knowledge and skill to produce locally abundant bobwhite populations. To be a viable game species, however, it is not sufficient for bobwhite to be locally abundant. They must be reasonably abundant over relatively large portions of the landscape. The problem, of course, is that bobwhite biologists and managers do not control large portions of the landscape." The solution, Roseberry continued: "Finding ways to accommodate the needs of bobwhite in emerging agricultural and forestry programs will be challenging, but absolutely essential."

Midwest agriculture is extremely diverse with a plethora of influences including local, state, national, and international economies, the expanding human population, the culture of family farms, biotic and abiotic elements (e.g., global warming, disease, weeds) and environmental concerns of society. Although the potential for agricultural trends is relatively easy to identify, the nature of those trends, and the potential effect on bobwhite are very speculative. A guiding

idea for such evaluation is that as intensity of land use increases, quality of habitat for bobwhites declines.

Demographics

For bobwhite conservation to be successful on agricultural lands biologists must understand basic characteristics of rural landowners and the landscape. For example, in Missouri, demographic data have led biologists in rural northeast Missouri to hold landowner workshops >100 miles away in St. Louis. The abundance of absentee landowners necessitated such effort.

Study by Constance et al. (1996) of land ownership in Missouri provides an example of important demographics in Midwest agriculture. In the early 1990s in the Midwest, about 44% of all cropland was rented, and these rental acreages were concentrated in the most productive landscapes (e.g., riverbottoms). The majority of landlords were old (71% are ≥ 60 years old and 45% are ≥ 70 years old), and lived far from their land (54% live ≥ 50 miles from their farms). In Missouri and nationally, about 40% of rented noncorporate agricultural land is controlled by women, and 47% of these women are widowed, and typically elderly. Moreover, women own smaller tracts, and importantly rely more heavily on this income as a percentage of total income. The rental situation is further complicated by the fact that most landlords ($\geq 70\%$) leave farm decision-making to the renter.

Clearly, private land efforts must involve a team approach with researchers identifying the nature of land ownership and landscape physiogamy, and urban and rural biologists collaborating to reach all parties involved in management (owner, renter, government agencies, agribusiness, Non-governmental Organizations [NGOs], etc.). Timing is also critical, particularly for large-scale bobwhite restoration efforts. For example, chances of success are dependent on landowner willingness to cooperate; this in turn is affected by a plethora of factors, not the least of which is the person's discretionary income. Unlike government workers that have steady income, agricultural income is cyclical, with a deficiency in about 4 out of 10 years (Womack 2001).

Farm Size

Midwest farm size is changing with mid-size farms being replaced by larger and smaller tracts. The latter are often used for recreation, residence and agriculture, although only as a minor source of income. In Missouri, large farms dominate production with 4% of the farms producing 42% of the state's agricultural output; they do so on only 17% of the total farmland (Seipel et al. 1995:31). For the smaller farms, agriculture is a secondary consideration, and thus, wildlife might be able to compete better for a place in the management of these lands. In addition, because income of these landowners is supplemented by off-farm income, greater discretionary spending is possible, a potentially important prerequisite for habitat management. Also, the relatively small size of these land holdings should increase the heterogeneity of rural land-

scapes, providing more "edge" for bobwhites. Negative aspects for bobwhite conservation of these smaller land holdings increase with increasing density of landowners. These include urban landscaping (Burger 1988), pets, and reduced access for hunting. Work with conservation-minded landowners such as these is the bread-and-butter of wildlife management. The shift toward smaller land holdings could be stimulated by agricultural trends that make production on marginal lands uneconomical.

Marginal Agricultural Lands: Opportunity for Bobwhite Conservation?

Several trends have the potential to shift intensive agricultural production away from marginal (unprofitable) lands. Although such reduction in intensive land use could benefit bobwhites, the CRP demonstrates well that plant succession quickly renders such unmanaged lands unsuitable for bobwhite (Burger et al. 1990). The chances of these marginal lands being managed for bobwhite is not great because many of the landowners could lack the discretionary income, or time, necessary to manipulate plant communities. Relative to intensive agricultural land use, however, these marginal lands could provide opportunity for bobwhite management.

Some inherent land characteristics that contribute to profitability include plant growth capacity (soil fertility, moisture, etc.), and distance to suppliers and markets. Any one of these factors, or a combination, can affect profitability. Erosive, infertile lands with erratic rainfall that are far from suppliers and markets would be the most likely to be unprofitable and to go out of production. Other major forces, including technology and international economics, are also contributing to change in the profitability of America's rural lands.

Advocates of biotechnology argue that genetically engineered higher-yielding crops will reduce cultivation of marginal lands. Dennis Avery, director of the Hudson Institute's Center for Global Food Issues (Avery 2001), states that "If we are successful in 2020, the world will have free trade in farm products of all kinds, so that it can use its best land to produce the products for which each acre is best suited. As a result, we will meet the food demand of seven billion people—all more affluent by far than the average people of the year 2000—without taking any more land away from nature."

Marginal lands could be shifting out of production by the trend toward concentration of production in the hands of a few corporations. Monsanto's failed attempt to acquire American Home Products, Inc., is part of an ongoing strategy to create what's called a "dirt-to-dinner plate company" with control of what, when and where seeds are planted and harvested, and the manufacture and distribution of final products (ASI Global Landletter, Spring 1999). The model for this business approach is well established with poultry and pork. This could result in lands going out of production, either because landowners are unwilling to operate un-

der contract, or they are unable to compete with large corporations. There also is believed to be an advantage for vertically-integrated corporations to have ownership of large contiguous tracts, rather than scattered tracts, resulting in increased operating efficiency and fewer problems with neighboring landowners (ASI Global Landletter, Winter 2000). The net effect of increased corporate ownership on wildlife management is unclear, with both positive (e.g., marginal land out of production, corporations' sensitivity to environmentally-based public relations, large land area controlled by 1 manager) and negative aspects (decisions ultimately made by distant executive). Experts predict environmental concerns will play a "much bigger part" in future production decisions (ASI Global Landletter, Winter 2000), so biologists need to be aggressive with potential corporate cooperators.

Marginal lands could be driven out of the agribusiness mode by foreign competition. Free-trade advocates believe that reduced input costs and less costly environmental regulation will give foreign agricultural producers a competitive edge and result in less agriculture land use in the United States. Steven Blank, agricultural economist at the University of California-Davis, suggested that the United States get out of the farming business all together (Kirschenmann 2001). Although marginally profitable lands would be the most vulnerable to foreign competition, the best lands could also be affected by competition. Particularly pertinent to bobwhite conservation is the prediction that American farmers will move away from bulk commodities such as corn and soybeans (ASI Global Landletter, Winter 2000). Analysts figure that some of these crops could be replaced by specialty products, with large fields that once grew 1 or 2 crops now producing 10–15 different products. Further, these producers will work more closely with manufactures, customizing their acreage to meet specific demands. Although this scenario of diversification and small "field" size is grossly appealing to bobwhite enthusiasts, it wouldn't be surprising if such systems required a level of intense management that leaves little habitat for wildlife. Regardless of the development of such markets and land use, a net reduction in corn and soybean production has implications for bobwhite conservation, and a change to non-production or specialized production could bring new opportunity for bobwhite conservation.

The existing government-sponsored marginal land program, the CRP, has well-known significance to bobwhite enthusiasts in the Midwest (Burger et al. 1990). Because of the dominance of overly thick stands of grass in CRP fields, the potential for bobwhite will not be realized except where management (disking and/or prescribed fire) is conducted. The 2002 Farm Bill could provide another iteration of bobwhite-friendly change if policy makers agree to make the \$5/acre per year management a reimbursable cost instead of an upfront payment. At this rate, and assuming disking costs \$10/acre, the 3-year strip disking protocol recommended for CRP could result in a net economic gain for landowners. For numerous reasons (lack of

equipment and training, absentee ownership, lack of awareness and/or motivation, etc.), however, we cannot assume this will result in widespread management of CRP. Large-scale CRP management will require intensive efforts to promote the need, facilitate contracting, connect hunters with landowners, provide tax incentives, etc. Furthermore, as reviewed by Brady and Hamilton (1988), farmers have largely ignored wildlife components because of inadequate economic return. Access fees for hunting, whether paid by natural resource agencies (e.g., Kansas Department of Wildlife and Parks Walk In Hunting Access), commercial hunting operations, or individuals, could increase landowner motivation for CRP management.

Sustainable Agriculture

Sustainable agriculture, as defined by the United States Department of Agriculture (USDA), is "A system that is economically viable for farmers and ranchers, environmentally healthy, and supportive of local communities and rural areas" (USDA, North Central Region, Sustainable Agriculture Research and Education Program 2001). Proponents include the USDA, Congressional Rural Caucus, Iowa State University's Leopold Center, Jefferson Institute, American Farmland Trust, and a plethora of other university, state, and NGOs. Outside the USDA, proponents use a more diverse description of sustainable agriculture to include concepts such as spirituality, hope, harmony, "the earth as community" and social justice. Ikerd (1997), describes sustainable agriculture as farmer-oriented, with little relation to "agribusiness" and that it is known variously as practical farming, organic farming, small farmers, and alternative agriculture. Kirschenmann's (2001) vision for the farm of the future is that: "they will be more ecology driven, less technology dependent. Biodiversity will be the key to their economic and ecological resilience . . . more of the value of the agricultural enterprises will be retained on the farms and in local communities."

The fate of this movement, and potential implications for bobwhites are uncertain. The generalizations sound promising, harkening back to a day when bobwhites were valued on the farm for their consumption of insect pests, and land use was less intensive. I speculate that insight into effects of sustainable agriculture on bobwhites could be gained today by study of farmland areas owned by the Amish or Mennonites.

Biotechnology and World Food Demand

Wildlife experts agree that intensive agriculture provides little if any habitat for bobwhite and other farmland wildlife (Burger 1988, Roseberry 2000). Intensive agriculture has led to higher yields through hybridized seed, weed and pest control, multiple cropping, high inputs of fertilizer, continuous and management intensive grazing, etc. Theoretically, higher efficiency in crop, forage and animal production could result in greater production on the same or less area of land. However, higher yields and/or increased demand for food or fiber, could also stimulate use of

marginal lands and/or conversion of native plant communities to agricultural production. Some combination of these factors led to an increase of about 4.4 million hectares in cropland in the Midwest during 1945–1992 (The H. John Heinz III Center for Science, Economics and the Environment 1999), rendering the theory of conservation of land area via higher yields suspect.

Biotechnology figures heavily in the future of agriculture, with various implications for bobwhite. Early genetically modified organisms (GMOs) such as Roundup Ready Soybeans and Bt corn were designed to increase production. Theoretical benefits for bobwhites include lower use of insecticides where the GMO involves insect resistance, and lower use of herbicides where Roundup Ready products are used. The later could result in weedy field borders and non-production areas because of the need to perpetuate the genetic makeup of the population from which crops are being protected. For example, engineers of Bt corn have called for untreated refuge areas amongst fields of Bt corn so that the GMO's effectiveness lasts longer. Such refugia can potentially provide habitat for bobwhite in an agricultural setting otherwise cleansed of natural biota.

On the other hand, the effort in biotechnology to add value to agricultural products could result in marginal lands increasingly being used for production. As discussed above, this could be relatively hurtful for bobwhite. Within agriculture there are major expectations for GMOs adding value to agricultural products. Value is added using chemical, physical, and enzymatic methods to generate valuable foods, food additives, nutraceuticals, pharmaceuticals, and industrial products. As agricultural products become more valuable, the interest in production on marginal lands will increase, at least for landowners who own their land, and thus have lower fixed costs; otherwise, owners of the best agricultural land will still have a competitive advantage in an era of "value-added" products. Regardless of any effect on the amount of land in production, it's clear that increased value of an agricultural product leads producers to more zealously protect their crop, a scenario that probably leaves little room for the needs of wildlife.

All the above potential gains for bobwhite conservation can be wiped out by catastrophes released by biotechnology and/or by increased demand for food/fiber from a growing human population. Environmental risks associated with GMOs are uncertain despite recent media reports. Preliminary warnings of deleterious effects of Bt corn on monarch butterflies by Iowa State university researchers was followed by contradictory reports by both the researchers and the Environmental Protection Agency (EPA) (APHIS 2000). Based on differences between laboratory testing and field application, the EPA reported that data are insufficient to cause undue concern of widespread risks to Monarch butterflies. Recently in Missouri a rumor was circulating that bobwhites, deer, turkeys, etc., would not eat Roundup Ready soybeans. We could find no tests of effects of such beans on wildlife. Indeed, it might be difficult to test for such effects using standard

toxicology tests because many normal foods in great quantities create an adverse reaction (e.g., soybeans in tests on bobwhite, Robert J. Robel, Kansas State University, personnel communication).

In the 21st century demand for food/fiber will increase initially because of removal of restrictions on free trade, particularly China's potential admission to the World Trade Organization (FAPRI 2001). Further, the world population is predicted to increase from 6 billion today to 7 billion in 2020 (Avery 2001) placing tremendous demand on food production.

CONCLUSION

Faced by such formidable challenges to widespread quail restoration, quail enthusiasts must adopt new strategies if we are to be successful. For most, we must join mainstream ecological movements such as the North American Bird Conservation Initiative, and shed ecologically indefensible practices such as predator control and artificial propagation of game birds. Only time will tell if John Roseberry is a prophet in suggesting that "... in the face of an ever-expanding human presence on the landscape, only a relatively few wildlife species will ultimately thrive, and the bobwhite will probably not be one of them," or if the ever-evolving world society has room for a species such as bobwhite whose abundance has been so closely tied to agriculture.

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