Upland Game Birds in the Era of Climate Change

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Extremes in climate and weather affect ground-nesting game birds at every stage of their life cycle, from initiating breeding behavior to selecting nesting sites to finding available food. The extremes also create conditions that foster the spread of invasive plants, animals and insects, potentially disrupting the food web and upsetting the ecological community's delicate balance. The consequences of climate change, some of which are already affecting game birds, will intensify in the coming decades.

Climate change will cause extremes in weather

The incidence of major weather events, exemplified by historic floods in the Midwest in 2008 and 2009, will increase. Exceptionally wet springs not only wash away nests and drown chicks, they also influence where hens nest after the waters begin to recede. Once the land dries, nesting sites selected during high water may prove to be extremely vulnerable to predation.

By contrast, anticipated increases in drought would limit the development of large, sustainable, upland bird populations. More arid springs and summers in Texas, Oklahoma, Kansas, Nebraska and Missouri would accelerate bird losses in these top five quail states.

Nesting quail are particularly susceptible to disruptions caused by severe storm seasons. Increasingly intense hurricanes and tropical storms could reduce the Southeast's bobwhite quail population toward the point of no return.

Climate change will change the form of precipitation

During cold winters, precipitation falls as soft snow. In severely cold weather, ruffed grouse burrow into that soft snow to create a kind of igloo and conserve heat. Without snow, exposure to severe cold or freezing rain leads to significant mortality among grouse.

Climate change predictions suggest snowfall will decrease across the primary range of grouse habitation. Relying on snow depth for roosting as well as for thermal cover, grouse populations decline following winters of low snowfall. Further, freezing rains during a warm winter can coat snow with a shell of ice, effectively entombing roosting grouse or preventing them from roosting at all.

Climate change will disrupt life cycles

As spring weather arrives earlier each year, phases of an upland bird's life cycle, including reproduction, also accelerate. Whether temporal changes in the emergence of insects and plants will correspond to birds' altered schedules is unknown. If food sources adapt to climate change at a rate different from that of birds, a warm-season grass or insect particularly important in a developing chick's diet could be absent.

Climate change will redistribute habitats

Warming temperatures will shift the boundaries of suitable habitat. For instance, global climate change could create more quail habitat in northern states like Wisconsin, Minnesota, and the Dakotas but decimate populations remaining in the Southeast.

As well as facing habitat loss, upland birds will confront threats from new predators within their habitat. Opossums, for example, have expanded their range northward to join raccoons and skunks in a powerful triumvirate of nest predators. As habitat suitable for upland birds becomes increasingly fragmented, predators become more effective at finding nests.

How Upland Birds Will Respond to Climate Change

Pheasants

Pheasants are a highly adaptable species, able to rebound from periodic bouts of deadly weather. But regular and frequent wet springs, arid

summers or severe winters could devastate pheasant populations long-term.

Quail

More moderate winters may result in northern bobwhite quail re-establishing populations in historic, northerly habitat. But shifts in forest composition and the increasing frequency of catastrophic wildfires, hurricanes and other extreme weather events increase the likelihood of quail numbers continuing their already precipitous decline.

Ruffed Grouse

Dependent on snow cover for roosting and thermal protection, ruffed grouse are vulnerable to even minor changes in winter temperature and snowfall. Of even greater concern is the changing complexion of North America's forests under climate change. The continued loss of early successional forests, which make up the habitat necessary for every stage of a grouse's life cycle, would be catastrophic. These phenomena are predicted consequences of global climate change and could lead to dramatic ruffed grouse losses across their core Northwoods range.

Yesterday's Programs Can't Solve Today's Problems

In the past, federal, state and private conservation organizations have offered a suite of voluntary, incentive-based programs to protect and restore wildlife habitats. Although inadequate funding limits their reach, overall the programs have worked well in supporting upland game birds. However, these conservation efforts are buffeted by the prevailing agricultural economy; when land or commodity prices rise, participation in the programs declines.

Clearly, the present system is unable to implement the vigorous conservation programs that responding to climate change requires. If comprehensive and necessary programs are not adequately funded, upland bird populations as a whole will decline drastically.

What Can be Done: Project Types

Fish and wildlife professionals recognize that they can't rely on yesterday's programs to address the consequences of global climate change. The first step toward innovation is to see clearly the broad categories within which new ideas can take shape. The following survey of project types offers that perspective.

Public and private partnership projects

Climate change accelerates the need to conserve upland birds and their habitats. Even as demands on management agencies grow, citizen participation in their conservation programs becomes more crucial. Non-governmental organizations can provide assistance to educate farmers, ranchers and landowners about the consequences of climate change and to enroll them in conservation programs that will help upland birds confronting a changing climate.

Exotic and invasive species control projects

During the past century monocultures of exotic species such as fescue, Bahia and brome spread over large swaths of land open to wildlife and hunters. Effectively choking out native plants, these thick, sod-forming grasses offer wildlife little value in nutrition nor in cover. Many climate change models predict that higher levels of atmospheric carbon dioxide will favor the growth of such invasive plants and lead to their dominance in critical upland bird habitats.

Converting land from invasive, exotic species to native grasses, forbs and legumes could improve upland bird habitat on millions of acres. This could be accomplished by encouraging managed disturbances on land enrolled in the U.S. Department of Agriculture's Conservation Reserve Program (CRP).

Buffer and corridor projects

As upland bird ranges shrink and become more fragmented under the assault of climate change, strips of land along the edges of fields and waterways could provide vital habitat and become crucial corridors connecting larger habitat tracts. Likewise, roadsides could develop into an extensive network of grassy paths for wildlife traversing the agricultural landscape.

Minor adjustments in management practices could maximize the habitat potential of these small but critical areas. Introducing native plants in swales and filter strips could enhance the environment for birds without jeopardizing the water-cleansing function of these drainages. Delaying summer mowing of roadsides until broods are capable of escape would markedly reduce bird mortality.

Prescribed burning projects

As climate change threatens the health and productivity of upland birds throughout their ranges, prescribed burns could encourage the habitat conditions most supportive of bird populations.

Controlled burning accomplishes two main objectives of upland bird habitat management: First, burning limits the growth of woody plant material and other unwanted vegetation, thereby maintaining prairie land as a distinct ecosystem, maintaining open space in pine forest understories for bobwhite quail, or creating early successional forests for ruffed grouse.

Second, prescribed burning consumes duff — partially decayed vegetative material on the forest floor — and releases nutrients bound in the plant litter, stimulating vigorous new growth of grasses, forbs, trees and legumes. This new growth promotes the proliferation of insects, a critical food source for young birds.

Water-management habitat projects

Moist soils nourish the kinds of vegetation that attract insects, so increased frequency of drought conditions in late spring and early summer greatly reduces insect populations. Various moist-soil management techniques and wetland preservation and restoration can bolster the number of insects available for young chicks' consumption. In arid regions, guzzlers installed by landowners could reduce the stresses that limited water supplies place on wildlife.

Solutions for Upland Birds: A Case Study

Editor's note: Fish and wildlife professionals contending with the effects of climate change need a framework to consider the essential factors of a successful field project. The following case study demonstrates the approach of Pheasants Forever to common project components such as goal identification, implementation barriers and costs typical of a Midwestern pheasant state.

A Case Study: Securing Pheasant Habitat in a Changing Climate

Project location

A Midwestern state with historic pheasant habitat

Background

Pheasant populations are highly sensitive to changes in habitat availability, food resources and weather conditions. Global climate change is expected to deteriorate habitat and produce weather conditions that jeopardize pheasants' survival throughout their range.

Fortunately, agricultural policies and practices are responding to the demands of climate change and realizing opportunities that will assist upland birds in their adaptation. As demonstrated in this project, the habitat requirements of pheasants can be incorporated into the design of easily harvested, highly cellulosic biofuel crops and land management policies that promote carbon sequestration. Thus, this project would provide habitat essential for upland birds adjusting to changing weather patterns while diminishing greenhouse gas accumulations and reducing the nation's dependence on fossil fuels.

Project goals

To secure pheasant habitat and assist birds adapting to climate change, the project will

- enroll 1.5 million acres over 10 years in programs to grow biofuels or to sequester carbon and simultaneously increase pheasant habitat

- maintain a minimum enrollment of 1.5 million acres in conventional conservation programs that provide pheasant and other upland wildlife habitat
- identify and test suitable biofuel plant species that also provide quality pheasant habitat
- develop and implement practices for carbon sequestration that preserve and develop wildlife habitat
- establish upland bird habitat enhancement as an objective of federal biofuel cultivation programs
- encourage including perennial grasses and forbs that support bird populations in biofuel crops
- develop standards to ensure winter habitat and nesting cover for pheasants while allowing efficient harvesting of biofuel crops

Implementation barriers

The project will require plant-specific research, experimentation, monitoring and evaluation to maximize the results of all its components. Educating farmers and landowners about new land management practices that integrate upland bird habitat with biofuel production and carbon sequestration will be challenging. In particular, the project must demonstrate that the approach increases producers' incomes.

Project tasks, timeline and costs

The tasks, timeline and estimated costs for this project are outlined below.

Tasks	***Narrative***	***Annual Costs***
	Year One	
Establish baseline	Define opportunities, limiting factors and habitat inventory	$40,000
Develop, research and evaluate plant	Develop, research and evaluate test sites to identify biofuel plant mixes that	$1,200,000

mixes Develop, research and evaluate carbon sequestration practices	provide quality pheasant habitat Develop, research and evaluate wildlife-friendly carbon sequestration practices, including species mix, management and harvest tactics and measurement of carbon storage	 $5,000,000
	Year One-10	
Employ personnel	Hire project coordinator, 10 field biologists @ $525,000/year X 10 years = $5,250,000; 15 additional biologists @ $675,000/year x 9 years = $6,075,000	$11,325,000
	Years two-six	
Conduct advocacy program	Promote establishing upland bird habitat enhancement and including perennial grasses and forbs that support bird populations as objectives of federal biofuel cultivation programs	$50,000
	Years two-10	
Maintain enrollment in conventional conservation	Enroll 100,000 acres/year in CRP, CCRP, CREP to maintain an annual minimum of 1.5million acres	$103,500,000

programs	$115/acre/year x 100,000 acres x 9 years	
	Years four-10	
Enroll acreage in biofuel program	Enroll 100,000 acres/year in new biofuel program. $120/acre for land preparation, seed, mowing, chemicals, etc., x 100,000 acres x 6 years	$72,000,000
Enroll acreage in carbon sequestration program	Enroll 50,000 acres/year to sequester carbon $100/acres/year for land preparation, seed, etc., x 50,000 acres x 6 years	$30,000,000
	Years 5, 7, 9	
Monitor, evaluate, adapt	Determine programs' effectiveness, adapt management as needed. $75,000/year x 3 years	$225,000
	Total costs over 10-year project life	$223,540,000

The costs of this 10-year project would be offset by the value of the following associated benefits:

- addition of renewable fuels
- carbon sequestration
- water quality protection
- soil erosion prevention
- rural economic stimulation
- additional wildlife and recreational benefits

- flood damage mitigation
- crop insurance cost reduction

Conclusion

While the goal of maximizing upland bird habitat through current conservation programs and new strategies is applicable across the continent, approaches to developing and preserving habitat will differ from state to state. Variables include the upland bird species of focus, the composition of major crops, forest cover, topography, state agency priorities and the prevailing conservation culture. Both federal and state natural resource agencies, along with non-governmental organizations, will need independence and flexibility to be able to accomplish habitat goals to assist upland birds adapting to a changing climate.