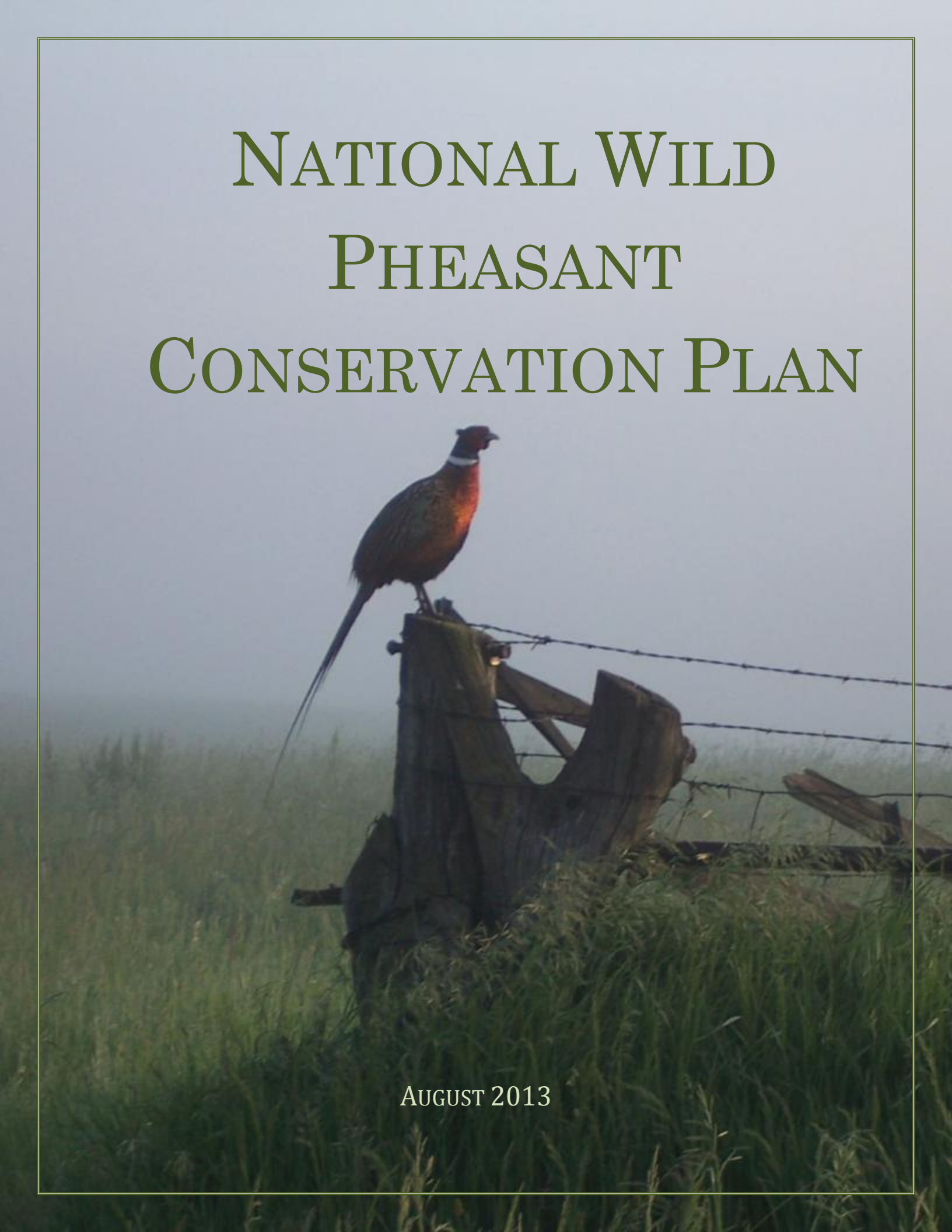
# National Wild Pheasant Conservation Plan



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# THE NATIONAL WILD PHEASANT CONSERVATION PLAN

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# TABLE OF CONTENTS

**Executive Summary** ..... **iv**

**Introduction** ..... **1**

Justification ..... 4

NWPCP Goal ..... 5

Methodology ..... 6

**Pheasant Habitat Management Regions** ..... **8**

Management Region 1. (ID, OR, UT WA) ..... 9

Management Region 2. (CO, KS, NM, OK, TX) ..... 16

Management Region 3. (MT, NE, ND, SD) ..... 24

Management Region 4. (IL, IA, MN, MO, WI) ..... 32

Management Region 5. (IN, MI, OH, NY, PA) ..... 41

Affiliate States. (AZ, DE, NV, NJ, RI, WV) ..... 49

Management Region Summary & Overall Habitat Objectives ..... 53

**Plan Implementation Objectives** ..... **54**

Personnel ..... 54

Policy ..... 54

Partnerships ..... 56

Education ..... 57

Research ..... 58

**Current Pheasant Research Needs** ..... **59**

**Bibliography** ..... **62**

**Appendices** ..... **68**

Habitat Management Practices ..... 69

State Economic Figures ..... 82

Habitat Model Calculations ..... 85

# EXECUTIVE SUMMARY

Though not a native species of North America, the Ring-necked pheasant (*Phasianus colchicus*) adapted to its agricultural landscape and became an important piece in the fabric of the country's hunting tradition. Today, the ring-necked pheasant is not only revered by the hunting community, it is an economically important and highly sought-after game bird. It is likely that pheasant hunters spend over half of a billion dollars each year pursuing ring-necked pheasant in this country alone.

Due to the continual loss of pheasant habitat from the conversion of grass and scrubland habitat to cropland, the development of "clean" farming practices, the decline in agricultural diversity, urban/suburban sprawl, and reforestation, pheasant populations across large portions of the range are in significant decline. Additionally, the looming loss of CRP habitat in much of the Midwest and Great Plains puts concern on current stable populations as well. Potential cuts to Farm Bill conservation programs are another concern and threat to pheasant habitat across the range.

Cock ring-necked pheasant/D. Rehder, Pheasants Forever

It is our hope that this plan will shed light on the importance of this game bird across its range and the issues currently and potentially facing this popular game bird.

With the goal to "restore and maintain self-sustaining wild pheasant populations in each state to provide maximum recreational opportunities**",** this plan will focus efforts on pheasant habitat creation and restoration through policy, partnerships, education, and research at state, regional, and national levels.

To implement this plan and accomplish the plan's goal, leadership is needed. This leadership will come from AFWA, agencies directors, designated regional coordinator, state biologists, and most importantly, a full-time National Wild Pheasant Conservation Coordinator. Without a dedicated coordinator, this important conservation plan, like many others before it, will struggle to gain momentum and will likely not spur successful results.

# INTRODUCTION

John Deere probably never understood the magnitude of change his moldboard plow would set into motion. With this invention, European settlers turned the grasslands of North America upside down, including much of the vast prairies that had been home to countless bison, elk, pronghorn, and even large predators like wolves and grizzlies.

The sweeping changes that converted grassland landscapes to cropland left many voids in the array of wildlife species. Early accounts indicate greater prairie-chickens (*Tympanuchus cupido*) initially became more abundant in response to the scattered grain fields created during the initial stages of agricultural establishment. But as crop fields eventually dominated many landscapes and the remaining prairie was fenced, prairie grouse (Tympanuchus spp.) became remnants of their former numbers. It's not hard to imagine this loss becoming the impetus for the rise of a new game bird, one with a very different taste in habitat and from an altogether different land.

Over the course of several millennia, the ring-necked pheasant (*Phasianus colchicus*) had adapted not only to coexist with human agriculture, but to thrive around it. So it must have seemed logical in 1881 when Judge Denny arranged to have a shipment of Chinese ring-necks, trapped near Shanghai, released into the burgeoning agricultural region of Oregon's Willamette Valley. While Denny's effort was not the first attempt at establishing pheasants in North America, it was the first to be successful. This success captured the imagination of North American hunters and triggered the meteoric rise of this spectacular game bird. It was only a matter of time before the ring-necked pheasant was widely established in agricultural regions of the Northeast, Midwest, Northern & Southern Plains, Intermountain West, and Pacific Coast.

Young ring-necked pheasants on hay bales/Iowa DNR

These birds were initially released into near-perfect pheasant habitats. Relatively primitive agriculture created a patchwork of small fields with lots of edge. Hay harvesting was a slow process that allowed time for good nest success. Weeds were abundant in the crops providing ideal brood habitat and high-quality winter cover. Harvest of grain was inefficient, leaving abundant waste grains supplemented by weed seeds for winter food. Under such conditions, it's likely that many of the original releases took hold and those birds initially thrived.

Depending on the region, North American pheasants generally rose to peak populations between the late 1930's and the early 1950's. These increases were by no means simultaneous across the range. Habitat loss associated with drought and the Dust Bowl of the 1930's in the western plains decimated pheasant numbers. Peak populations there came only after the drought ended and conservation measures on agricultural lands were implemented. Elsewhere, losses associated with agricultural intensification were noted as early as the 1940's, probably resultant from increased demands placed on the land during World War II. This was perhaps the first illustration of how federal policy and geopolitical events could affect what had become North America's most popular game bird.

In 1956, the Soil Bank Act began to add millions of acres of perennial grassland habitat to U.S. landscapes which helped to maintain good pheasant populations into the middle 1960's when the Act was repealed. One of the more interesting periods of geopolitically-related pheasant decline and recovery occurred in the 1970's. A period of all-out grain production occurred after the U.S. sealed a huge grain deal with the Soviet Union in 1973. Then U.S. Secretary of Agriculture, Earl Butz, exhorted farmers to plant "fencerow to fencerow" to take advantage of booming export markets. And plant they did, often removing fencerows to increase field size, breaking new ground, and increasing the frequency of tillage in the process. The predictable result was that pheasant populations plummeted on the Great Plains, hitting a low point in 1976. But this decline was not to last. In 1974, Arab states embargoed oil exports to the U.S. causing fuel prices to spike. In August of 1976, a sharp decline in grain prices began as a result of the U.S. embargo on grain exports to the Soviet Union. Combined, these forces resulted in fewer acres being seeded with less-intense weed control. This set the stage for an amazing pheasant comeback. More recently, the Conservation Reserve Program (CRP), first created by the 1985 Farm Bill, has become a cornerstone for pheasant habitat throughout the bird's U.S. range. The species' dependence on CRP grassland is evident throughout its range, but perhaps is most obvious in the Corn Belt where agricultural landscapes have become so dominated by intensive cropping of corn and soybeans that little perennial vegetation remains.

Ring-necked pheasant hen with brood/Iowa DNR

Agricultural intensification in many forms has continued to erode the ring-necked pheasant's habitat base for the last 3–4 decades, both in quantity and quality. Throughout this game bird's range, fields have increased in size with associated losses of perennial habitats and field edge. In many areas of the range, large tracts of grassland have been converted to cropland as commodity prices continue to rise, leaving pheasants with fewer and fewer place to nest, brood their young, or escape predation. Additionally, more widespread and effective weed control within crop fields has also reduced the availability of quality brood habitat. Shorter varieties of small

grains and more powerful combines have together resulted in reduced crop-stubble height, leaving pheasants more vulnerable to predation and adverse weather. In regions of the intermountain west and the Pacific states where irrigation is essential to producing crops, a side effect of increased efficiency in water distribution and application systems has been elimination of many grassy and/or weedy areas once critical to producing and holding pheasants.

But not all changes in the pheasant range have been negative. The development of no-till farming and its specialized seeding equipment allows the farmer to plant crops and control weeds without turning the soil. New cold-tolerant varieties of winter wheat are steadily replacing spring wheat in the northern plains. Since winter wheat is seeded in the fall, it can develop ground cover of sufficient height for nesting and brood rearing much sooner in the spring than was previously provided by spring wheat. The development of the Shelbourne stripper header now allows farmers to harvest wheat and other small grains while leaving the "stubble" at virtually the same height it was before harvest. This taller stubble provides better cover than stubble left after harvest with a conventional sickle-bar header.

### *ECONOMICS*

Few occasions bring more activity to quiet rural towns within the pheasant belt of North America than the opening days of pheasant season. Many friends and families make it a tradition to pheasant hunt together as a group at least once each year. Other sportsmen travel from across the nation and even from foreign countries to experience the excitement of pheasant hunting. This fluster of activity not only changes the look of many small towns, it bolsters local and regional economies through hunting related expenditures.

Illinois pheasant hunter and his dogs/Illinois DNR

Within the core pheasant range in the Midwest, many businesses receive a crucial amount of their annual income during the relatively short pheasant hunting season. Local diners, motels, gas stations, grocery stores and state wildlife agencies all benefit greatly from the money generated from these sportsmen. But how much money is generated, and how could this be influenced by declining pheasant populations?

From 2006 to 2009, an average of nearly 1.1 million sportsmen bagged nearly 6.1 million wild pheasants annually in 25 states across the pheasant range. While in pursuit of ring-necks, sportsmen spent just over 6.1 million days afield, and they pumped over $502 million annually into local

economies. The estimated cost of a harvested bird was $68 for resident hunters and $118 for non-resident hunters, for a combined average of $83 for every rooster harvested (Appendix B).

It has been well demonstrated in several states how number of hunters and harvest decline when pheasant populations decline. The tremendous effort and money spent in the pursuit of ring-necked pheasants should represent further justification for the conservation of this species and their habitats. There are many stakeholders besides pheasant hunters that would benefit from a plan aimed at preserving populations of this great game bird.

### *JUSTIFICATION*

Why create a national plan to promote the conservation of wild ring-necked pheasant populations? Currently, multiple conservation plans have been or are being developed for native gallinaceous birds (i.e., quail and grouse species) due to declining populations and habitats. No doubt, there are those who dismiss the ring-necked pheasant as just another exotic species. To be sure, problems have often outweighed benefits with many other introductions of exotics. But, generally, this has not been the case with ring-necked pheasants. Though isolated instances of inter-specific competition do occur between pheasants and native prairie grouse, in the vast majority of their range pheasants have not displaced native galliformes, but rather filled habitat niches that became available after agricultural development occurred.

Ring-necked pheasant in seasonal wetland/Utah DWR

Pheasants in North America have become a powerful engine for conservation. The strong desire to see and pursue this beautiful game bird has motivated generations of hunters to conserve and create wildlife habitat. Pheasants require habitats that benefit multiple species of wildlife. Conservation efforts small and large aimed at conserving pheasants will have a myriad of benefits to native wildlife, specifically grassland species. Pheasants are truly a "flagship" species in our agro-ecosystems since the habitats created on their behalf benefit many less charismatic species. Without the work of the many advocates who mainly know conservation through their interest in pheasants, it seems unlikely that our collective efforts to control soil erosion and improve water quality would be as effective as they are today.

Without ring-necks, how many urbanites might have less understanding of rural America, and vice-versa? How many youngsters might never have experienced the camaraderie and exhilaration of the hunt in the crisp air of fall? And how many of those might have never learned the love for the land that they possess today? Those who now care for the land would have loved to experience the

wildness of the prairie before it was turned and tamed by John Deere's plow. Of course, that can never be. But it seems likely the heart-pounding thrill of taking a first pheasant isn't so different from that experienced by young Indians on their first bison hunts 150 years ago. This keeps us connected to the land. Nothing is more important. Outdoor interest from our rising generation is decreasing, and as a result hunting and fishing license sales, which have traditionally supported wildlife management in this country, are following suit. Arguably, the pheasant has been the reason for more introductions to the outdoors pursuits across its range than any other wildlife species. Youth recruitment into hunting and fishing is critical to the future of wildlife management, and this species is critical to that recruitment.

Ring-necked pheasant hunting in Illinois/Illinois DNR

Stated simply, the pheasant has captured the heart of the American sportsman and has an enormous economic impact to the country. The reality of this economic influence can be seen from state agency budgets to local communities that benefit from the sportsman's dollar. The economic impact of pheasant hunting can wield a large socio-political interest in conservation, even influencing the habitat pheasant and other wildlife depend on. Agricultural policies that are more conservation oriented have come about due, at least in part, to this exotic species. The economy generated by the singular interest in this wildlife species cannot be ignored, nor the efforts afforded by organizations, such as Pheasants Forever, that generate funds aimed at pheasant conservation.

This plan is not simply a necessary accumulation of statistics that document where we have been and what we hope to retain for the future. It represents an important step aimed at finding a way to keep the ring-necked pheasant an integral part of our agricultural landscape and our culture.

### *THE GOAL OF THE NATIONAL WILD PHEASANT CONSERVATION PLAN*

**Restore and maintain self-sustaining wild pheasant populations in each state to provide maximum recreational opportunities.**

### *METHODOLOGY*

In this plan, we assigned responsibility for setting pheasant population goals to individual state wildlife agencies as they have statutory authority for wildlife populations (complete results in Appendix C). We used pheasant harvest as an index to pheasant abundance because it was the only measure of standardized abundance consistently estimated by all states.

Pheasant densities increase as the proportion of undisturbed grassy type habitats increase in the landscape (Haroldson et al. 2006, Nielsen et al. 2008), up to a maximum of about 50% grass (Kimball et al. 1956, Wagner 1965, Trautman 1982, Johnsgard 1999). To provide maximum nesting opportunity, grass habitats should provide residual cover or new growth at least 10 inches high when hens begin nesting in mid-April and remain undisturbed until at least August 1 when most renesting is completed (Leif 1996). Small grains, pasture and hay are also used as nesting and brood habitat, but reproductive success may be lower than in undisturbed grasslands because of inadequate cover in early spring and untimely harvest (Trautman 1982).

To plan future habitat needs for pheasants in the U.S., we first estimated the amount of reproductive habitat available to support pheasant populations during 1990 through 2005. We chose this time period to reflect modern landscapes and agricultural practices. States were asked to choose a 10-year period between 1990-05 that best represented "realistic" habitat, harvest, and weather conditions for their respective states. Information on habitat and harvests during the 10-yr period was then used to calibrate a harvest based model. We estimated the amount of land enrolled in the Conservation Reserve Program (CRP) within the pheasant range for each state and applicable year from statistics reported by the Farm Service Agency (2009). For states on the edge of the pheasant range, we extracted CRP enrollment data for only those counties within the pheasant range. We assumed all CRP enrollments provided reproductive cover for pheasants, even though a small proportion of CRP enrollments during the first 11 signup periods in the Midwest were not planted to grass mixtures (Osborn et al. 1992).

CRP nesting habitat/Pheasants Forever

We estimated the area planted to small grains and hay for each applicable year from statistics reported by the National Agricultural Statistics Service (2009). We extracted data on small grains by combining the areas harvested for barley (all), oats, rye, wheat (all), and flaxseed for all counties in the pheasant range. Small grain calculations for many states only included some of these grain types, and in many cases, included only one, in particular, winter wheat. We extracted data on grass hay by subtracting area of alfalfa hay from area of all hay. Although alfalfa is very attractive to hens

and broods, it is less productive than other habitats because the early and repeated mowing for hay destroys nests, nesting hens, and broods (Warner and Etter 1989). We estimated total available reproductive habitat by summing area of pasture (only in states where pasture land has the ability to support nesting), small grains, grass hay, alfalfa, and CRP for each year.

Pheasant nest in Iowa/Iowa DNR

We used pheasant harvest estimates to back-calculate pre-hunt population size based on estimated pre-hunt sex ratios and proportion of males harvested in each state. We calculated the pre-hunt population as:

(reported harvest) ÷ (pre-hunt sex ratio x harvest rate).

We constrained the pre-hunt sex ratio to vary between 0.40 - 0.50 (Stokes 1954:87), and the harvest rate to vary between 0.65 and 0.85 (Hill and Robertson 1988:181) unless states had specific data suggesting otherwise.

We estimated the amount of each habitat needed to produce a live pheasant in the pre-hunt population by distributing the pre-hunt population among habitats in proportion to their availability weighted by relative nest success. We used the simplifying assumption that pheasants used habitats in proportion to their availability, but weighted this assumption with relative nest success values derived from Chesness et al (1968), Trautman (1982), Clark and Bogenschutz (1999), and expert opinion. These varied among habitats according to the following weights: CRP = 0.63, small grains = 0.46, grass hay = 0.25, and alfalfa = 0.10. If individual states had specific data for their states, they were allowed to replace the literature derived values.

To estimate habitat needed to support a desired future pheasant population, each state estimated the habitat available in 2010, the pheasant harvest supported by that habitat, and the difference between the actual and desired pheasant harvest. Using previously estimated habitat/bird ratios, the amount of additional habitat or habitats required to increase harvest to the desired goal was estimated.

# HABITAT MANAGEMENT REGIONS

Habitat is the primary driving factor for restoring and maintaining self-sustaining wild pheasant populations. Essential habitat for ring-necked pheasants varies significantly across their range, both regionally and state-to-state. To facilitate our management goals, the states within the pheasant range (Figure 1) have been divided into management regions. These regions were divided based on geographic, economic, and agricultural factors, and pheasant demographics. States with small unique pheasant populations, or lacking habitat data, or who did not want to fully participate in the plan have been listed as affiliate states and are not grouped into one of five regions.

- Region 1. ID, OR, UT, WA
- Region 2. CO, KS, NM, OK, TX
- Region 3. MT, NE, ND, SD
- Region 4. IL, IA, MN, MO, WI
- Region 5. IN, MI, NY, OH, PA
- Affiliate. AZ, DE, NV, NJ, RI, WV

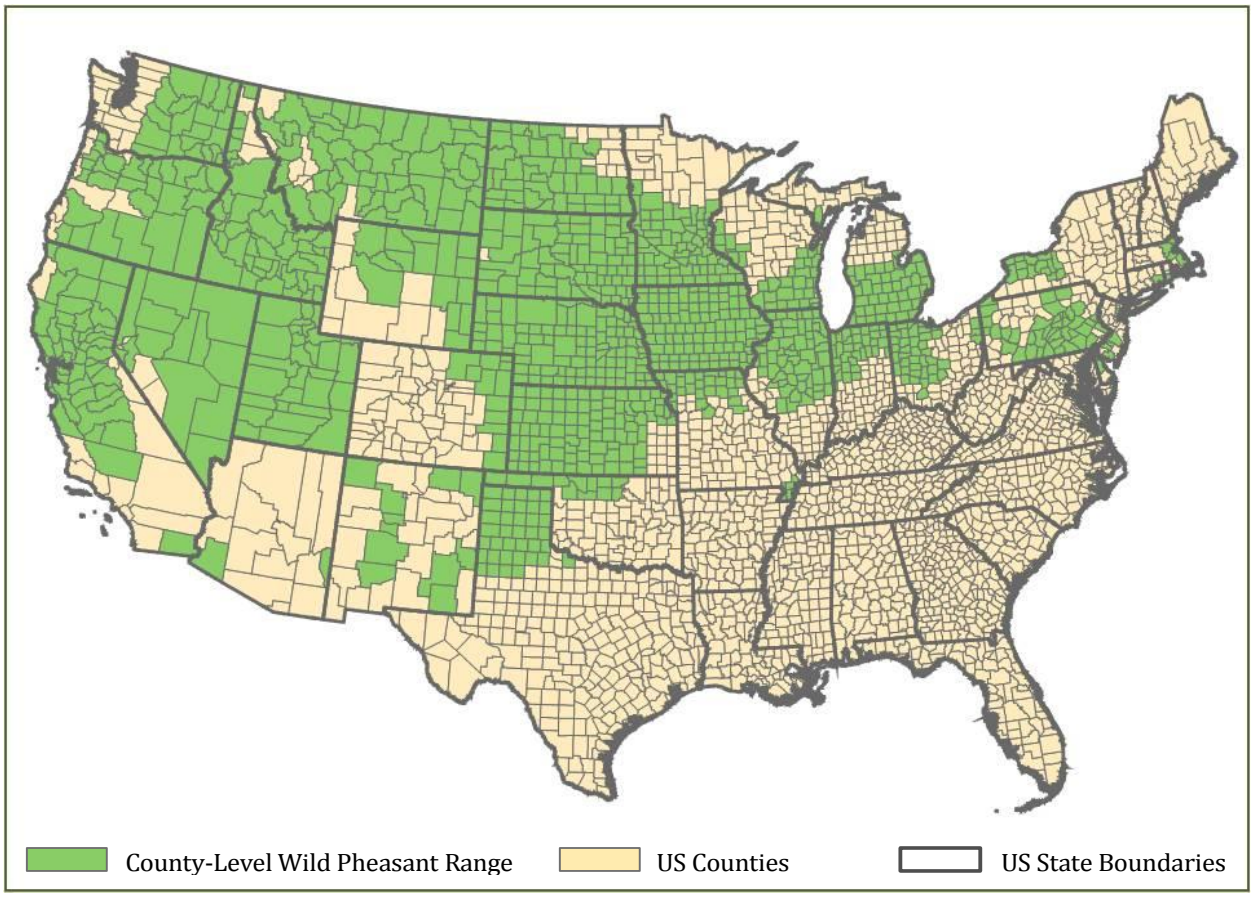
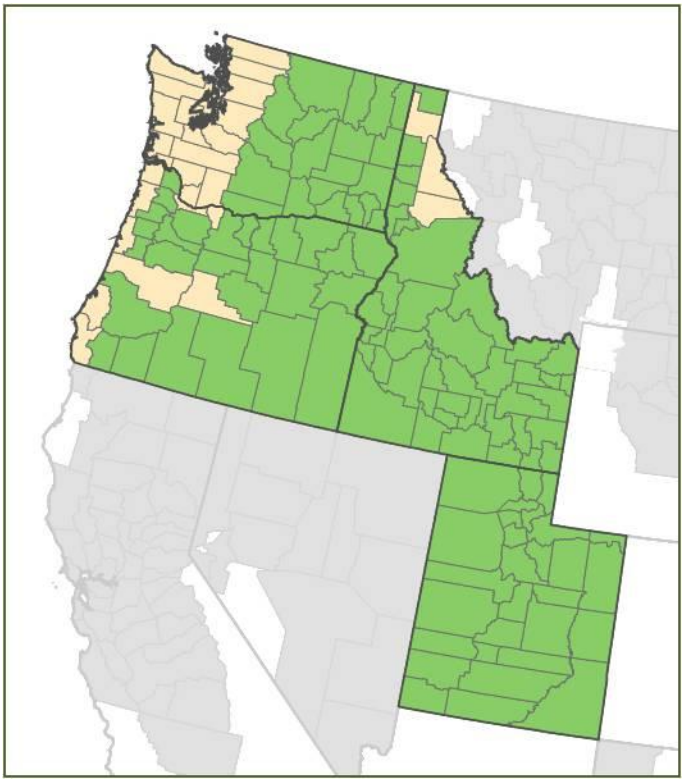



Figure 1. The estimated county-level range of wild ring-necked pheasant as determined by wildlife biologist in each state or the Midwest Pheasant Study Group (estimated the range based on best available public data for states that did not respond to data requests).

## *MANAGEMENT REGION 1*
### *IDAHO, OREGON, UTAH, WASHINGTON*



The Great Northwest Region (Mgmt Region 1) includes the states, Idaho, Oregon, Utah, and Washington and is the birthplace of the first successful pheasant introductions in the US. This diverse region extends from the temperate rain forest of the Pacific Coast across the Columbia Basin to the Palouse, south across the Snake River Plain leading into the Great Basin and south across the Grand Canyon and Colorado River into the southern warm deserts. Pheasants were first established in the Willamette Valley of Oregon in 1882, then transplanted from Oregon to other areas of management region one.

Since the early 1900's, the majority of grasslands have been converted to crop, hay, or pasture lands. Bluebunch wheatgrass, Idaho fescue, and native forbs were formerly widespread in the northern portions of the region. Cultivated ground in this region supports a wide variety of agricultural crops and commodities including wheat, barley, peas, potatoes, corn, grass seed, as well as hay, range, and pasture lands. Following the initial conversion to agriculture, millions of acres have been enrolled in CRP. Pheasants once thrived in this region when weed management was not considered a major issue and water usage was more liberal. In response to clean farming practices, urban and suburban sprawl, changes in types of agricultural crops, pheasant populations throughout the region have suffered long term declines.

The creation of CRP is one practice that has prevented pheasant populations from experiencing even more dramatic declines. Most biologists believe CRP could provide even greater wildlife habitat benefits through enhancements that increase stand diversity; emphasizing native grasses with forbs and legumes would provide benefits for many native wildlife species, particularly grassland obligates, and needs to be a high priority. A loss of CRP would certainly be detrimental to pheasants in this region.

### *CHALLENGES*

Pheasant populations in southern Idaho have declined concurrent with irrigation efficiency and agricultural intensification.

The effect on pheasants of irrigation efficiency and the cleaning up of irrigated landscapes is multi-layered. The conversion of flood to sprinkler irrigation dries up important brood habitat in damp areas that had resulted from flood irrigation. Likewise, irrigation efficiency enables more intensive and uniform cropping, which results in the loss of nesting habitat and winter cover (e.g., secure patches of grassland habitat for nesting, flood-irrigation induced willow thickets for winter cover). Furthermore, center-pivot irrigation has led to increased hay production with multiple cuttings per year. Often, the first cutting destroys hens and/or nests.

### *OPPORTUNITIES*

Even though populations have decreased dramatically over time, pheasants remain one of the most popular game birds in the region. During the period of 2006-2009, an average 72,140 hunters (resident and non-resident) took 357,752 trips and bagged 230,457 roosters annually (Table 1.1). Hunters spent on average $88 per harvested rooster, or $20,226,141 annually in expenditures while hunting pheasants.

Pheasant in sagebrush habitat in Utah/Utah DWR

Much like states in the Midwest, high demand for commodity crops will almost certainly remain into the second decade of the century, making targeting and management of CRP acres more important than in the past. The advent of CRP did not benefit pheasants as much as it has other species (i.e. Columbian sharp-tailed grouse in Idaho). Innovation and new partnerships between USDA, state agencies, and NGO's will be needed to maximize the benefits of the Conservation Reserve Program or future programs for pheasants; every acre will need to produce.

Table 1.1. Mean number of pheasant hunters, days hunted, trips, birds/hunter, harvest, expenditures, and estimated cost per bird harvested based on hunter and harvest data within the Great Northwest region from 2006 - 2009. Calculated by multiplying average cost of an upland hunting trip in ND, SD, NE, KS, IA, and MN by the number of pheasant hunting trips in each state based on 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

| State | Hunters[b] | Days Hunted | Trips | Birds/Hunter | Harvest | Expenditures | $/Bird Harvested |
|---|---|---|---|---|---|---|---|
| ID | 24,761 | 5.18 | 128,287 | 3.60 | 89,222 | $8,372,514 | $94 |
| OR[a] | 12,034 | 4.61 | 55,525 | 2.77 | 33,354 | $2,868,269 | $86 |
| UT[a] | 16,003 | 3.45 | 55,225 | 2.29 | 36,623 | $2,852,798 | $78 |
| WA[a] | 19,342 | 6.14 | 118,715 | 3.66 | 71,259 | $6,132,560 | $86 |
| Sum/*Mean* | 72,140 | *4.96* | 357,752 | *3.19* | 230,457 | $20,226,141 | *$88* |

[a] All hunter expenditures calculated as residents

[b] data is combined resident and Non-resident

## *REGIONAL GOALS*

The Great Northwest region has a pheasant harvest goal of 285,000 roosters (Table 1.2). Using the habitat calculation work sheets and 2010 NASS data, an additional 867,000 acres of CRP or 1,186,000 acres of small grains are needed within the region to achieve the harvest goal. Increasing the pheasant harvest to 285,000 birds would increase pheasant hunting expenditures within the region by more than 15%. Conversely, if the habitat provided by CRP were eliminated, the expected pheasant harvest would be 149,789 or about 100,000 less than expected with 2010 CRP acreage. At $88 per bird harvested (Table 1.1), $8,572,000 in pheasant hunting related expenditures could be lost annually if CRP is eliminated.

Table 1.2. The 2010 habitat data for the Great Northwest Region, predicted pheasant harvest, harvest goals, and additional habitat needed to achieve goals.

| | 2010 NASS/FSA Habitat Data (Ac) | | | | | Predicted Pheasant Harvest Based on 2010 Habitat | State Pheasant Harvest Goal | CRP Needed to Meet Harvest Goal | Sm. Grain Needed to Meet Harvest Goal |
|---|---|---|---|---|---|---|---|---|---|
| State | Range/ Pasture | Alfalfa | Small Grains | Grass Hay /Playas | CRP | | | | |
| ID | NA | 1,130,000 | 710,000 | 340,000 | 719,806 | 95,293 | 100,000 | 80,000 | 110,000 |
| OR | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| UT | NA | 540,0000 | 162,000 | 160,000 | 139,310 | 49,598 | 60,000 | 86,000 | 117,000 |
| WA | NA | 377,500 | 2,171,300 | 181,000 | 1,439,780 | 102,312 | 125,000 | 701,000 | 959,000 |
| Total | | | | | | 247,203 | 285,000 | 867,000 | 1,186,000 |

[a] Oregon did not provide habitat model data, including habitat acres, previous harvest totals, and harvest goals

IDAHO

Pheasants occupy suitable habitat in 42 of Idaho's 44 counties. Populations were likely higher during the 1950s and 1960s than at any other time. Harvest peaked at over 750,000 birds in the early 1960s, but declined sharply in the early 1970s and has continued to gradually decrease with intensified agricultural practices. Even though populations have decreased dramatically over time, pheasants remain one of the most popular game birds in Idaho. An estimated 24,000 hunters harvested approximately 81,000 pheasants in Idaho from 2001-2010.

Pheasants are closely associated with agriculture and occur in varying abundance on or near farmland throughout Idaho. Riparian and wetland habitats near agricultural areas provide critical winter cover. Sagebrush habitats adjacent to farmland also provide important winter cover in parts of the state. Pheasant numbers are highest on the irrigated agricultural lands of south-central and southwest Idaho. The advent of CRP did not benefit pheasants as much as it has other species (i.e. Columbian sharp-tailed grouse) in Idaho. Much of the CRP acreage occurred in former dryland wheat fields in the southeast and north-central portions of the state. Moreover, the habitat model developed for this exercise emphasizes the importance of alfalfa hay and winter wheat. The two years in which acreages for these two commodities increased substantially (1997 and 2002), pheasant harvest declined dramatically. This is just the opposite of what the model predicted. Increased dairy production and improved irrigation techniques have led to increased acreages of alfalfa with increased cutting frequencies that have been detrimental to pheasant populations.

Idaho used the 10-year period from 1993-2002 as representative of "normal/modern landscape" conditions and harvests. Using the habitat models to calculate acres per harvested bird, Idaho believes a harvest goal of 100,000 is a realistic goal given current landscape conditions and harvest practices.

Using the habitat and harvest calculations, Idaho would need to increase CRP acreage by 80,000 acres (11%), or increase winter wheat acreage by 110,000 acres (15%), or some combination of these habitat types to achieve a rooster harvest of 100,000 birds. It is important to note that it is necessary to increase habitat on the irrigated agricultural lands in south-central and southwest Idaho. Idaho believes increased nesting and brood-rearing habitats in these portions of the state will increase pheasant populations significantly.

| Production Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | Cons. Cover |
| Relative Nest Success | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.401 | 0.258 | 0.090 | 0.252 |
| Weighted Nest Success | 0.118 | 0.349 | 0.066 | 0.467 |

| Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | Cons. Cover |
| Distributed 93-02 Harvest | 12,415 | 36,689 | 6,942 | 49,135 |
| Pre-hunt Population | 36,784 | 108,708 | 20,568 | 145,584 |
| Acres/Harvested Bird | 102.64 | 22.31 | 41.06 | 16.29 |

| Habitat Variable | Habitat Types | | | | Predicted Harvest |
|---|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | Cons. Cover | |
| 2010 USDA/NASS Habitat Data | 1,130,000 | 710,000 | 340,000 | 719,806 | 95,293 |
| Increase CRP (80,000ac) | 1,130,000 | 710,000 | 340,000 | 800,000 | 100,215 |
| Increase Sm. Grain (110,000ac) | 1,130,000 | 820,000 | 340,000 | 719,000 | 100,173 |

## OREGON

Oregon's Willamette Valley was the site of the first successful introduction of ring-necked pheasants to North America. Following a rapid population increase, seasons were opened 10 years later, but over-exploitation quickly reduced numbers creating the need for more conservative management. Documented harvest in Oregon peaked in 1958 at 477,000 roosters. Since then populations have declined, with the most rapid decline occurring between 1961 and 1991. During this 30-year time period, surveys in western Oregon indicated pheasant abundance declined from 25 pheasants/10 miles to < 1 pheasant/ 10 miles. Loss of habitat due to development and a changing agricultural landscape likely contributed to this decline. According to the Oregon Agricultural Information Network, wheat acreage in the Willamette Valley in 1976 was 261,000 acres and acreage for perennial ryegrass and tall fescue combined was 53,000 acres, by 2006 these predominant acreages had been reversed with 27,000 acres in wheat and nearly 320,000 acres in perennial ryegrass and tall fescue

Though found in low densities in most of the 28 counties with breeding populations of wild pheasants, the largest remaining pheasant populations are in northern Malheur County and the Columbia Basin. The five-county Columbia Basin region represents just less than 10% of the state's land area, but accounts for 38% of the statewide pheasant harvest (2006-2010). These same 5 counties (Gilliam, Morrow, Sherman, Umatilla, and Wasco) also had 87% (477,922 acres) of the state's enrolled CRP acreage in 2010.

The goal in Oregon is to improve the quality of CRP acreage to increase the productivity of these lands for pheasants and other wildlife. Much of the existing CRP acreage has transitioned to low diversity stands of non-native grasses. With expiration of large proportions of CRP, 16% of the CRP acreage in the Columbia Basin will be expire in just 2012, there is the opportunity to work with landowners to implement cover practices that will benefit wildlife and increase the landowner's Environmental Benefit Index scores, thus improving their chance of re-enrollment.

## UTAH

Pheasants were first introduced in Utah about 1890. Since then, its distribution has been increased by transplanting, release of game-farm birds, and natural dispersion. Populations are found in every county in the state and all suitable habitat is now occupied, approximately 1,400,000 ha in 2006. Suitable habitat is limited to agricultural areas, primarily irrigated croplands. Urban and industrial development during the past quarter century has progressively destroyed a considerable amount of pheasant habitat, and placed greater hunter demand and use on remaining areas, although specific losses to total area are not available. Data on pheasant numbers and harvest by different habitat types does not exist.

Utah used the 10-year period from 1996-2005 as representative of "normal/modern landscape" conditions and harvests. Using the habitat models to calculate acres per harvested bird, Utah believes a harvest goal of similar to the 10-year average, 60,000 birds, is a realistic goal given current landscape conditions and harvest practices.

Using the habitat and harvest calculations, Utah would need to increase CRP acreage by 86,000 acres (62%), or increase small grain acreage by 117,000 acres (72%), or some combination of these habitat types to achieve a rooster harvest of 60,000 birds.

| Production Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | Cons. Cover |
| Relative Nest Success | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.487 | 0.199 | 0.139 | 0.175 |
| Weighted Nest Success | 0.171 | 0.321 | 0.122 | 0.387 |

| Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | Cons. Cover |
| Distributed 96-05 Harvest | 10,702 | 20,119 | 7,668 | 24,248 |
| Pre-hunt Population | 31,710 | 59,612 | 22,721 | 71,847 |
| Acres/Harvested Bird | 51.67 | 11.23 | 20.67 | 8.20 |

| Habitat Variable | Habitat Types | | | | Predicted Harvest |
|---|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | Cons. Cover | |
| 2010 USDA/NASS Habitat Data | 540,0000 | 162,000 | 160,000 | 139,310 | 49,598 |
| Increase CRP (86,000ac) | 540,0000 | 162,000 | 160,000 | 225,310 | 60,083 |
| Increase Sm. Grain (117,000ac) | 540,0000 | 279,000 | 160,000 | 139,310 | 60,013 |

WASHINGTON

Washington is located in the Pacific Northwest adjacent to the Pacific Ocean and divided by the Cascade Mountain Range extending from southern British Columbia through Washington and Oregon to northern California. Weather is effected by the Cascade Range with areas of western Washington receiving over 100 inches of rain annually and areas of eastern Washington receiving as little as 5 inches annually. Western Washington pheasant plantings from Oregon's Willamette Valley were plentiful after 1890 and eastern Washington stocking started between 1898 and 1900. Pheasant's started to expand quickly with western Washington holding its first pheasant hunting season in 1896. Pheasant populations thrived in the early 1900's until a "crash decline" occurred in 1929 and 1930 with the low lasting into the middle 1930's with recovery into 1939 and 1940 followed by another decline from 1941 to 1945 with another period of increase and a high point of recovery in 1949. Statewide harvest was at its highest during the mid-to-late 1960's with another peak in the late 1970's when over 500,000 pheasants were harvested. Since that time, pheasant harvest has steadily declined. Washington's goal would be an annual harvest of 125,000 birds.

Today, wild pheasant populations are found in the eastern 20 counties of the state. Western Washington has a state owned pheasant game farm for hunting opportunities. The five-county Snake River Basin (Asotin, Garfield, Columbia, Walla Walla, and Whitman) make up 42% of the states harvest. While the five-county Columbia River Basin (Adams, Douglas, Franklin, Grant, and Lincoln) make up 31% of the states harvest. Together these two river basins comprise the majority of the states Conservation Reserve Program (CRP) Lands and 73% of the state's total pheasant harvest.

The goal in Washington is to convert low diversity exotic forage grass plantings to a diverse mix of native grasses including forbs and legumes through mid-contract management. When available, State Acres for Wildlife Enhancement (SAFE) CRP plantings have been utilized for new contracts. The majority of these contracts have been utilized within the Columbia River Basin.

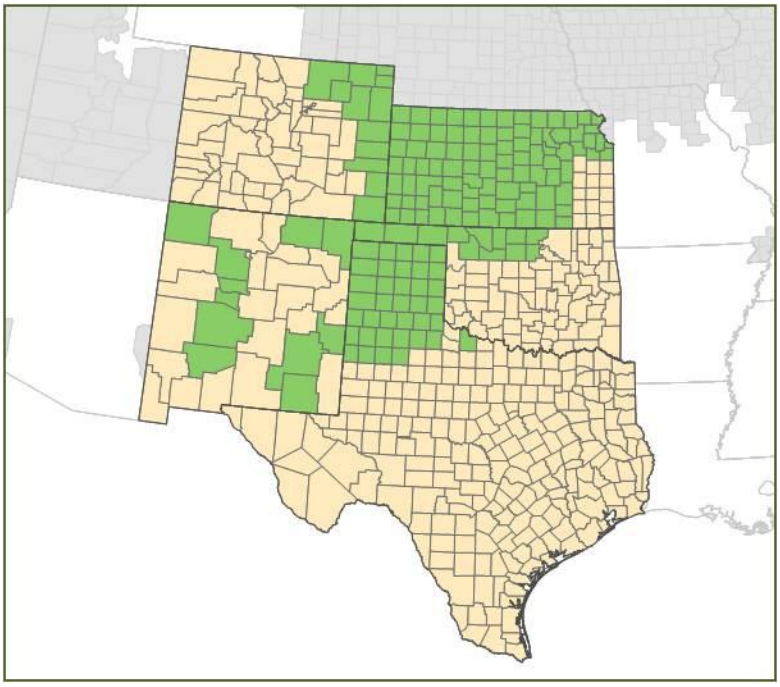
| Production Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | Cons. Cover |
| Relative Nest Success | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.106 | 0.628 | 0.037 | 0.230 |
| Weighted Nest Success | 0.023 | 0.637 | 0.020 | 0.319 |

| Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | Cons. Cover |
| Distributed 95-04 Harvest | 2,377 | 64,851 | 2,059 | 32,530 |
| Pre-hunt Population | 11,883 | 324,254 | 10,295 | 162,652 |
| Acres/Harvested Bird | 194.39 | 42.26 | 77.76 | 30.86 |

| Habitat Variable | Habitat Types | | | | Predicted Harvest |
|---|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | Cons. Cover | |
| 2010 USDA/NASS Habitat Data | 377,500 | 2,171,300 | 181,000 | 1,439,780 | 102,312 |
| Increase Cons Cover (701,000ac) | 377,000 | 2,171,300 | 181,000 | 2,410,780 | 125,030 |
| Increase Sm. Grain (959,000ac) | 377,500 | 3,130,300 | 181,000 | 1,439,780 | 125,005 |

## *MANAGEMENT REGION 2*

### *COLORADO, KANSAS, NEW MEXICO, OKLAHOMA, TEXAS*



The Southern High Plains Region (Mgmt Region 2) is comprised of Colorado, Kansas, Oklahoma, New Mexico, and Texas. This region has a pheasant distribution throughout croplands within the tallgrass, mixed grass, and shortgrass prairies in the southern extent of the Great Plains. Pheasants were established across the region in the early 1900's, like most of North America (Dahlgren 1988). Landscapes consisted of small farms that generally rotated crops in fallow fields because of dry conditions through much of the region. Fallow fields provided excellent "weedy" cover, and pheasant populations expanded in the area. Populations seemed to peak in the late 1970s and early 1980s (Dahlgren 1988).

Farms steadily grew bigger, and modern agricultural practices have changed landscapes. The predominant crop in this area is winter wheat. Because winter wheat's phenology provides for early spring growth, this crop provides excellent nesting cover for pheasants, rivaling nest success rates of conservation grasslands (e.g., CRP) in other areas (Snyder 1984). Large scale agricultural practices such as the loss of fallowing combined with herbicide application for weed control that reduced the pheasant habitat potential of millions of acres throughout the High Plains in the mid-1980s to present (Rodgers 1999). Fortunately, the Conservation Reserve Program (CRP) began in the mid-1980s, and provided much needed reproductive habitat in many areas that seemed to stabilize populations. However, winter wheat still provides significant nesting habitat, especially in good wheat years when wheat harvest is normal or delayed, leaving many nests and young broods undisturbed.

### *CHALLENGES*

CRP continues to play a significant role in nesting and brooding habitat throughout the High Plains, and is currently threatened by significant contract expirations in the coming years. Commodity prices are strong, and discourage many producers from enrolling their cropland in conservation practices at current program payments rates. Winter wheat will continue to play a primary role in nesting habitat in the High Plains. However, periodic drought can significantly reduce the quality of nesting within this region, as well as early harvest periods which increase nest and early brood destruction. Large CRP acreages can alleviate some of these concerns.

It is the need for brood-rearing habitat located near nesting habitat that is likely the limiting factor for the region. The common practice of herbicide for wheat stubble eliminates the weedy areas needed for good brooding cover. Weedy growth is likely the largest scale challenge for the pheasant population in the High Plains.

### *OPPORTUNITIES*

Pheasant hunting is a popular and economically sustaining activity within the region. During the period of 2006-2010, an average 167,761 hunters (resident and non-resident) took 800,082 trips and bagged 970,900 roosters annually (Table 2.1). Hunters spent on average $69.37 per harvested rooster, or $67,352,346 annually in expenditures while hunting pheasants. Maintaining nesting and increasing brood-rearing habitat is key to abundant pheasant populations throughout the region.

Winter wheat will likely continue to provide nesting habitat into the future. CRP remains the best program to continue important pheasant habitat to maintain pheasant populations by providing nesting and much needed brooding habitat. Many management practices within CRP such as burning, disking, and grazing can provide more forb-abundant habitats, improving brooding conditions. Cover crops and soil- health practices, while not done at large scales yet, have good potential to provide brood-rearing habitat if done at the right time.

Pheasant habitat in Logan Co., CO/E. Gorman, Colorado DP&W

Cellulose ethanol production also provides an opportunity for pheasant habitat. Timing of planting, growth, and harvest is the key to determining a benefit or detriment to pheasant populations. If residual grass cover can be left during the nesting season, and harvest occurs after early brood-rearing activities, then pheasants could receive a benefit from grass planting for ethanol production. Rotation of fields in a general location

with various timing of planting, growth, and harvest will also be critical to local pheasant population levels.

Table 2.1. Mean number of pheasant hunters, days hunted, trips, birds/hunter, harvest, expenditures, and estimated cost per bird harvested based on hunter and harvest data within the Southern High Plains region from 2006 - 2009. Calculated by multiplying average cost of an upland hunting trip in ND, SD, NE, KS, IA, and MN by the number of pheasant hunting trips in each state based on 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

| State | Hunters[c] | Days Hunted | Trips | Birds/Hunter | Harvest | Expenditures | $/Bird Harvested |
|---|---|---|---|---|---|---|---|
| CO[a,b] | 13,633 | 4.67 | 63,706 | 2.96 | 40,417 | $3,290,907 | $81 |
| KS | 114,625 | 5.30 | 608,000 | 6.73 | 771,750 | $57,429,852 | $74 |
| NM | NA | NA | NA | NA | NA | NA | NA |
| TX | 21,394 | 2.70 | 57,691 | 3.41 | 72,892 | $2,980,186 | $41 |
| OK[a] | 18,109 | 3.90 | 70,685 | 4.74 | 85,842 | $3,651,400 | $42 |
| Sum/*Mean* | 167,761 | *4.77* | 800,082 | *5.79* | 970,900 | $67,352,346 | *$69* |

[a] All hunter expenditures calculated as residents
[b] 2006, 2007, and 2008 data only
[c] data is combined resident and Non-resident

### *REGIONAL GOALS*

The Southern High Plains region has a pheasant harvest goal of 962,500 roosters (Table 2.2). Using the habitat calculation work sheets and 2010 NASS data, an additional 6,504,000 acres of CRP or 4,827,000 acres of small grains is needed with the region to achieve the harvest goal. Increasing the pheasant harvest to 962,500 birds would increase pheasant hunting expenditures within the region by 17%. Conversely, if the habitat provided by CRP were eliminated the expected pheasant harvest would be 657,007 or about 149,000 less than expected with 2010 CRP acreage. At $69 per bird harvested (Table 2.1), $10,263,000 in pheasant hunting related expenditures could be lost annually if CRP is eliminated.

Table 2.2. The 2010 habitat data for the Southern High Plains Region, predicted pheasant harvest, harvest goals, and additional habitat needed to achieve goals.

| | 2010 NASS/FSA Habitat Data (Ac) | | | | | Predicted Pheasant Harvest Based on 2010 Habitat | State Pheasant Harvest Goal | CRP Needed to Meet Harvest Goal | Sm. Grain Needed to Meet Harvest Goal |
|---|---|---|---|---|---|---|---|---|---|
| State | Range/ Pasture | Alfalfa | Small Grains | Grass Hay /Playas | CRP | | | | |
| KS | NA | 246,300 | 8,687,800 | 1,404,500 | 2,716,000 | 587,081 | 700,000 | 4,933,000 | 2,007,000 |
| CO | NA | 304,100 | 1,918,500 | 126,700 | 1,588,359 | 71,684 | 77,500 | 332,000 | 260,000 |
| OK | NA | 100,000 | 1,790,000 | 290,000 | 610,023 | 71,829 | 95,000 | 499,000 | 1,400,000 |
| TX | 7,250,000 | NA | 1,250,000 | 350,000 | 1,500,000 | 75,152 | 90,000 | 740,000 | 1,160,000 |
| NM[a] | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Total | | | | | | 805,746 | 962,500 | 6,504,000 | 4,827,000 |

[a] New Mexico was unable to provide habitat model data

## COLORADO

Thirty (30) counties in Colorado (CO) have populations of pheasants, however, due to the inability to improve populations in many of these counties, due to the impacts of urban development, extremely high land values and other insurmountable limitations, this analysis focuses on 12 specific counties in eastern Colorado (Weld, Morgan, Washington, Logan, Sedgwick, Phillips, Yuma, Kit Carson, Cheyenne, Kiowa, Prowers and Baca) where there are reasonable opportunities to address population limitations. These counties provide the bulk of statewide harvest at present and represent the most likely locations where improvement is possible.

Colorado has statewide harvest data beginning in 1956 and continuing through present. The survey was not done in 2009, but returned in 2010. Within this data set, harvest has ranged from 34,000 (2002) to 248,000 (1959) with a historical average, across all years, of 107,000 pheasants harvested. Historical high harvests occurred in the late 1950's, with 4 consecutive years of harvest estimates exceeding 200,000 pheasants, undoubtedly the result of excellent habitat and a much larger core pheasant range than is present today, as historical pheasant harvests were significantly increased by areas (the western slope and front range counties of Colorado) that do not have significant populations today. Harvest estimates and hunter numbers steadily declined throughout the 1970's, improved across the decade of the 1980's. Beginning in 1990, harvest estimates dropped below 100,000 and have remained below that benchmark since, although multiple factors have contributed to that decline, including more intensive farming practices, and most notably since 2000, severe drought has reduced populations drastically. Populations have begun to rebound somewhat since 2008, buoyed by a lessening of drought impacts and significantly better CRP mixes and agricultural practices, including the use of stripper headers for wheat harvest.

Colorado used the 10 year period of 1990-1999 as representative of normal range-wide landscape conditions (county level) and harvests (avg. ≈ 75,000). Weather conditions were equally balanced between "normal" and drought condition. Using the habitat model, Colorado believes that a harvest objective of 70,000 to 85,000 is realistic, given the relative limitations of the current size of the core range, hunter numbers, and farming practices. This harvest objective range may not be attainable if the trend towards a drier climate, which impacted populations significantly throughout 2000-2008, returns to the plains of Colorado.

Using the habitat and harvest model calculations, Colorado would need to increase CRP acres by 305,000 acres (19.2%) or increase winter wheat by 242,000 acres (12.6%) while maintaining current levels of CRP to maintain a rooster harvest around 77,500 birds.

| Production Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Relative Nest Success | 0.050 | 0.600 | 0.050 | 0.600 |
| Relative Habitat Availability | 0.065 | 0.547 | 0.030 | 0.358 |
| Weighted Nest Success | 0.006 | 0.655 | 0.003 | 0.336 |

| Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Distributed 90-99 Harvest | 476 | 48,370 | 223 | 24,800 |
| Pre-hunt Population | 2,644 | 268,723 | 1,238 | 137,775 |
| Acres/Harvested Bird | 535.45 | 44.62 | 535.45 | 56.96 |

| Habitat Variable | Habitat Types | | | | Predicted Harvest |
|---|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP | |
| 2010 USDA/NASS Habitat Data | 304,100 | 1,918,500 | 126,700 | 1,588,359 | 71,684 |
| Increase Cons. Cover (332,000ac) | 304,100 | 1,918,500 | 126,700 | 1,920,359 | 77,512 |
| Increase Sm. Grains (260,000ac) | 304,100 | 2,178,500 | 126,700 | 1,588,359 | 77,511 |

## KANSAS

Over 52 million acres make up the state of Kansas and pheasants occur through most of those acres (excepting the extreme southeastern counties). Though the rest of the counties contain pheasants, the western half of the state has the highest densities. Pheasants in Kansas (and other High Plains states) use the landscape differently than other areas in the Northern Plains. Winter wheat is an extremely important habitat for pheasants and one of the primary cash crops. The winter and early spring growth of this crop provided significant nesting habitat for pheasants (see data below).

Historically, winter wheat was left fallow without herbicide application, and annual forbs (weeds) were left to grow providing incredible brooding, winter, and nesting (spring following harvest) habitat. This practice provided incredible habitat and populations of pheasants until the last couple of decades when herbicide application has become the norm for most of western Kansas wheat fields. However, winter wheat still provides excellent nesting habitat, which is only limited in Kansas in years of drought and/or early harvest.

Kansas has historically had high harvests of pheasants, which peaked in the mid-1980s with close to 1.5 million. As the practice of herbicide application to wheat stubble increased in the late-1980s, harvest started to decrease. During this period CRP began, which replaced nesting and brooding habitat which was lost when weedy wheat stubble acreage dropped. CRP has certainly helped to stabilized pheasant populations in Kansas. CRP in the High Plains seems to have a less dense structure than other areas in the Northern Plains, and seems to provide less productive nesting habitat (see data below). However, this does not detract from the significant contributions CRP has made to pheasant populations in Kansas.

Using the 10-yr period from 1996 to 2005 as representative of "normal/modern" landscape conditions and harvests, and given current landscape conditions and farming practices, Kansas considers a harvest goal of 700,000 wild pheasants as a realistic target.

Using the habitat and harvest model calculations, Kansas would need to increase small grain (winter wheat) acreage by 2.01 million acres (23% increase), or increase CRP by 4.9 million acres (182% increase; not feasible due to CRP acreage caps), or increase both small grain and CRP acreage to some combination to achieve the harvest goal of 700,000 wild roosters.

| Production Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Relative Nest Success | 0.100 | 0.590 | 0.250 | 0.240 |
| Relative Habitat Availability | 0.063 | 0.681 | 0.080 | 0.176 |
| Weighted Nest Success | 0.013 | 0.854 | 0.042 | 0.090 |

| Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Distributed 96-05 Harvest | 8,742 | 554,759 | 27,481 | 58,317 |
| Pre-hunt Population | 25,903 | 1,643,732 | 81,425 | 172,792 |
| Acres/Harvested Bird | 104.81 | 17.76 | 41.93 | 43.67 |

| Habitat Variable | Habitat Types | | | | Predicted |
|---|---|---|---|---|---|
| | Alfalfa Hay | Sm Grains | Grass Hay | CRP | Harvest |
| 2008 USDA/NASS Habitat Data[a] | 246,300 | 8,687,800 | 1,404,500 | 2,716,000 | 587,081 |
| Increased CRP (4.9 mil ac) | 246,300 | 8,687,800 | 1,404,500 | 7,649,000 | 700,036 |
| Increased Sm. Grains (2.01 mil ac) | 246,300 | 10,694,000 | 1,404,500 | 2,716,000 | 700,056 |

[a] Kansas used the 2008 USDA/NASS data as the 2010 data was incomplete

## NEW MEXICO

The distribution of ring-necked pheasants in New Mexico is primarily in the Northwest (San Juan County), the Middle Rio Grande (Bernalillo, Sandoval, Socorro, Valencia, Sierra), and eastern New Mexico (Chaves, Colfax, Eddy, Roosevelt and Union Counties) regions. Pheasants have been sighted in other regions, though it is unclear if these represent truly wild individuals. Regardless, the majority of pheasant populations in New Mexico are relatively small. New Mexico offers a 4-day pheasant season statewide (3 per day, six in possession), in all counties except for Valencia county. In Valencia County a 1-day hunt is offered with a daily/season bag limit of 3 males. New Mexico Department of Game and Fish also offers 4 "put and take" 1-day draw hunts, 2 of which are youth only.

Due to the limited wild pheasant population, harvest data for New Mexico is largely unknown. It is estimated that 1,500 roosters were harvested in 2002 and 2007, of which an estimated 10% were wild birds. We estimate a harvest of 150-300 wild roosters, thus it is unrealistic to calculate a model for habitat needs at a state or county level. However, to maintain or increase the number of wild pheasants in New Mexico, the retention or increase of conservation program cover, small grains, and pasture land is of utmost importance.

## OKLAHOMA

There is a small portion of Oklahoma where wild pheasants reside. The 12 counties are Alfalfa, Beaver, Cimarron, Garfield, Grant, Harper, Kay, Major, Noble, Texas, Woods and Woodward Counties and portions of Blaine, Dewey, Ellis, Kingfisher, Logan and Osage counties that total the pheasant range in Oklahoma. Oklahoma has conducted surveys of hunters since 1986. Over this time span harvest has varied from 120,000 roosters to 38,000 roosters and averages just over 70,000 roosters. There have been a few regulation changes that could have increased harvest numbers by increasing the bag limit from 1 rooster in portions of the range to 3 roosters range wide. The Conservation Reserve Program (CRP) has been a big benefit to pheasants in Oklahoma. The birds are generally localized around agriculture, native range, and CRP fields that provide food and nesting cover. However, the grasses used in CRP in Oklahoma were primarily introduced grasses and might not have been the preferred species of grass but the birds are still using the fields for nesting cover. Winter wheat in Oklahoma doesn't provide the best nesting cover due to the timing of harvest. Since farmers generally harvest crops in June and use complete tillage the first nest attempt might not be completed. With farming practices changing to a no till system this can benefit pheasants by allowing them to possible complete the first nesting attempt. Haying in Oklahoma has benefited pheasants since the hay is generally not removed until after the first nesting attempt. However, the acreages are relatively small at 304,000 acres on average in Oklahoma.

In the last 10 years Oklahoma has seen an increasing trend in the pheasant population. The 10-year period selected was 1999 – 2008. Since pheasant populations can have big fluctuations in production numbers from year to year the time period selected should show a good representation. Using the habitat models acres per harvested bird; Oklahoma believes a harvest goal of 95,000 birds is a realistic goal with the habitat conditions and farming practices that are being used.

Using the habitat and harvest model calculations Oklahoma would need to increase CRP acres by 499,000 acres (82%), or increase winter wheat by 1,400,000 acres (78%), or a combination of increases for these two habitat types to achieve the harvest goal of 95,000 birds.

| Production Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Relative Nest Success | 0.100 | 0.100 | 0.250 | 0.280 |
| Relative Habitat Availability | 0.023 | 0.715 | 0.065 | 0.197 |
| Weighted Nest Success | 0.016 | 0.493 | 0.112 | 0.380 |

| Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Distributed 99-08 Harvest | 1,304 | 40,959 | 9,272 | 31,586 |
| Pre-hunt Population | 5,798 | 182,041 | 41,207 | 140,381 |
| Acres/Harvested Bird | 60.18 | 60.18 | 24.07 | 21.49 |

| Habitat Variable | Habitat Types | | | | Predicted Harvest |
|---|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP | |
| 2010 USDA/NASS Habitat Data | 100,000 | 1,790,000 | 290,000 | 610,000 | 71,829 |
| Increase Cons Cover (422,000ac) | 100,000 | 1,790,000 | 290,000 | 1,109,000 | 95,045 |
| Increase Sm. Grain (1.18 mil ac) | 100,000 | 3,190,000 | 290,000 | 610,000 | 95,091 |

## TEXAS

Wild rooster pheasant harvest is estimated by surveying licensed small game hunters. Shooting preserves in the Texas Panhandle region are few and we do not feel contribute to estimates of wild bird harvest. There is very little tame pasture due to climate so this category is re-named to rangeland which only has a fair value for Texas pheasants. Playas and wheat are both good to excellent nesting habitat in most years both having drawbacks such as destruction of nests during harvest and higher than average rainfall filling in playa basins completely. District 11 was used in the NASS database because it captures over 95% of the area where pheasants are hunted. Rangeland acreage was estimated using the 2002 and 2007 USDA Census of Agriculture for the 23 counties in District 11.

Because of the great importance of weather in a semi-arid environment and recent trends in a reduction of grains and an increase in cotton production, a ten year period (1999-2008) was chosen which represents the fluctuation of pheasant abundance as related to climate and crop trends.

Texas' estimated harvest of 75,152 birds is in line with the 10-year average. Emergency haying and grazing has had a tremendous negative effect on pheasant winter habitat availability in 2011-2012. In 2012, 60,000 acres are coming out of Texas CRP and the majority of this is in the pheasant range. Whether or not this acreage is re-enrolled or if additional acreage is enrolled is largely dependent on weather. If Texas remains in drought, producers will likely re-enroll but if we continue to get rains, producers will likely plant cotton in expired CRP or otherwise break it out.

Texas has set a harvest goal of 90,000 roosters. Texas would need to increase CRP habitat within its conservation cover by 740,000 acres (49%), or increase winter wheat by 1,160,000 acres (193%), or a combination of increases for these two habitat types to achieve the harvest goal of 90,000 birds.

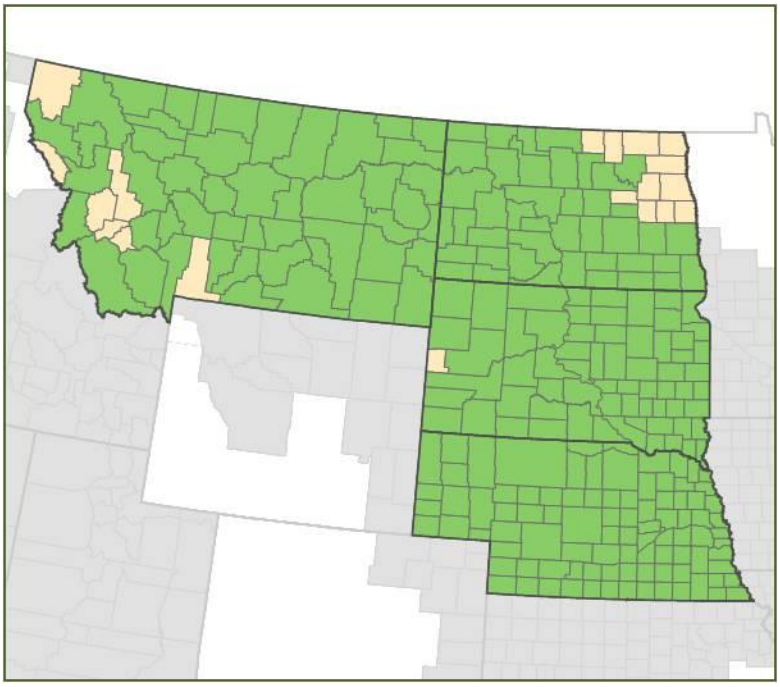
| Production Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Rangeland | Sm. Grains | Playas | Cons. Cover |
| Relative Nest Success | 0.100 | 0.400 | 0.500 | 0.630 |
| Relative Habitat Availability | 0.700 | 0.123 | 0.034 | 0.143 |
| Weighted Nest Success | 0.310 | 0.218 | 0.075 | 0.398 |

| Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Rangeland | Sm. Grains | Playas | Cons. Cover |
| Distributed 99-08 Harvest | 23,235 | 16,324 | 5,608 | 29,850 |
| Pre-hunt Population | 103,265 | 72,553 | 24,926 | 132,666 |
| Acres/Harvested Bird | 312.03 | 78.01 | 62.41 | 49.53 |

| Habitat Variable | Habitat Types | | | | Predicted |
|---|---|---|---|---|---|
| | Rangeland | Sm. Grains | Playas | Cons. Cover | Harvest |
| 2010 USDA/NASS Habitat Data | 7,250,000 | 1,250,000 | 350,000 | 1,500,000 | 75,152 |
| Increase CRP (740,000ac) | 7,250,000 | 1,250,000 | 350,000 | 2,240,000 | 90,093 |
| Increase Sm. Grain (1,160,000 ac) | 7,250,000 | 2,410,000 | 350,000 | 1,500,000 | 90,022 |

## *MANAGEMENT REGION 3*

### *MONTANA, NEBRASKA, NORTH DAKOTA, SOUTH DAKOTA*



The Northern Great Plains Region (Mgmt Region 3) is made up of Montana, Nebraska, North Dakota, and South Dakota. Most of this management region was historically mixed grass prairie, although the eastern fringe of the Dakotas and Nebraska transitioned to tallgrass prairie. The extreme western periphery of the Dakotas and Nebraska along with the pheasant distribution in Montana was dominated by shortgrass prairie. Several unique landscapes exist within management region 3 including the prairie pothole region which extends across North and South Dakota east of the Missouri river and much northeastern Montana. The Nebraska Sandhills represent another unique and large landscape in the south-central portion of this management region.

The alteration of the intact grassland that once represented management region 3 to a mosaic of grassland and cropland along with the establishment of woody cover has allowed pheasants to flourish. Although agriculture represents a crucial component of pheasant habitat, nesting cover is considered a limiting factor for pheasant populations within agricultural landscapes such as management region 3. For this reason, pheasant populations have responded strongly to managed grassland cover such as grasslands established under the Soil Bank Program of the 1960s and 1970s and the CRP since 1985. Similarly, land owned and managed by state and federal wildlife agencies provide ideal pheasant production habitat. Other important pheasant production habitats include hayland, small grain fields (particularly winter wheat), and grazing lands. Winter cover becomes increasingly important as you move north in the management region. Large cattail sloughs and multi-rowed low growing tree and shrub plantings provide high quality winter habitat for pheasants where severe winters can reduce pheasant survival. In the north, winter survival is further enhanced with the addition of food plots such as strategically located un-harvested fields of corn, milo, or sorghum.

Within the management region, acreage of CRP grasslands exceeded 9 million acres during 1990 - 2010 and approached 10 million during its peak in 2007. As of February 2012, there were 7 million acres of CRP in the region with nearly half of the acreage under contract due to expire in federal

fiscal years 2012 – 2014. The establishment of CRP grassland helped offset the decline in other grasslands, primarily loss of grazing lands to conversion to agriculture. Between 1982 and 1997, 4.41 million acres of grassland categorized as rangeland or pasture were converted to cropland in the USDA's Northern Plains Crop Production Region (KS, NE, SD, ND; GAO 2007). High grassland loss rates continue, particularly in ND, SD and MT (GAO 2007, Stubbs 2007).

Acreage of other important pheasant production habitats has also declined within the management region. Small grain (barley, oats, rye, and wheat) acreage declined by nearly 50% (32.5 million vs. 17.2 million acres) between 1989 and 2011. The amount of hayland declined during this period, but to a lesser extent (12.5 million vs. 11.2 million acres).

Results from the habitat calculation worksheet indicate managed grasslands such as land enrolled in the CRP produced more pheasants per acre than any other habitat type within the management region. Small grains, hayland, and grazing lands were also identified as important pheasant producing habitats within the region. The pheasant harvest goal for region 3 is 2.37 million roosters. To achieve this goal, several combinations of habitat changes could result in the estimated harvest goal (see state-specific sections). Considering the overwhelming per acre contribution of CRP grasslands to the expected harvest, we included only CRP in the management region habitat goal. However, we recognize the importance of other habitats and discussion challenges and opportunities related to other habitats are discussed. To achieve the harvest goal for region 3, CRP acreage would need to be increased to 8.62 million acres if acreage of grass hay, alfalfa, small grains and grazing lands were held at 2010 levels. Considering the regional declines in these other habitats, CRP acreage will likely need to be higher to sustain the regional harvest goal.

Native grass and forb habitat at Harlan Co. Lake, NE/Nebraska GPC

During the period of 2006-2009 (Table 3.1), an average of 207,000 resident and 151,000 non-resident hunters bagged 3.1 million wild roosters annually in these four states. Hunters spent on average of $70 for every bird harvested, or about $221 million in total annual expenditures while hunting pheasants. Non-residents paid two and a half times as much per bird harvested compared to residents, or about twice as much in total expenditures while pheasant hunting.

### *CHALLENGES*

Many factors are contributing to the ongoing and recently accelerated loss of pheasant production habitats across the region. Soaring demands for grain driven by world population growth and increased demand for biofuels has resulted in very high commodity prices. Advances in agricultural technology such as genetically modified crops and drought tolerant varieties have made farming more profitable thus putting added pressure to convert non-cropland acres to cropland. Additionally, federal farm program subsidy, insurance, and disaster payments have reduced the risk of farming, especially for marginal lands. Rental payments for CRP have not kept up with increases in cash rent for cropland which has resulted in less interest in the program. Without changes to federal farm program policy, additional declines of pheasant production habitats and pheasant populations are expected.

### *OPPORTUNITIES*

In general, pheasant populations will benefit from actions or policies that promote, encourage, or otherwise incentivize for diverse agricultural operations. In the forefront, a strong Conservation Title of the Federal Farm Bill will have the most influence over agricultural practices at a landscape-level. Opportunities exist to promote land use practices that provide production habitat for pheasants that also mesh will with productive, diverse, and profitable agricultural operations.

South Dakota CREP sign /South Dakota GF&P

Most importantly, establishment and maintenance of managed grasslands through the CRP should be sustained at levels recommended in this plan. Rental payments should be adjusted to attractive levels to assure authorized acreages are enrolled. Special CRP initiatives such as State Acres For wildlife Enhancement (SAFE) should be utilized to establish cover specifically for pheasants (e.g. minimum patch size and limited to favorable pheasant landscapes). Aggressive and periodic "midcontract-management" should be required and adequately cost shared to ensure early successional habitat persists through the contract duration.

The inclusion and implementation of a sodsaver provision within the Farm Bill that renders newly broken land ineligible for federal crop insurance, subsidy and disaster payments for a specified number of years, preferably for perpetuity would discourage "sodbusting", especially for marginal lands. We recommend that livestock producers are offered comparable incentives as grain producers through the federal farm program. The playing field needs to be equal for livestock and crop

production. Declining livestock inventories undoubtedly contribute to the loss of hayland, and obviously grazing lands. Recoupling conservation compliance with federal crop insurance eligibility would also discourage the continued and recently accelerated loss of wetlands that, among other benefits, provide important winter cover for pheasants.

Other federal programs such as EQIP and WHIP should be sustained and adequately funded. These programs have been successful at encouraging wildlife and environmentally friendly land use practices. Pheasants will benefit from practices that encourage sustainable grazing and diverse crop rotations such as incentives for including small grains, especially winter wheat in rotation. These programs are also used to establish upland, wetland, and woody cover habitat. The WRP has also temporarily or permanently restored, enhanced, or protected wetland and upland habitats. We recommend that this program is sustained, adequately funded, and contracts skewed to or completely transitioned to perpetual agreements.

The establishment of woody cover and food plots should also be encouraged, especially in the Dakotas and Montana. Wide (at least 8 rows) shelterbelts consisting of low growing trees (e.g. eastern red cedar) and shrubs provide excellent thermal cover while minimizing tall perch sites for raptors. Food plots of unharvested corn, milo, sorghum, and/or millet provide escape cover and food. Food plots oriented downwind of prevailing NW winter winds will be most beneficial. We discourage the establishment of food plots or woody cover in native prairie, or otherwise intact grassland habitats that may provide habitat for area sensitive grassland birds such as prairie grouse, Baird's sparrows, or Sprague's pipit.

CP-21 filter strip /Pheasants Forever

A shift from corn based to cellulosic ethanol has the potential to increase pheasant nesting habitat acreage. Corn ethanol currently consumes 40% of the nation's corn production which has inflated grain prices and put pressure on producers to till every available acre. The use of switchgrass or mixed stands of warm season grasses for biomass production could provide pheasant nesting habitat if some residual vegetations is left unharvested. Although the ideal height residual to be unharvested is unknown, 12 inches seems like an appropriate minimum. Unfortunately, much of the biomass is concentrated in the lower 12 inches and there would need to be incentives to leave unharvested grass for nesting birds. Researchers should investigate the use of cool season grasses as the current year's growth could provide nesting cover for upland nesting birds even if the previous year's crop was completely removed.

Table 3.1. Mean number of pheasant hunters, days hunted, trips, birds/hunter, harvest, expenditures, and estimated cost per bird harvested based on hunter and harvest data within the Northern Great Plains region from 2006 - 2009. Calculated by multiplying average cost of an upland hunting trip in ND, SD, NE, KS, IA, and MN by the number of pheasant hunting trips in each state based on 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

| State | Hunters[a] | Days Hunted | Trips | Birds/ Hunter | Harvest | Expenditures | $/Bird Harvested |
|---|---|---|---|---|---|---|---|
| SD | 175,634 | 5.76 | 1,011,858 | 10.75 | 1,888,280 | $127,446,986 | $67 |
| NE | 57,294 | 7.44 | 426,448 | 6.00 | 343,784 | $32,033,981 | $93 |
| ND | 100,974 | 5.43 | 548,603 | 7.64 | 771,677 | $49,545,963 | $64 |
| MT | 24,324 | 5.19 | 126,346 | 5.61 | 136,545 | $11,487,943 | $84 |
| **Sum/*Mean*** | **358,225** | ***5.90*** | **2,113,254** | ***8.77*** | **3,140,286** | **$220,514,872** | ***$70*** |

[a] data is combined resident and Non-resident

## *REGIONAL GOALS*

The Northern Great Plains Region has a pheasant harvest goal of 2.37 million roosters (NE, ND, & SD; Table 3.2). Using the habitat calculation work sheets and 2010 NASS data, an additional 3.83 million acres of CRP or 5.12 million acres of small grains is needed within the region to achieve the harvest goal. Increasing the pheasant harvest to 2.37 million birds would increase pheasant hunting expenditures within the region by almost 25%. Conversely, the expected pheasant harvest without the habitat provided by the CRP would be 1,308,008, or about 615,000 less than expected with 2010 CRP acreage. At $70 per bird harvested, $43,074,000 in pheasant hunting related expenditures could be lost annually within the management region if the Conservation Reserve Program was discontinued.

Table 3.2. The 2010 habitat data for the Northern Great Plains Region, with predicted pheasant harvest, harvest goals, and additional habitat needed to achieve goals.

| | 2010 NASS/FSA Habitat Data (Ac) | | | | | Predicted RPHE Harvest | State RPHE Harvest Goal | Additional CRP Habitat Needed to Attain Harvest Goal | Additional Sm. Grain Habitat needed to attain Harvest Goal |
|---|---|---|---|---|---|---|---|---|---|
| State | Pasture | Alfalfa Hay | Small Grains | Grass Hay | CRP | | | | |
| MT[a] | | | | | | | | | |
| NE | | 120,000 | 1,700,000 | 2,705,000 | 1,092,760 | 434,422 | 500,000 | 510,000 | 570,000 |
| ND | 6,300,000 | 1,525,000 | 591,960 | 948,000 | 2,656,000 | 383,297 | 600,000 | 2,669,000 | 3,650,000 |
| SD[b] | 8,000,000 | 2,150,000 | 1,300,000 | 1,450,000 | 1,250,000 | 1,105,627 | 1,270,000 | 650,000 | 900,000 |
| Total | | | | | | 1,923,346 | 2,370,000 | 3,829,000 | 5,120,000 |

[a] Montana did not provide state data, including habitat acres, previous harvest totals, and harvest goals

[b] South Dakota's "CRP" column includes all conservation lands (82% CRP, 18% non-CRP conservation cover[DGF&P/USFWS])

**Note: Montana did not provide a state pheasant summary or habitat model calculations.**

## NEBRASKA

Located in the Great Plains, Nebraska covers over 49.2 million acres, 93.5% (~46 million acres) of which is used for some sort of agricultural production (crops, livestock). In 2002, agriculture produced $10 billion in products. Divided into 93 counties, all of which are within the pheasant's range, Nebraska has a human population as of 2006 of 1.8 million people. Between 1990 and 2006, the density of the human population increased from 7.9 people/km$^2$ to 8.9 people/km$^2$. Along with an east-west elevation gradient ranging from 300 m ASL in the east to 1,500 m ASL in the west, there is also a strong east-west precipitation gradient ranging from 891 mm in the east to 348 mm in the west. Rangeland suitable for livestock grazing predominates in the Panhandle and north-central Nebraska, whereas some form of cultivation predominates elsewhere.

Changes in agricultural land-use in Nebraska between 1866 and 2007 were detailed in Hiller et al. (2009). Briefly, the number of farms and farm size increased until 1900. Between 1900 and 1930, both farm size and number were relatively stable; thereafter, the number of farms declined rapidly and total cropland area remained stable. Crop diversity was greatest during 1955-1965, before slowly decreasing. Corn was always a dominant crop type, but sorghum and oats were often replaced with soybeans beginning in the 1960s. Currently, corn and soybeans comprise more than 66% of Nebraska's total croplands. Based on 2010 NASS data, the total potential suitable habitat for pheasants encompassed 5.6 million acres, which is 12% of the total agricultural area of the state.

Harvest records dating back to 1955 indicate that a peak harvest of 1.5 million pheasants occurred in 1963. Harvest of over 1 million pheasants occurred each year between 1958 and 1966, but has declined since then to its lowest point of approximately 300,000 pheasants harvested in 2009. The era of peak annual harvest roughly coincided with the period of greatest crop diversity. Nebraska believes that an achievable goal for total annual harvest would be 500,000 roosters.

Nebraska selected as its 10-year reference period the years 1995 through 2004, when annual harvest averaged just over 480,000 roosters. Given the habitat model developed as part of this plan, Nebraska would need to increase small grain acreage by 570,000, an increase of 34%, or increase CRP acreage by 510,000 acres, an increase of 47%. There is also the possibility that some combination of increases in small grain and CRP could be used to achieve the harvest goal of 500,000 roosters.

| Production Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Relative Nest Success | 0.060 | 0.620 | 0.190 | 0.690 |
| Relative Habitat Availability | 0.057 | 0.287 | 0.476 | 0.179 |
| Weighted Nest Success | 0.009 | 0.450 | 0.229 | 0.313 |

| Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Distributed 95-04 Harvest | 4,197 | 216,639 | 110,035 | 150,537 |
| Pre-hunt Population | 17,059 | 880,645 | 447,295 | 611,938 |
| Acres/Harvested Bird | 89.36 | 8.65 | 28.22 | 7.77 |

| Habitat Variable | Habitat Types | | | | Predicted Harvest |
|---|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP | |
| 2010 USDA/NASS Habitat Data | 120,000 | 1,700,000 | 2,705,000 | 1,092,760 | 434,422 |
| Increased CRP (510,000 ac) | 120,000 | 1,700,000 | 2,705,000 | 1,602,760 | 500,057 |
| Increased Sm Grains (570,000 ac) | 120,000 | 2,270,000 | 2,705,000 | 1,092,760 | 500,337 |

## NORTH DAKOTA

No game species introduced into North Dakota has been as successful as the ring-necked pheasant. Extensive introductions of pheasants during the 1930's established a permanent population. Once viable populations are established, land-use patterns are the most important factor in pheasant survival. The state's highest pheasant populations occur in areas with small grain agriculture where 20 to 45 percent of the land is in small grain and wild hay, and less than 40 percent in corn and alfalfa. Where cultivated lands and permanent vegetation are interspersed, pheasants thrive.

As expected, pheasant populations in North Dakota need cropland to maintain stability. In prime pheasant range in North Dakota, spring wheat, sunflowers, grasses and ragweed are very important to pheasants. They provide food for pheasants throughout the annual life cycle. Land set-aside booms have come and gone, and the pheasant population has fluctuated with these increases and decreases in cover. Where intensive farming has removed fence rows, drained and leveled wetlands, and narrowed roadside cover, pheasant numbers have declined. The grain-hay-pasture combination of southern North Dakota provides a most favorable field habitat for pheasants, because the highest pheasant populations traditionally occur where these three subdivisions are present in close proximity.

When mild winters are coupled with abundant nesting cover and good hatching weather in June, North Dakota can produce pheasants. This has been observed during Soil Bank Program years (1958-1964) and Conservation Reserve Program years (2000-2010). North Dakota has documented record pheasant harvests of over 500,000 roosters in eight of ten years during the 2000's, with a peak harvest of over 907,000 roosters in 2007. North Dakota has set an annual harvest goal of 600,000+ wild pheasant roosters.

Using the habitat model's acres/harvested bird estimate, calculated from the 10-year average of 1997 to 2006 and leaving other variables constant, North Dakota would need to increase CRP/conservation acreage to 5,325,000 acres (double the present acreage), or increase pastureland acreage to 23.1 million acres (266% increase), or increase both alfalfa hay and grass hay acreage by 400% of present acres and CRP by 13% to achieve the harvest goal of 600,000+ roosters.

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative Nest Success | 0.100 | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.548 | 0.088 | 0.052 | 0.072 | 0.239 |
| Weighted Nest Success | 0.214 | 0.034 | 0.093 | 0.071 | 0.588 |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed 97-06 Harvest | 97,881 | 15,749 | 42,351 | 32,269 | 269,160 |
| Pre-hunt Population | 290,017 | 46,664 | 125,484 | 95,612 | 797,512 |
| Acres/Harvested Bird | 77.36 | 77.36 | 16.82 | 30.94 | 12.28 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest |
|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2010 USDA/NASS Habitat Data | 6,300,000 | 1,525,000 | 591,960 | 948,000 | 2,656,000 | 387,297 |
| Increased CRP (2.7 mil ac) | 6,300,000 | 1,525,000 | 591,960 | 948,000 | 5,325,000 | 600,661 |
| Increased Pasture (16.8 mil ac) | 23,100,000 | 1,525,000 | 591,960 | 948,000 | 2,656,000 | 600,471 |
| Increase Hay & CRP (9.0 mil ac) | 6,300,000 | 6,222,000 | 591,960 | 4,900,000 | 3,000,000 | 599,750 |

## SOUTH DAKOTA

Since their successful introduction in 1908, pheasants have flourished in the state's diverse agricultural landscape, being found in 65 of the state's 66 counties. The quantity, quality, and interspersion of habitats support high pheasant populations and made pheasants an icon of South Dakota culture. Of the nearly 50 million acres that make up the state of SD, about 16 million acres were planted to cropland in 2011. Slightly over half of the planted cropland acres were corn (5.2 million) and soybeans (4.1 million), while wheat was the third most abundant annually planted crop at 2.9 million acres. Much of the remaining non-cropped land in SD is used for cattle grazing. In 2012, South Dakota had an estimated cattle inventory of 3.65 million. Also in 2012, 1.11 million of cropland acres were enrolled in the CRP.

In SD, conservation cover (e.g. CRP grassland, state/federal-owned land), hayland, pastureland, and small grains (specifically winter wheat) are considered the primary pheasant nesting habitats. Since enrollment began in 1986, CRP acreage ranged from approximately 1.75 million acres throughout the 1990s to about 1.45 million acres during most of the early 2000s. Enrolled acres declined sharply beginning in 2007 and current enrollment equals 1.11 million acres. Small grain acreages have been declining since the 1970s. In the late 1990s, total acreage of corn and soybeans was more than small grains for the first time in recent history. This trend continues as the acreages of small grains vs. row crops has become more disparate. The amount of hayland has also been on a steady decline since about 1960. The 3.6 million hayland acres available as nesting habitat in 2010 is 2 million acres less than in 1960. Although not as closely tracked as cropland acres, pastureland acres have also been declining in recent years (Classen et al. 2011, Brooke et al. 2009, USGAO 2007, Stubbs 2007). Between 1982 and 1997, 1.82 million grassland acres were converted to cropland, with another 475,000 grassland acres converted to cropland from 2002-2007. The pheasant population has responded strongly to the grasslands established under the CRP, and its predecessor, the Soil Bank Program. From 1988 - 2011, the harvest averaged nearly 1.4 million birds, but harvest only averaged 900,000 during the previous 20 years. During the soil bank era ('57-'68), harvest averaged nearly 1.9 million roosters. Because of the importance of CRP managed grassland to pheasants, our harvest goals revolve around conservation cover (Only 225,000 acres of the conservation cover are not enrolled in the CRP).

With a wild pheasant harvest goal is 1.27 million birds and the habitat model's acres/harvested bird estimate from the 10-year average of 1991-2000, it is estimated that South Dakota would need to increase conservation cover acreage by 650,000 CRP acres or increase winter wheat by 900,000 acres or some combination to achieve the harvest goal.

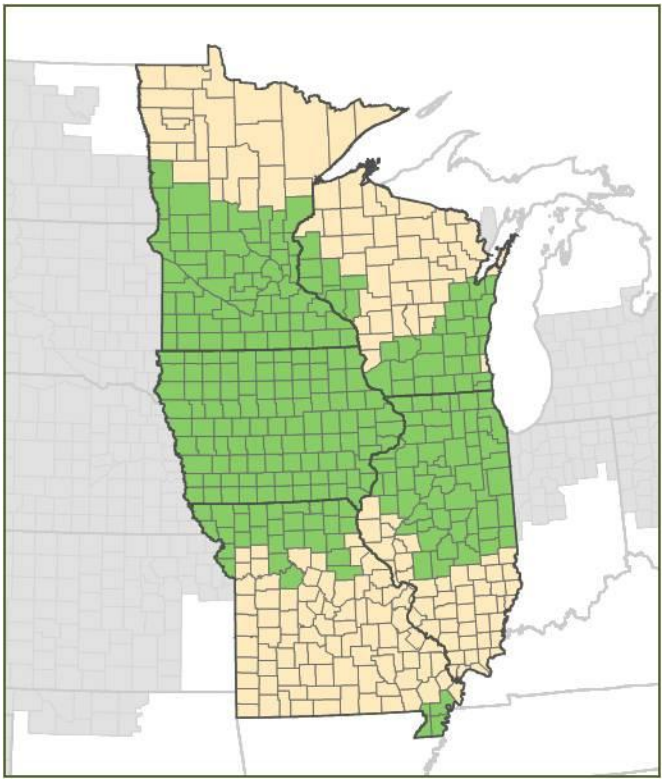
| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm. Grains | Grass Hay | Cons. Cover |
| Relative Nest Success | 0.100 | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.527 | 0.164 | 0.079 | 0.109 | 0.121 |
| Weighted Nest Success | 0.252 | 0.078 | 0.175 | 0.130 | 0.365 |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm. Grains | Grass Hay | Cons. Cover |
| Distributed 91-00 Harvest | 320,124 | 99,638 | 221,806 | 165,064 | 464,449 |
| Pre-hunt Population | 1,422,771 | 442,838 | 985,803 | 733,616 | 2,064,217 |
| Acres/Harvested Bird | 24.99 | 24.99 | 5.43 | 10.00 | 3.97 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest |
|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm. Grains | Grass Hay | Cons. Cover | |
| 2010 USDA/NASS Habitat Data | 8,000,000 | 2,150,000 | 1,300,000 | 1,450,000 | 1,250,000 | 1,105,627 |
| Incrsed Cons. Cover (650,000 ac) | 8,000,000 | 2,150,000 | 1,300,000 | 1,450,000 | 1,900,000 | 1,269,490 |
| Incrsed Sm. Grains (900,000 ac) | 8,000,000 | 2,150,000 | 2,200,000 | 1,450,000 | 1,390,000 | 1,271,291 |

## *MANAGEMENT REGION 4*

### *ILLINOIS, IOWA, MINNESOTA, MISSOURI, WISCONSIN*



The Big Rivers Region (Mgmt Region 4) is comprised of Illinois, Iowa, Minnesota, Missouri, and Wisconsin. This region along the upper Mississippi River has a pheasant distribution that covers the majority of the former northern tallgrass prairie, prairie/hardwood transition zone, and part of the prairie pothole region, and currently makes up the western portion of the US Corn Belt. Pheasant were established across the region in the early 1900's. Landscapes at the time included a diverse mixture of corn, small grains, hay, pasture, wetlands, and wood lots and pheasants adapted very well to this diverse mixture of small farm agriculture. According to Dahlgren (1988) pheasant populations peaked in the 1940's through the 1970's.

Adoption of soybeans in the 1960's and improvements in agricultural equipment and drainage led to a steady gradual decline in pheasant numbers with less nesting cover (hay/small grains/pasture) and loss of wetland winter habitat. USDA programs like Soil Bank, Emergency Feed Grain Program, and Cropland Adjustment Program (aka set-aside programs) helped mitigate some of the habitat loss. However, the benefit of these programs to pheasants was dependent upon how deferred acres were managed. In response to the Farm Crisis of the 1980's, Congress established the CRP program in 1985 and by 1990 over 6.3M acres of cropland within the region had been seeded down to grasses, providing a boom to pheasant populations. CRP enrollment in the Big Rivers Region states peaked in 1994 at 7.2M acres, but declined to 5.3M acres in 1998. Currently the region has 6.1M acres enrolled in CRP, but almost 30% of this is enrolled in buffer - practices and these smaller blocks of habitat to do not provide as much benefit as do the larger blocks typical of general CRP (Clark et al. 1999). Contracts on 2.8M CRP acres will expire across the region from 2012-15, which represents 45% of the region's total CRP acreage.

### *CHALLENGES*

Maintaining nesting and winter cover is the greatest challenge facing the Big Rivers region. According to the 2007 Census of Agriculture, the Big Rivers states account for over 44% of the corn, soybeans, and sorghum acres harvested in the United States. Agricultural and energy policies (2007 Renewable Fuels Standard [RFS]), particularly mandates related to corn ethanol, and subsequent row crop production have an enormous effect on pheasant populations and habitats within these states. Agricultural census data reveal that between 1997-07 row crop (corn, milo, soybeans) acreage increased by 3.2M acres, while crops providing potential habitat for pheasants small grain (wheat, oats, barely) and hay lands decreased by 3.5M acres. This equates to the land area of 7 typical Midwest counties (+5,400 $mi^2$). Unfortunately, the National Agricultural Statistics Service (NASS) does not track pasture land acres annually; thus, there is no way to determine how acreage in this habitat type has changed through time.

High commodity prices for corn and soybeans, driven by RFS, have led to a 964,000 acre loss of CRP across the five states from 2007-10. There has likely also been further conversion of small grains, hay land, and pasture lands to row crop production. Pheasant populations, pheasant hunting, and the resulting economic activity cannot be sustained with continued losses of pheasant habitat.

Iowa pheasants foraging cropland in winter /Iowa DNR

### *OPPORTUNITIES*

Pheasant hunting is a tremendously popular activity in the region. During the period of 2006-2009, an average of 319,000 resident and non-resident hunters took 2.3 million trips and bagged 1.5 million wild roosters annually (Table 4.1). Hunters spent on average $90 for every bird harvested, or $137.8 million annually in expenditures while hunting pheasants. Maintaining quality nesting, brood-rearing and winter habitat is the key to abundant pheasant populations across the region.

The CRP program remains the best program in the Big Rivers Region for effectively producing pheasants on a bird/acre basis. High demand for commodity crops will almost certainly remain into the second decade of the century, making targeting and management of CRP acres more important than in the past. Because of higher rainfall in this region mid contract management is necessary every 2-3 years to retain the benefits of CRP grasslands for pheasants. Innovation and new partnerships between USDA, state agencies, and NGO's will be needed to maximize the benefits of the program for pheasants.

Other opportunities may exist in the form of cover crops or cellulosic energy crops. Concerns over water quality are a key concern in the Upper Mississippi watershed, and the use of cover crops and denitrification of wetlands are being promoted and explored by land grant universities. In many cases the preferred cover crop is some type of small grains, perhaps providing a benefit to pheasants. To address nitrogen and the hypoxia issue, university researchers are looking at wetlands as an effective tool for removing nitrates from tile systems. With appropriate input from wildlife professionals these wetlands might provide additional pheasant winter and nesting habitats.

Switchgrass in Iowa /J. Johnson, USDA-NRCS (Iowa)

Another opportunity is the use of cellulosic crops like switchgrass for ethanol production. These biomass crops could be grown on less productive and erosive soils, improving water quality and, depending upon harvest regimes and management, would have potential as pheasant habitat. Pheasant benefits would depend upon management actions during the nesting season, seed mixtures, stand density and diversity, timing of harvest, and stubble heights.

Table 4.1. Mean number of pheasant hunters, days hunted, trips, birds/hunter, harvest, expenditures, and estimated cost per bird harvested based on hunter and harvest data within the Big Rivers region from 2006 - 2009. Calculated by multiplying average cost of an upland hunting trip in ND, SD, NE, KS, IA, and MN by the number of pheasant hunting trips in each state based on 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

| State | Hunters | Days Hunted | Trips | Birds/ Hunter | Harvest | Expenditures | $/Bird Harvest |
|---|---|---|---|---|---|---|---|
| IL[a] | 31,433 | 4.64 | 145,653 | 3.10 | 97,312 | $7,524,103 | $77 |
| IA | 96,949 | 6.73 | 652,865 | 5.24 | 508,468 | $50,357,972 | $99 |
| MN | 110,335 | 7.38 | 814,017 | 4.89 | 539,177 | $44,377,361 | $82 |
| MO[ab] | 9,782 | 4.69 | 45,892 | 3.29 | 32,142 | $2,370,378 | $74 |
| WI[c] | 70,251 | 8.58 | 602,549 | 4.99 | 350,767 | $33,147,689 | $95 |
| **Sum /*Mean*** | **318,749** | ***7.09*** | **2,260,976** | ***4.79*** | **1,527,865** | **$137,777,503** | ***$90*** |

[a] All hunter expenditures calculated as residents (resident vs. non-resident data unavailable)
[b] 2006, 2007, 2008 data only
[c] 2006 and 2007 data only

### *REGIONAL GOALS*

The Big Rivers Region has a pheasant harvest goal of 1.88 million roosters (Table 4.2). Using the habitat calculation work sheets and 2010 NASS data, an additional 1.06 million acres of CRP or 1.59 million acres of small grains is needed within the region to achieve the harvest goal. Increasing the

pheasant harvest to 1.88 million birds would increase pheasant hunting expenditures within the region by almost 25%. Conversely, if the habitat provided by the CRP were eliminated the expected pheasant harvest would be 553,889 or about 1.13 million less than expected with 2010 CRP acreage. At $90 per bird harvested (Table 4.1), $101,850,000 in pheasant hunting related expenditures could be lost annually if the CRP were eliminated.

Table 4.2. The 2010 habitat data for the Big Rivers Region, with predicted pheasant harvest, harvest goals, and additional habitat needed to achieve goals.

| | 2010 NASS/FSA Habitat Data (Ac) | | | | Predicted | State RPHE | Additional CRP | Additional Sm. Grain |
|---|---|---|---|---|---|---|---|---|
| **State** | Alfalfa Hay | Small Grains | Grass Hay | CRP | RPHE Harvest Goal | Harvest Goal | Habitat Needed to Attain Harvest Goal | Habitat needed to attain Harvest Goal |
| IL | 242,400 | 91,800 | 83,100 | 405,600 | 159,486 | 180,000 | 70,000 | 96,000 |
| IA | 880,000 | 80,000 | 320,000 | 1,680,000 | 912,215 | 1,000,000 | 200,000 | 280,000 |
| MN[a] | 773,900 | 731,300 | 414,000 | 1,550,400 | 407,709 | 450,000 | 246,000 | 337,000 |
| MO | 49,200 | 193,400 | 735,800 | 927,929 | 47,863 | 60,000 | 347,000 | 476,000 |
| WI | 887,000 | 446,800 | 378,000 | 426,400 | 158,283 | 190,000 | 198,000 | 403,000 |
| Total | | | | | 1,685,556 | 1,880,000 | 1,061,000 | 1,592,000 |

[a] Minnesota's "CRP" column includes all conservation lands (43% CRP, 14% other farm conservation programs, and 43% public lands [DNR/USFWS])

## ILLINOIS

Illinois is the 24th largest state by area at 56,400 square miles. Illinois' 76,000 farms cover more than 26 million acres, a little over 75% of the state's total land area. Illinois ranks second in U.S. corn production with more than 1.5 billion bushels produced annually. In most years, Illinois is either the first or second state for the highest production of soybeans, with a harvest of 427.7 million bushels. Only 3.3% of Illinois farmland is in pasture. In 2009, farm commodities brought in $14.5 billion to Illinois producers. Corn accounted for 52% of Illinois farm income (17% of the US value). Soybeans made up 29% of Illinois farm receipts (14% of the US value). Hogs accounted for 6.5% of Illinois farm income and cattle and calves made up 3.3%. Nursery and greenhouse products made up 2.1%.

Illinois has had a rich history as a pheasant producing state. The Illinois pheasant range extends across approximately 17.4 million acres in 43 counties in the northern part of the state. In 2010, pheasant nesting habitat made up 822,900 acres (5%) of Illinois pheasant range compared to 1,554,630 acres (9%) in 1990. Most of this decline in nesting habitat came from oats, wheat, and hay being converted to corn production. Oat and winter wheat acres dropped 88% between 1990 and 2010. Hay acres dropped 41%. The use of GMO crops has been widely accepted in Illinois. In 2010, 89% of soybeans and 67% of corn planted in Illinois were herbicide resistant varieties. Cleaner fields mean fewer annual weeds available to pheasant broods. CRP acres have actually increased from 219,430 acres in 1990 to 405,604 acres in 2010. Unfortunately, there has been a shift from competitive (whole field) CRP to continuous CRP like filter strips and waterways. These continuous practices are much less beneficial to pheasants. Additional CRP acres came from the Illinois CREP program that focuses on the Illinois River floodplain and the bulk of it is unsuitable for pheasants.

The last time hunters harvested over a million roosters was in 1973. As farm production ramped up in the mid-70s, harvests plummeted into the 200,000 range through the mid-80s. Harvests bounced back up into the 300,000 range after the CRP program began in 1985. The benefits from CRP were soon outstripped by changes in grain production and Illinois pheasant harvest has dropped to around 160,000 in 2010. Illinois has set an annual harvest goal of 180,000 wild pheasant roosters.

Using the habitat model's acres/harvested bird estimate, calculated from the 10-yr average of 1996 to 2005, Illinois would need to increase small grain acreage by 96,000 acres (105% increase), or increase CRP or some type of conservation acreage by 70,000 acres (17% increase), or any combination of both small gain and CRP acreage to achieve the harvest goal of 180,000 wild roosters.

| Production Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Relative Nest Success | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.351 | 0.256 | 0.096 | 0.298 |
| Weighted Nest Success | 0.096 | 0.323 | 0.066 | 0.515 |

| Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Distributed 96-05 Harvest | 17,260 | 57,506 | 11,704 | 91,708 |
| Pre-hunt Population | 50,845 | 170,387 | 34,679 | 271,727 |
| Acres/Harvested Bird | 21.49 | 4.67 | 8.60 | 3.41 |

| Habitat Variable | Habitat Types | | | | Predicted Harvest |
|---|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP | |
| 2010 USDA/NASS Habitat Data | 242,400 | 91,800 | 83,100 | 405,600 | 159,486 |
| Increased CRP (70,000 ac) | 242,400 | 91,800 | 83,100 | 475,600 | 180,005 |
| Increased Sm. Grains (96,000 ac) | 242,400 | 187,800 | 83,100 | 405,600 | 180,033 |

## IOWA

All 99 counties in Iowa have pheasant populations. Iowa has standardized harvest figures dating back 50+ years to 1958. Over this time span harvest has varied from 200,000 to 2 million roosters with a long term average of 1.2M rooster harvest. The highest harvests occurred in the late 1960's corresponding to the old USDA Soil Bank program. USDA set-aside programs like Soil Bank provided excellent year round habitat for pheasants and led to high harvest levels. However, harvests of 1.1-1.5M were common after the Soil Bank into the late 1970's. These birds were produced in hay, small grains, and pasture type grasslands. Harvests tended to decline with intensified agriculture from the 1970-1980's and the loss of these habitat types, but rebound and approached 1.5M harvests in the mid-1990's coinciding with the implementation of the CRP program. In 1960 Iowa had approximately 8.4M acres of hay and small grain type habitats. By 1985 this figure had fallen to just under 3M acres, most of this loss being small grain habitats. However, the implementation of the CRP program in Iowa created 2.2M acres of excellent habitat by the early 1990's.

Iowa used the 10-yr period from 1994-03 as representative of "normal/modern" landscape conditions and harvests. Habitat values averaged 3.7M acres, harvest averaged 1.08M roosters, and weather conditions were balanced over the time period. Using the habitat models acres per harvested bird, Iowa believes a harvest goal of 1 to 1.1M birds is a realistic target given current landscape conditions and farming practices.

Using the habitat and harvest model calculations Iowa would need to increase CRP acres by 200,000 acres (12%), or increase small grain habitats by 280,000 acres (350%) to achieve a rooster harvest of over 1 M birds.

| Production Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative Nest Success | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.339 | 0.062 | 0.105 | 0.494 |
| Weighted Nest Success | 0.085 | 0.072 | 0.065 | 0.778 |

| Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed 94-03 Harvest | 91,568 | 77,433 | 70,770 | 841,705 |
| Pre-hunt Population | 308,622 | 260,980 | 238,525 | 2,836,889 |
| Acres/Harvested Bird | 13.85 | 3.01 | 5.54 | 2.20 |

| Habitat Variable | Habitat Types | | | | Predicted Harvest |
|---|---|---|---|---|---|
| | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2010 USDA/NASS Habitat Data | 880,000 | 80,000 | 320,000 | 1,680,000 | 912,215 |
| Increased CRP (200,000 ac) | 880,000 | 80,000 | 320,000 | 1,880,000 | 1,003,205 |
| Increased Sm. Grains (280,000 ac) | 880,000 | 360,000 | 320,000 | 1,680,000 | 1,005,227 |

## MINNESOTA

Minnesota's 63 county pheasant range lies on the northern periphery of the pheasant range in North America, where pheasant populations are influenced by habitat and winter weather. Sixty-five percent of Minnesota's pheasant range is cropland. Corn and soybeans are currently the dominant crops (13 million acres), with less than 2 million acres in hay and small grains. This represents a dramatic reversal from 1950, when less than 6 million acres were planted to row crops and nearly 10 million acres were planted to small grains and hay.

The Minnesota Department of Natural Resources (MDNR) began acquiring lands for wildlife habitat in the 1950s. By 2010, MDNR and the U.S. Fish & Wildlife Service (USFWS) had acquired 712,408 acres of permanently protected wildlife habitat within the pheasant range. CRP enrollments added another 837,988 acres of habitat. The amount of habitat protected as MDNR and USFWS lands continues to increase, but CRP enrollments have been declining in Minnesota.

Pheasant harvest in Minnesota averaged 1 million birds per year during the diversified farming period of 1931-1964. The pheasant population crashed in 1965 following a devastating winter and never fully recovered due to dramatic changes in land use and farm policy that encouraged conversion of wetlands, haylands, and pastures to feed-grain production. Pheasant harvest during 1965-1986 averaged only 270,000 roosters per year, a 74% reduction from the diversified farming period. But with the addition of habitat protected by the CRP since 1987, pheasant harvest in Minnesota has again increased to an average of 407,000 roosters per year, a 51% increase from the previous period.

Minnesota has set a short-term harvest goal of 450,000 wild pheasant roosters per year and a long-term harvest goal of 750,000 roosters per year. Using the habitat model's acres/harvested bird estimate, calculated from the 10-yr average of 1997 to 2006 (most representative decade of average habitat and weather since CRP became established), Minnesota would need to increase small grain acreage by 337,000 acres (46% increase from 2010), increase CRP or some type of conservation acreage by 246,000 acres (16% increase from 2010), or some combination of both to achieve the 450,000-bird harvest goal. To achieve the 750,000-bird harvest goal, Minnesota would need to increase small grain acreage by 2.73 million acres (373% increase from 2010), increase conservation land acreage by 1.99 million acres (128% increase from 2010), or some combination of both.

| Production Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | Cons. Land |
| Relative Nest Success | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.290 | 0.233 | 0.091 | 0.386 |
| Weighted Nest Success | 0.072 | 0.267 | 0.056 | 0.605 |

| Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | Cons. Land |
| Distributed 97-06 Harvest | 28,859 | 106,637 | 22,540 | 242,063 |
| Pre-hunt Population | 85,509 | 315,962 | 66,785 | 717,225 |
| Acres/Harvested Bird | 36.64 | 7.97 | 14.66 | 5.82 |

| Habitat Variable | Habitat Types | | | | Predicted Harvest |
|---|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | Cons. Land | |
| 2010 USDA/NASS Habitat Data | 773,900 | 731,300 | 414,000 | 1,550,400 | 407,709 |
| ST: Increased sm. grain (337,000ac) | 773,900 | 1,068,300 | 414,000 | 1,550,400 | 450,012 |
| ST: Increased Cons. Land (246,000 ac) | 773,900 | 731,300 | 414,000 | 1,796,400 | 450,001 |
| LT: Increased sm. grain (2.73 mil ac) | 773,900 | 3,458,300 | 414,000 | 1,550,400 | 750,028 |
| LT: Increased Cons. Land (1.99 mil ac) | 773,900 | 731,300 | 414,000 | 3,541,400 | 750,003 |

## MISSOURI

Pheasants were first released in Missouri in the 1890's, with the first hunting season starting in 1901. Concern over low numbers resulted in the closure of the season just 3 years later in 1904. For the next 30 years, pheasants were released throughout the state by private citizens, 4-H clubs, hunt clubs, and the Fish and Game Department (predecessor of the current Missouri Department of Conservation.) The Missouri Department of Conservation began releasing pheasants in 1958. Between 1958 and 1971 approximately 16,000 pheasants were released on 8 areas. The introductions were characterized as failures on 6 areas, and small populations remained on 2. Another release period occurred from 1974-1980 in north central and northeastern Missouri. From 1987-2000, pheasants were released using wild birds trapped from existing populations in Missouri, Kansas, Nebraska, and South Dakota. Some areas continue to hold steady populations of birds, some have continued low numbers of birds, and others never established successful populations of pheasants. Pheasant harvest in Missouri peaked in 1990 with 24,479 hunters harvesting nearly 90,000 birds. In the 2010-2011 season, 6,163 hunters harvested just over 16,000 birds.

Currently, the pheasant range in Missouri is made up of 32 counties, mostly in the northern 1/3 of the state, and 3 counties in the Bootheel (New Madrid, Pemiscot, and Dunklin). The northern range includes Atchison, Nodaway, Worth, Harrison, Mercer, Putnam, Schuyler, Scotland, Clark, Holt, Andrew, DeKalb, Gentry, Daviess, Grundy, Sullivan, Adair, Knox, Lewis, Buchanan, Livingston, Linn, Macon, Shelby, Monroe, Audrain, Platte, Carroll, and Saline counties.

Missouri used the 10-yr period from 1991-2000 to represent habitat conditions including CRP with moderate to high annual pheasant harvests. Using the habitat models, Missouri has set a harvest goal of 60,000. In order to achieve this goal, Missouri would need to increase CRP habitat by 347,000 acres (37% increase) or increase small grain habitats by 476,000 acres (246% increase), or some combination of both habitat types. With current economics and politics, these habitat goals seem unlikely. However, the harvest goal may be attainable without much increase in CRP areas or small grains, simply by properly managing existing CRP acres and lands adjacent to CRP acres.

| Production Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Relative Nest Success | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.032 | 0.200 | 0.360 | 0.407 |
| Weighted Nest Success | 0.007 | 0.209 | 0.204 | 0.580 |

| Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Distributed 91-00 Harvest | 417 | 11,856 | 11,596 | 32,976 |
| Pre-hunt Population | 1,235 | 35,128 | 34,357 | 97,708 |
| Acres/Harvested Bird | 180.10 | 39.15 | 72.04 | 28.59 |

| Habitat Variable | Habitat Types | | | | Predicted Harvest |
|---|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP | |
| 2010 USDA/NASS Habitat Data | 49,200 | 193,400 | 735,800 | 927,929 | 47,863 |
| Increased CRP (347,000 ac) | 49,200 | 193,400 | 735,800 | 1,274,292 | 60,001 |
| Increased Sm Grains (476,000 ac) | 49,200 | 669,400 | 735,800 | 927,929 | 60,020 |

## WISCONSIN

The southern third of Wisconsin is home to wild pheasant populations south of a line stretching from Sheboygan County west to St. Croix County. Wisconsin's harvest figures date back more than 70 years to 1932. Over this time span harvest has varied widely from a low of 40,450 in 1932 shortly after the state's pheasant stocking program began in the state to upwards of 802,000 in 1942 around the time pheasant populations peaked in the state, with the peak harvests occurring in the late 1940s. Pheasant harvests have fluctuated greatly over the years, but often hovered around 500,000 pheasants into the late 1970s. Harvests tended to decline with intensified agriculture from the 1980s and the loss of valuable habitat types, but slightly rebounded to more than 300,000 harvested in the mid-1990s coinciding with the CRP program.

In the early 1930s, Aldo Leopold realized the inherent dangers in depleting the landscape of its resources, and began formulating a new train of thought in resource management. Included in this framework were implications for "stocking" wildlife populations on the landscape. In response to the demands of the time, the Wisconsin DNR created the Experimental State Game and Fur Farm in 1928. Over the next couple decades, and in response to the popularity of pheasant hunting, the Department expanded its pheasant rearing program, ultimately discontinuing propagation of all other species. In 1928, 14,000 pheasants were released, increasing to more than 180,000 in 1939. Pheasants rearing peaked at over 270,000 birds in the late 1950s. By the 1980s, in response to research indicating that adding pen-reared birds to the landscape did not have significant results for establishing new populations or contributing to wild population, the focus of the State Game Farm had largely shifted from one of population establishment to one of providing short-term hunting opportunities during the hunting season. Today, the Department produces between 70,000 and 90,000 pheasants annually. It is estimated, based on harvest estimates and stocking numbers that stocked pheasants account for 21.5% of the reported harvest and wild pheasants account for 78.5%.

Using the 10-yr period from 1997-06 as representative of "normal/modern" landscape conditions and harvests, and given current landscape conditions and farming practices, Wisconsin considers a harvest goal of 190,000 wild pheasants as a realistic target. Ultimately, this goal may prove to be too high given the significant recent losses, and therefore contribution to pheasant habitat, of CRP acres in Wisconsin. Using the habitat and harvest model calculations, Wisconsin would need to increase CRP acreage by 198,000 acres, or increase small grain acres by 403,000 acres, or any combination of habitat types to achieve the harvest goal of 190,000 wild pheasant roosters.

| Production Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Relative Nest Success | 0.170 | 0.310 | 0.170 | 0.630 |
| Relative Habitat Availability | 0.527 | 0.150 | 0.068 | 0.256 |
| Weighted Nest Success | 0.290 | 0.150 | 0.037 | 0.523 |

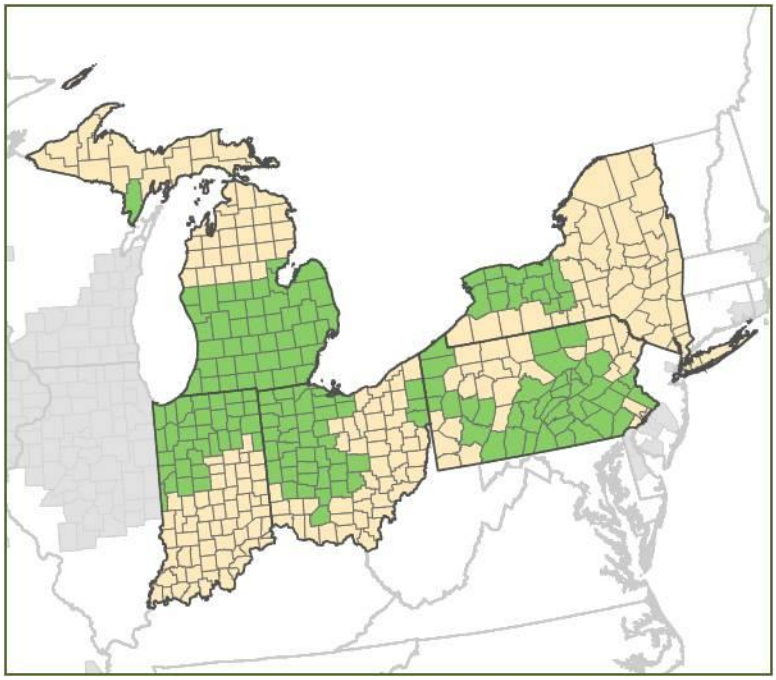
| Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Distributed 97-06 Harvest | 55,335 | 28,652 | 7,123 | 99,762 |
| Pre-hunt Population | 175,667 | 90,960 | 22,612 | 316,704 |
| Acres/Harvested Bird | 23.12 | 12.68 | 23.12 | 6.24 |

| Habitat Variable | Habitat Types | | | | Predicted Harvest |
|---|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP | |
| 2008 USDA/NASS Habitat Data[a] | 887,000 | 446,800 | 378,000 | 426,400 | 158,283 |
| Increased CRP (198,000 ac) | 887,000 | 446,800 | 378,000 | 624,400 | 190,016 |
| Increase Sm. Grains (202,000 ac) | 887,000 | 849,800 | 378,000 | 426,400 | 190,064 |

[a] Wisconsin used the 2008 USDA/NASS data as the 2010 data was incomplete.

## *MANAGEMENT REGION 5*

### *INDIANA, MICHIGAN, NEW YORK, OHIO, PENNSYLVANIA*



The Great Lakes Region (Mgmt Region 5) is made up of Indiana, Michigan, New York, Ohio, and Pennsylvania. This region, extending from Lake Michigan to the Atlantic Ocean, is broken by the Appalachian Mountains and the eastern Continental Divide, with the Ohio River watershed to the west and the Chesapeake and St. Lawrence watersheds to the east. In Presettlement, most of this region was forested, with the western third covered by Tallgrass prairie. Most of the forested land was cleared of timber during settlement, and agriculture was established on the fertile lands of the tall grass prairie, and on the now treeless, previously glaciated portions of the region, north and west of the Appalachian Mountains and on the Piedmont to the east. The agricultural land of this region, much of it cultivated by the Amish, was always diverse, from orchards and vineyards to dairies to wheat and corn.

First introduced to the region in early 1900s, pheasants populations took hold across the region, particularly in the former Tallgrass Prairie, the Great Lakes Basin, and the Piedmont. Populations across the region peaked between 1940 and 1970. In the late 1970s, several severe winters decimated pheasant populations across the region, but populations began recovering in portions of the region with the inception of the Conservation Reserve Program (CRP). However, over the past decade, populations have again declined with most harvest estimates in the region currently at or near record lows.

#### *CHALLENGES*

The Great Lakes Region faces many challenges in restoring pheasant populations for maximum recreation opportunity. These challenges include the decline in agricultural diversity, the conversion of grass and scrubland habitat to cropland, the development of "clean" farming practices, urban/suburban sprawl, reforestation, and severe winter weather. These factors have all played a role in reducing wild pheasant populations in this region. Though severe weather cannot be con-

trolled, establishing quality winter cover will help in survival. Other factors like reforestation and urban and suburban sprawl may seen as impossible to control as the weather and though most acres that have fallen victim to these factors cannot be reclaimed, programs that permanently set aside land for conservation with management required or even keep acres in cropland can slow or halt some of this loss.

The challenges that are most controllable in this region are the decline in agricultural diversity, the conversion of grass and scrubland habitat to cropland, and the development of "clean" farming practices. The high commodity prices of corn and soybean, stemming from renewable fuel standards, have caused a significant decline in the diversity of agricultural products across the region. In the western portion of the region, wheat and other cash grains in the pheasant region have declined by 20% over the last decade. In the eastern portion of the region, grass hay, essentially the most important nesting habitat in this portion of the region, is in decline, replaced by cropland or alfalfa, which is cut too early for successful pheasant nesting.

### *OPPORTUNITIES*

Pheasant hunters do spend some money pursuing pheasants in the Great Lakes Region. During the period of 2006-2009, an average of 141,000 resident and non-resident hunters took 560,000 trips and bagged 164,000 wild roosters annually (Table 5.1). Hunters spent on average $339 for every bird harvested, or $55.6 million annually in expenditures while hunting pheasants. The economics of this species in the region must be taken into account when resources are distributed for management of habitat planning.

Cock pheasant in NE Indiana /J. Maxwell, Indiana DNR

The CRP program in western portions of the Great Lakes Region is essential to producing pheasants, but rental rates in the east have been too low to entice landowners to participate. With high commodity prices, keeping and managing CRP acres is more important than ever. To keep CRP grasslands beneficial to pheasants, mid-contract management must be completed every 2-3 years. Every effort must be made to build cooperation between state agencies, the USDA, and organizations like Pheasants Forever to convince landowners that setting land aside and making it pheasant friendly is worth doing. This primarily means getting incentive rates to a level that is desirable or creating other conservation programs that quality pheasant habitat. In the East, promotion of grass hay and later cutting periods could have significant positive effects on nest success. Michigan and Pennsylvania have put forth bold efforts to restore pheasant populations including translocation and dramatic incentives.

Other opportunities exist to plant cover crops to prevent runoff and erosion and to plant cellulosic crops such as switchgrass to replace corn in ethanol production or even for use at power station as a replacement to coal. These biomass crops, depending upon harvest regimes and management, would have potential as pheasant habitat.

Table 5.1. Mean number of pheasant hunters, days hunted, trips, birds/hunter, harvest, expenditures, and estimated cost per bird harvested based on hunter and harvest data within the Great lakes region from 2006 - 2009. Calculated by multiplying average cost of an upland hunting trip in ND, SD, NE, KS, IA, and MN by the number of pheasant hunting trips in each state based on 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

| State | Hunters | Days Hunted | Trips | Birds/ Hunter | Harvest | Expenditures[a] | $/Bird Harvest |
|---|---|---|---|---|---|---|---|
| **IN[b]** | 11,200 | 1.93 | 21,663 | 0.67 | 7,493 | $1,119,061 | $149 |
| **MI** | 61,005 | 3.42 | 208,849 | 1.32 | 80,288 | $37,409,125 | $466 |
| **NY[d]** | 10,954 | 3.74 | 40,954 | 1.69 | 18,517 | 2,115,565 | $114 |
| **OH[c]** | 57,746 | 5.00 | 288,730 | 1.00 | 57,668 | $14,915,792 | $259 |
| **PA** | | | | | | | |
| **Sum/*Mean*** | **140,905** | ***3.98*** | **560,195** | ***1.16*** | **163,965** | **$55,559,542** | ***$339*** |

[a] All hunter expenditures calculated as residents
[b] 2008 data only
[c] 2009 data only
[d] Based on pheasant hunting zone A of western NY. An estimated 60% of the hunters and harvest involved wild pheasants so hunter and harvest values were reduced by 40%.

### *REGIONAL GOALS*

The Great Lakes Region has a pheasant harvest goal of 408,750 roosters (Table 5.2). Using the habitat calculation work sheets and 2010 NASS data, an additional 759,750 acres of CRP or 1,281,600 acres of small grains is needed within the region to achieve the harvest goal. In the eastern portion of the Great Lakes Region, Grass hay acres appear to be more important than small grains or CRP acres due their abundance and decent nest success. In New York and Pennsylvania, a combined 445,000 acres of grass hay could be added to achieve their harvest goals. Increasing the pheasant harvest to 308,750 would increase pheasant hunting expenditures within the region by almost 28%. Conversely, if the habitat provided by the CRP were eliminated the expected pheasant harvest would be reduced to 226,460 or nearly 92,000 less than expected with 2010 CRP acreage. At $339 per bird harvested (Table 5.1), $31,022,000 in pheasant hunting related expenditures could be lost annually if the CRP were eliminated.

Table 5.2. The 2010 habitat data for Great Lakes Region, with predicted pheasant harvest, harvest goals, and additional habitat needed to achieve goals.

| | 2010 NASS/FSA Habitat Data (Ac) | | | | Predicted | State RPHE | Additional CRP | Additional Sm. Grain |
|---|---|---|---|---|---|---|---|---|
| State | Alfalfa Hay | Small Grains | Grass Hay | CRP | RPHE Harvest Goal | Harvest Goal | Habitat Needed to Attain Harvest Goal | Habitat needed to attain Harvest Goal |
| IN | 145,000 | 87,300 | 41,700 | 148,200 | 17,653 | 30,000 | 176,000 | 241,000 |
| MI | 530,500 | 500,100 | 90,000 | 217,435 | 122,476 | 150,000 | 158,000 | 217,000 |
| NY | 119,500 | 104,000 | 110,900 | 11,000 | 7,317 | 8,750 | 31,250 | 63,500 |
| OH | 116,020 | 627,000 | 73,900 | 216,382 | 93,217 | 120,000 | 207,500 | 284,100 |
| PA | 381,800 | 237,400 | 663,400 | 158,713 | 76,810 | 100,000 | 187,000 | 476,000 |
| Total | | | | | 317,473 | 408,750 | 759,750 | 1,281,600 |

## INDIANA

Of the nearly 23 million acres that make up the state of Indiana, 14.8 million acres are farmland, with 76% of this land planted to either corn or soybeans. The 32 northern Indiana counties that make up the pheasant range contain nearly 44% of the state's farmland, and over 78% of that farmland is annually covered with corn or soybeans. Understandably, corn was the leading source of income for Indiana farmers in 2010, while soybeans were second. Meat animals were third, followed by Poultry/Eggs, and Dairy. These five commodity groups accounted for nearly 95 percent of the 2010 cash receipts.

Within the 32 pheasant range counties as of 2010, pheasant nesting habitat encompasses just over 420,000 acres. However, this habitat is 19% less than the available habitat in 2000, and 48% less than that of 1990, with small grain habitat having the steepest decline, down 69% in the past 20 years. Though not as steeply declining as small grains, but likely more critical, CRP acreage is being lost at a significantly increasing rate. To reverse these trends, increased small grain commodity prices and significantly higher incentive payments are needed, respectively.

Indiana has never been able to support the large pheasant populations found in neighboring states. In the past 70 years, Indiana has recorded harvests of over 100,000 birds only 10 times, with a peak harvest of nearly 220,000 birds in 1940. Current harvest numbers are between 15,000 and 19,000 wild pheasant roosters annually.

Indiana used the 10-yr period from 1991 to 2000 as representative of "normal/modern" landscape conditions and harvests. Habitat values averaged 625,255 acres, harvest averaged 28,082 roosters, and weather conditions were balanced over the time period. Using the habitat models acres per harvested bird, Indiana believes a harvest goal of 30,000 roosters is a realistic target given current landscape conditions and farming practices.

Using the habitat and harvest model calculations, Indiana would need to increase CRP acreage by 176,000 acres (119%) or increase small grain acreage by 241,000 acres (276%), or any combination of both CRP and small grain acreage to achieve the harvest goal of 30,000 wild roosters.

| Production Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Relative Nest Success | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.264 | 0.335 | 0.079 | 0.322 |
| Weighted Nest Success | 0.065 | 0.382 | 0.049 | 0.503 |

| Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Distributed 91-00 Harvest | 1,839 | 10,728 | 1,378 | 14,137 |
| Pre-hunt Population | 5,448 | 31,787 | 4,084 | 41,888 |
| Acres/Harvested Bird | 89.76 | 19.51 | 35.90 | 14.25 |

| Habitat Variable | Habitat Types | | | | Predicted Harvest |
|---|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP | |
| 2010 USDA/NASS Habitat Data | 145,000 | 87,300 | 41,700 | 148,200 | 17,653 |
| Increased Sm. Grains (241,000 ac) | 145,000 | 328,300 | 41,700 | 148,200 | 30,004 |
| Increased CRP (176,000 ac) | 145,000 | 87,300 | 41,700 | 324,200 | 30,006 |

## MICHIGAN

Pheasants were introduced from China in 1895. Since 1900, pheasant populations have fluctuated based on habitat availability and winter conditions. Much of the farmland in the 1940's and 1950's provided outstanding pheasant habitat. At that time, farms had small fields from 10 to 20 acres in size surrounded by brushy fencerows and diverse crop rotations. However, by the 1960's farming activities began to change and pheasant populations began to decline. The number of farms fell from 190,000 in 1940 to less than 60,000 by 1990. The amount of land farmed also decreased from more than 18 million acres in 1940 to less than 11 million acres in 1990. Increased urbanization, natural succession, the gradual conversion of grasslands to forest, and intensified agriculture practices across southern Michigan have all played a role in the decline of pheasants in this state.

Michigan has continuous harvest figures beginning in 1937 and population monitoring surveys dating back to 1946. The first pheasant hunting season occurred in 1925. Hunters once harvested over 1M birds annually. By 1986, pheasant kill had dropped to 84,000 roosters. Harvest rebounded after the CRP began in 1985 and exceeded 150,000 birds annually through most of the 1990's. Pheasant harvest has had a precipitous decline since 2000 (130,000 wild roosters harvested) with 2010 being the lowest harvest on record (36,000 birds). In 2010, the Michigan Pheasant Restoration Initiative was established to restore and enhance Michigan pheasant habitat, populations and hunting opportunity. Currently, the core pheasant range of Michigan includes 43 counties in the southern 1/3 of Michigan.

Michigan used the 10-year period from1990-1999 as representative of "normal/modern" landscape conditions and harvests. Habitat values averaged 1.5 M acres, harvest averaged 157,000 birds and there was a range of weather conditions during this period including 2 severe winters (1996 and 1997) with resulting low pheasant populations and 2 mild winters (1993 and 1999) with resulting higher pheasant population responses. Using the habitat model's acres per harvested bird, Michigan believes a harvest target of 150,000 roosters is a realistic goal given current landscape conditions and farming practices. The harvest goal, 150,000 birds/year, is based on goals of the Michigan Pheasant Restoration Initiative with baseline monitoring results of 1.5 broods/mail-carrier day in the summer mail-carrier brood survey.

Using the habitat and harvest model calculations, Michigan would need to increase CRP/conservation acreage by 158,000 acres (73%) or increase small grain acreage by 217,000 acres (43%) or some combination of both small grain and CRP/conservation acreage to achieve a wild rooster harvest of 150,000 birds.

| Production Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Relative Nest Success | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.409 | 0.374 | 0.069 | 0.148 |
| Weighted Nest Success | 0.126 | 0.532 | 0.053 | 0.288 |

| Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Distributed 90-99 Harvest | 19,833 | 83,585 | 8,373 | 45,250 |
| Pre-Hunt Population | 58,763 | 247,659 | 24,810 | 134,075 |
| Acres/Harvested Bird | 36.14 | 7.86 | 14.45 | 5.74 |

| Habitat Variable | Habitat Types | | | | Predicted |
|---|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP | Harvest |
| 2010 USDA/NASS Habitat Data | 530,500 | 500,100 | 90,000 | 217,435 | 122,476 |
| Increased CRP (158,000 ac) | 530,500 | 500,100 | 90,000 | 375,435 | 150,022 |
| Increased Sm Grains (217,000 ac) | 530,500 | 717,100 | 90,000 | 217,435 | 150,099 |

## NEW YORK

The ring-necked pheasant population in New York remains at an all-time low after reaching its peak in the late 1960s. The major surveying tool of the pheasant population is the Department's Farmer Pheasant Inventory which began in 1945 and continues today. Each spring and summer, farmers in the Lakes Plain of western New York are asked to observe pheasants on their farms. The data is collected and summarized in an annual report. A look at the pheasant broods per observer index data show a decline from 3.0 broods per observer in 1969 to 0.19 broods per observer in 2010, over a 90% decline.

More recent NYS Breeding Bird Atlas data indicates a 77% decline in the number of confirmed pheasant breeding blocks from 1980-85 to 2000-05. For the period 1980-07, the USGS North American Breeding Bird Survey showed a 4.5% decline in pheasants per year. Pheasant abundance is linked to federal farm programs that set-aside large acreage of fallow grasslands. Since the Soil Bank Program set-aside 333,000 acres in 1968 in the Great Lakes Plain of western New York, no other farm program has benefitted pheasants here. In addition, reversion to a forested landscape, changing farming practices, and urbanization have reduced the quantity and quality of pheasant habitat.

The best pheasant range in the Lake Plains of western NY allows cock-only harvest to protect hens, while marginal habitat allows the taking of hens and cocks (the vast majority of which are captive-bred birds). The bag limit is two birds, except for Long Island where the bag is four birds. The season is shorter in the best pheasant range in the Lake Plains of western New York and longer elsewhere to encourage the harvest of released pheasants that generally do not survive to breed and produce offspring. Pheasant harvest strategies are based on production of about 90,000 pheasants annually (30,000 adult birds released by DEC; 60,000 day-old chicks raised and released by cooperators) by the state-owned and operated game farm and on available pheasant range. DEC's Small Game Hunter Survey for 2010-2011 indicated that about 18,000 hunters harvested roughly 43,000 pheasants, of which, an estimated 7,600 wild pheasants were harvested in western New York.

Our harvest goal is to maintain a harvest of 8,500 - 9,000 wild roosters. To achieve this goal, an independent increase of 26,000-36,500 (234-329%) conservation cover acres or 37,000-52,500 (33-47%) grass hay acres or 52,000-72,500 (50-72%) winter wheat acres would be needed, or some combination of all three habitats.

| Production Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | Cons. Land |
| Relative Nest Success | 0.100 | 0.308 | 0.440 | 0.630 |
| Relative Habitat Availability | 0.340 | 0.268 | 0.360 | 0.032 |
| Weighted Nest Success | 0.115 | 0.280 | 0.537 | 0.068 |

| Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | Cons. Land |
| Distributed 01-10 Harvest | 876 | 2,125 | 4,071 | 513 |
| Pre-Hunt Population | 5,346 | 12,976 | 24,855 | 3,129 |
| Acres/Harvested Bird | 136.34 | 44.27 | 30.99 | 21.64 |

| Habitat Variable | Habitat Types | | | | Predicted Harvest |
|---|---|---|---|---|---|
| | Alfalfa | Sm. Grains | Grass Hay | Cons. Land | |
| 2010 USDA/NASS Habitat Data | 119,500 | 104,000 | 110,900 | 11,000 | 7,317 |
| Increase Con. Land (26-36.5ac*) | 119,500 | 104,000 | 110,900 | 37,092-47,592 | 8,519-9,004 |
| Increase Grass Hay (37-52.5ac*) | 119,500 | 104,000 | 147,900-163,400 | 11,000 | 8,511-9,011 |
| Increase Sm. Grain (52.5-74.5ac*) | 120,000 | 156,500-178,500 | 110,900 | 11,000 | 8,503-9,000 |

* in Thousands

## OHIO

Currently, pheasants occur in 39 of the 88 counties in Ohio. Pheasant harvest has been monitored since the 1950's through contacts made in the field between wildlife officers and sportsmen. In the 1950's annuals harvest were averaging around 750,000 cock pheasants. By the late 1960s, Ohio's pheasant harvest declined to 100,000 to 300,000 cock birds annually. Hunter success rates have paralleled total harvest and reached all-time lows in the mid-1980s. These lows followed severe winters throughout the Midwest in 1978. However, success rates appear to have stabilized since the inception of the CRP. Survey results for 2004-05 indicate approximately 150,000 wild pheasants are harvested in Ohio. Currently, populations have again declined, approximately 60,000 cock pheasants are harvested annually in Ohio.

Ohio used the 10-year period of 1992-2001 as representative of the "normal/modern" landscape conditions and harvest. During this time period there was an average of 1,392,800 acres of habitat and 119,834 cock pheasants harvested. Ohio harvest goal is set at 120,000 cock pheasants harvest annually.

Using the habitat harvest model, Ohio would need to increase CRP acreage by 207,500 acres (96%) or increase small grain acreage by 284,100 acres (45%) or some combination of these habitats to achieve the harvest goals of 120,000 cock pheasants.

| Production Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Relative Nest Success | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.062 | 0.593 | 0.202 | 0.143 |
| Weighted Nest Success | 0.015 | 0.650 | 0.120 | 0.215 |

| Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Distributed 90-99 Harvest | 1,761 | 77,890 | 14,401 | 25,783 |
| Pre-Hunt Population | 5,216 | 230,786 | 42,668 | 76,394 |
| Acres/Harvested Bird | 48.79 | 10.61 | 19.52 | 7.74 |

| Habitat Variable | Habitat Types | | | | Predicted |
|---|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP | Harvest |
| 2010 USDA/NASS Habitat Data | 116,020 | 627,000 | 73,900 | 216,382 | 93,217 |
| Increased CRP (207,500 ac) | 116,020 | 627,000 | 73,900 | 423,882 | 120,009 |
| Increased Sm. Grains (284,100 ac) | 116,020 | 911,100 | 73,900 | 216,382 | 120,001 |

## PENNSYLVANIA

From 1970 to 1980, we estimated that the annual pheasant harvest was 80-85% wild pheasants statewide and 95% in primary pheasant range. The wild cock harvest exceeded 500,000 annually. The objective of the PA Pheasant Management Plan 2008-2017 is to increase the reported harvest of 43,000 wild pheasants in 2010 to a total harvest of 100,000 annually. This is to be achieved by increasing wild pheasant populations thru habitat improvement, trap and transfer of wild pheasants and elimination of releasing pen-reared pheasants in Wild Pheasant Areas. The true current estimated harvest of wild cock pheasants in 2010 was 18,000 cock birds out of a total reported harvest of 90,000 cock birds. This estimate is based on the estimated number of pen reared birds released by the PGC and private sector in 2010; 180,000 cock birds and 75,000 hens. Based on research conducted in 1998, we estimated the harvest rates of pen-reared pheasants, we estimated at 40%. for 2010, this results in a harvest of 72,000 pen-reared cocks from our estimated total harvest 90,000 cock pheasants from the Game Take Survey. Thus, we estimated that 20% of the harvest was wild pheasants in 2010, compared to 85% from 1970 to 1980 and 45% from 1990 to 1999. The 10 year average cock harvest from 1990 to 1999 was estimated at 88,000 wild birds, out of the total pheasant harvest of 192,000. At an estimated harvest of 45% wild birds and 55% pen reared birds, the model predicts a harvest of 86,524 wild cock pheasants. This is very close to the 88,000 reported harvest. When we apply this same model to 2010 data it estimates a harvest of 76,810 wild cock pheasants under existing habitat conditions in PA, which we believe is an over-estimate of the current wild pheasant harvest, but will be used for the purpose of this habitat model.

We assume that secure nesting cover is the limiting factor to pheasant abundance in PA. However, The habitat model shows that increasing nesting cover will have only a small effect on abundance of wild pheasants in PA. In states with large amounts of grass cover (Hay, small grains) in an otherwise cropland landscape (most Dairy states); grass cover for nesting may not be the main limiting factor to pheasant abundance; Hen survival may instead be the limiting factor. More research and monitoring will be necessary to determine the future of pheasants in the states with diverse landscapes that release large numbers of pen-reared pheasants.

Pennsylvania has a harvest goal of 100,000 wild pheasants from Wild Pheasant Areas. Based on the model estimates, we would need to add 476,000 acres of small grains (200%), or 187,000 acres of CRP (118%), or 408,000 acres of grass hay (62%), or some combination these habitats to achieve the harvest goal.

| Production Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Relative Nest Success | 0.100 | 0.240 | 0.280 | 0.610 |
| Relative Habitat Availability | 0.323 | 0.214 | 0.424 | 0.039 |
| Weighted Nest Success | 0.143 | 0.227 | 0.525 | 0.104 |

| Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Alfalfa Hay | Sm. Grains | Grass Hay | CRP |
| Distributed 90-99 Harvest | 27,520 | 43,735 | 100,992 | 20,028 |
| Pre-Hunt Population | 68,799 | 109,339 | 252,479 | 50,070 |
| Acres/Harvested Bird | 22.13 | 9.22 | 7.90 | 3.63 |

| Habitat Variable | Habitat Types | | | | Predicted Harvest |
|---|---|---|---|---|---|
| | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2010 USDA/NASS Habitat Data | 381,800 | 237,400 | 663,400 | 158,713 | 76,810 |
| Increased Sm. Grains (476,000 ac) | 381,800 | 713,400 | 663,400 | 158,713 | 100,041 |
| Increased CRP (187,000 ac) | 381,800 | 237,400 | 663,400 | 345,713 | 100,006 |
| Increased Grass Hay (408,000 ac) | 381,800 | 237,400 | 1,071,400 | 158,713 | 100,041 |

## *AFFILIATE STATES*

### *ARIZONA, DELAWARE, NEVADA, NEW JERSEY, RHODE ISLAND, WEST VIRGINIA*

Affiliate States are those states not designated to a specific region because they are partial participants in the National Wild Pheasant Conservation Plan or have such limited pheasant populations that habitat calculations are not feasible and/or standard BMPs typically do not apply. Each Affiliate state has provided a short synopsis of pheasant management in their respective state.

## ARIZONA

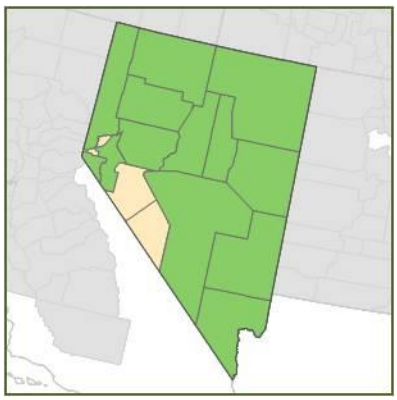
Many pheasant transplant efforts occurred in Arizona over the years with limited success. The Yuma Valley area is seen as our only population that maintains itself through natural reproduction. Pheasants are present along the Gila and Verde Rivers, but these sightings are likely due to stocked birds that have escaped from pheasant hunting clubs in close proximity. Arizona has not stocked or transplanted birds in the past few decades.

Arizona currently provides 4 different types of pheasant hunts: Juniors Only shotgun, General shotgun, Archery Only, and Falconry Only. The Junior's Only and General seasons are available by permit only through a draw process. These are 3-day long seasons with a limit of 2 pheasants (either sex) per hunter. There is only one hunt provided for the Juniors Only season and 4 different draw hunts for the General season; all of these take place in the Yuma Valley (Game Management Unit 40B). The Archery Only and Falconry Only seasons occur simultaneously and are 129 days in length (2011-12 hunt structure). These hunters are allowed to hunt pheasants (either sex) with a valid hunting license in open areas statewide with a daily bag limit of 2 birds and a possession limit of 4 (of which no more that 2 may be taken in any one day).

## DELAWARE

Despite efforts in the early 1900s to introduce ring-necked pheasants into Delaware, formal observations of pheasants in the wild were not reported until 1940. The pheasant population peaked in Delaware in the 1960s. Agency stocking efforts ceased in 1975. An attempt to establish green pheasants was made between 1973 and 1980 but despite releasing 2,014 birds this effort failed. While pheasants may still be found in all three counties, it is unknown if these are wild birds or pen-raised birds released by private individuals/entities. BBS data indicate that pheasants have declined in Delaware an average of 7.6% a year from 1966-2009. A recent hunter harvest survey attempted to partition out harvest among wild and pen-raised birds. It is estimated that nearly 68% of our pheasant hunters are pursuing pen-raised birds and 91% of our estimated pheasant harvest is comprised of pen-raised birds. Habitat loss associated with increased residential/suburban development and agricultural pressure are the primary factors believed to be responsible to the population decline. However, declining hunter numbers that previous drove much of the private stocking efforts and habitat management for pheasant on private lands has also exacerbated their decline in Delaware.

## NEVADA



For a time, pheasants were one of the most popular game birds in Nevada. However, due to limited habitat availability, the cost of maintaining the "put and take" program, contemporary and efficient agricultural practices and lack of sportsmen's' access to private lands, the overall abundance and popularity of the species has decreased over time. The evolution of pheasant management in Nevada has gone through four distinct phases.

The first phase of pheasant management in Nevada involved the introduction of the species, for which there is little definitive information. A 1917-1918 biennial report of the State Fish and Game Warden mentions that "ring-necked pheasants are doing remarkably well in all parts of the State where propagated and are increasing at a wonderful rate". Prior biennial reports dating back to 1879 made no mention of pheasants or their release. It is likely that pheasant introductions were first made by interested private individuals (Christensen 1962). The second phase (1927-1945) saw the Nevada Fish and Game Commission focus on purchasing pheasants from a private breeder for release into all areas of the state. In addition to the Commission's efforts, the individual counties (which controlled a share of the hunting and fishing license funds at that time) also participated in releases. During this period, approximately 31,000 pheasants were released. The decision by the Commission to build a game farm in Verdi, Nevada constituted the third phase of the pheasant management program. From 1946 until 1951 about 68,000 pheasants were raised at the game farm and subsequently released. After an evaluation study, the Commission discontinued the pheasant release program in 1952. Under pressure from the Nevada Federated Sportsmen in 1957, the Commission instituted a "release before the gun" program in 1958 (phase four). This program was essentially maintained until 1974 when it was determined that the program was cost prohibitive. Additionally, "clean" farming practices removed protective cover and effectively reduced the carrying capacity of private agricultural lands for pheasants.

Hunter harvest information derived from the 10% hunter harvest questionnaire shows an average harvest of approximately 13,000 pheasants annually during the 1960s. In contrast, during the last two decades the annual pheasant harvest has averaged around 1,000 birds.

Nevada continues to hold a pheasant season annually although no releases have been conducted by the Nevada Department of Wildlife since 1974. The season generally begins in early November and concludes in early December. Limits are two daily and four in possession and only cocks may be harvested. The pheasant season is open statewide to both residents and nonresidents.

Nevada's management goals are to provide for a limited, self-sustaining population of pheasants in suitable agricultural lands and lowland riparian habitats, manage a portion of agricultural lands in appropriate areas to meet the needs of pheasants for cover, food and water, and provide sportsmen with information regarding the distribution of the species in Nevada.

## NEW JERSEY

Although the state annually stocks 55,000 pheasant from the state-owned Rockport Game Farm to select wildlife management areas and lists its annual harvest around 200,000 birds, it is believed that approximately only 5000 – 7000 wild pheasants are harvested annually. These birds are primarily found along the Delaware River and south of Trenton, with additional remnant populations in the meadowlands area of northeast New Jersey.

## RHODE ISLAND

In Rhode Island, "wild" pheasant populations are known to exist today only in the town of New Shoreham (Block Island) 10 miles off the RI coast in the Atlantic Ocean. The island is characterized by dense coastal shrub scrub habitats and extensive grasslands and meadows, much of it ideal pheasant habitat. Other than house cats, there are no native mammalian predators on the island. Total area of the island is 10 square miles. The hunting season on the island is very short (10 days per year) and due to the inaccessibility of the island, hunting pressure is probably low, although no hard numbers on take exists. Mainland Rhode Island did have wild pheasants in abundance at one time in the coastal communities of the state; however, these disappeared completely over 25 years ago and are no longer present. Today, Rhode Island annually stocks 4000 game farm raised pheasants onto state owned public hunting areas, maintaining the tradition of pheasant hunting in the state.

## WEST VIRGINIA

West Virginia is home to a very limited number of wild pheasants. Their range is primarily limited to the northern panhandle, bordered by Pennsylvania to the east and Ohio to the west. Hillcrest Wildlife Management Area, owned and managed by the West Virginia Division of Natural Resources, in Hancock County is primarily managed specifically for pheasants and offers West Virginia hunters a unique opportunity at this game bird. Wild pheasants are rarely observed in other areas of the state due to West Virginia's topography and habitat types. West Virginia is nearly 80% forested and has a very steep terrain across most of state.

### *MANAGEMENT REGION SUMMARY AND OVERALL HABITAT OBJECTIVES*

Across the pheasant range, states vary from merely maintaining or enhancing ring-necked pheasant populations to achieve their harvest goals to those desperate to halt plummeting pheasant numbers. This can create a dilemma, as some believe a national conservation plan for a naturalized species is unwarranted; particularly when the population is not is serious decline in a large portion of its range. Achieving the range-wide harvest goals of 5.9 million roosters could return an estimated economic boost of $93.7 million annually. However, the agricultural landscape continues to change rapidly, particularly with the impending loss of Conservation Reserve Program (CRP) acres over the next few years. CRP is a cost-effective federal program in providing habitat for ground-nesting birds.

In 2010, acres set aside through the CRP made up only 20% of the available pheasant habitat across twenty states within the pheasant range. However, these 18.5 million CRP acres produced enough pheasants to account for 58% of the pheasant harvest, almost 2.9 million roosters, in these twenty states. Without CRP and other conservation programs, some states may completely lose their already small pheasant populations, while states that depend on the economic benefits of pheasant hunting will face significant financial woes. A complete loss of CRP acres within twenty states in the pheasant range would create an annual economic loss of $194.8 million. The economic impact of this species, as stated in the introduction, cannot be overlooked when promoting the objectives of this conservation plan.

Habitat Actions to attain a range-wide harvest goal of 5.9 million roosters [20 states with data]:

- Add 13 million CRP or other conservation acres to the 2010 CRP acreage total within the pheasant range (20 states), having no less than 40 million acres nationwide.
- Revitalize the Conservation Reserve Program with greater allocations, stronger promotion and increased incentives.
- Promote an enhancement program for CRP which implements pheasant-friendly practices to enhance the conservation value.
- Promote active grassland management (cool season, warm season, hay lands, savanna, etc) to maintain and/or increase pheasant habitat.
- Promote increased small grain production.
- Promote no-till agriculture.
- Promote late mowing of both cool-season and warm-season grass hay.
- Increase prescribed fire use on private land.
- Implement pheasant-friendly grazing practices.

# PLAN IMPLEMENTATION OBJECTIVES

## PERSONNEL

*Objective:* Identify and hire a National Ring-necked Pheasant Conservation Coordinator.

*Justification*: This plan was initiated by the Midwest Pheasant Study Group in Nebraska in 2006 and approved by the MAFWA Directors in 2007. This plan was not completed until 2012, some 6 years later. The slow progress in plan development was simply due to the lack of time by individual state upland biologists to focus on the plan. For the plan to succeed, a full-time coordinator will be needed, as state pheasant biologists are stretched too thin with state responsibilities to effectively implement a national plan.

We strongly suggest the hiring of a plan coordinator and identification of a funding source should be the first action undertaken by this national plan. We further suggest the first two priorities of this coordinator be the establishment of a national pheasant management board and a national wild ring-necked pheasant technical committee, expanding the former Midwest Pheasant Study Group. This 3 pillar approach has been very successfully used by the National Bobwhite Conservation Initiative and would work equally as well for this plan.

Future Actions:

- Seek funding for and hire an individual for the position of plan coordinator.
- Establish and appoint a national pheasant management board (comprised of state level administrators and key partners to provide oversight and guidance).
- Establish a national ring-necked pheasant technical committee (representing the needs and objectives of all states and partners).

## POLICY

*Objective*: Influence national conservation, agricultural and energy policies, which are beneficial to ring-necked pheasant.

*Justification*: The ring-necked pheasant is a naturalized game bird of primarily agricultural landscapes. Given appropriate interspersion and management of agricultural and grassy habitat types, pheasants have demonstrated the ability to achieve high population levels from Pennsylvania to Oregon and from North Dakota to Texas. Preferred habitats include row crop/small grain agricultural practices interspersed with grassland/wetland habitats. It uses shrub/brush habitats, but generally avoids mature woodlands. Because of its affinity to agricultural lands and most agricultural lands are privately owned, pheasant populations

across their range are strongly influenced by federal policies impacting private agricultural lands.

The ring-necked pheasant is a state trust responsibility. Unlike migratory species, non-migratory game birds do not have the benefit of a federal government structure (Migratory Bird Treaty and USFWS) to coordinate conservation actions across state boundaries. The migratory bird program of the USFWS service has been very successful in protecting, prioritizing, and partnering with various state agencies and NGO's to the benefit of migratory birds species across their range (e.g, Joint Ventures, NAWMP, NAWCA, Flyway Councils). No similar structure exists with non-migratory state game birds. Agricultural land use is largely dictated by federal agricultural policy, not by state departments of agriculture. On an individual basis, states have limited ability to impact federal agricultural policy. Coupled with this is a lack of a unified message of what is needed (policy, programs, etc.) across the pheasant range to achieve desired population goals. At this point in time a national pheasant population goal cannot even be provided to federal policy makers. To be effective addressing the needs of pheasant on agricultural landscapes a structure similar to the USFWS migratory bird program is needed. A cohesive and coordinated plan is needed across the pheasant range to effectively influence federal policies for the benefit of the species.

Future Actions

- Influence national agricultural policy (e.g., program scope, availability, rule changes, etc.) to establish habitat on private lands through federal conservations and commodity programs to obtain a national pheasant harvest of 5.9 million roosters (20 participating states).
    - Support inclusion and implementation of a nationwide Sod-saver provision in the Farm Bill modeled on the provisions of the Senate floor-passed version of the Farm Bill passed December 14, 2007, N.R.2419, the Food and Energy Security Act of 2007.
    - Encourage regulations for participation in such programs as CRP that do not create an incentive to bring grasslands into crop production only long enough to meet cropping history eligibility.
    - Encourage an increase in the nationwide CRP acreage cap to 40 million acres in the Farm Bill.
    - Support re-coupling Federal Crop Insurance eligibility to conservation compliance.
- Provide recommendations on national energy and climate change policies that are beneficial to national pheasant goals and objectives.
- Identify economic incentives (income tax, community development, etc.) to promote pheasant populations.
- Identify funding sources for achieving state and/or regional objectives.

- Hire FSA/NRCS liaison.

## PARTNERSHIPS

*Objective:* Identify partners in government and non-government agencies, agriculture, economic, and conservation communities to help implement the plan.

*Justification:* Partnerships large and small create opportunity and often result in synergistic results in any endeavor. Never is this more apparent than in the realm of wildlife conservation. Partnerships have become the contemporary model for moving conservation efforts in a positive direction at local to national scales. As an example, this very plan is the collaborative work of multiple state agencies partnering in an effort to nationalize pheasant conservation efforts. There are multiple public and private parties critical to the implementation of this plan.

The technical committee will make contact and possibly partner with the below groups, organizations and agencies. Partnerships with these groups will be key to plan implementation and on the ground management actions to improve habitat for wild pheasants and other wildlife. Many of the below organizations have strong track records for insuring the conservation of wildlife through habitat management. Because pheasants inhabit agroecosystems, private landowner contact, buy-in, and incentive programs will be key to plan implementation. Most of the partners listed have strong ties to private lands, and many already have incentive programs in place. By working together these partners can move a national conservation effort forward successfully, one project at a time.

Future Actions:

- The technical committee will make contact and possibly partner with the below groups, organizations and agencies.
  - Governmental Agencies & Organizations

    State Wildlife Agencies
    Association of Fish and Wildlife Agencies
    US Dept of Agriculture
      - Natural Resource Conservation Service
      - Farm Service Agency
    US Fish & Wildlife Service
      - Joint Ventures
      - Landscape Conservation Cooperatives
    US Bureau of Land Management
    US Forest Service
    Northern Bobwhite Technical Committee

  - Non-Governmental Organizations

    American Bird Conservancy
    National Audubon Society
    National Shooting Sports Foundation
    National Wild Turkey Federation

North American Grouse Partnership
North American Versatile Hunting Dog Association
Partners in Flight
Pheasants Forever
Quail Forever
Quail & Upland Wildlife Federation
Quail & Upland Game Alliance
Ducks Unlimited
U.S. and State Sportsman's Alliances

- Private

  Landowners
  Universities

## EDUCATION

*Objective*: Educate stakeholders and the general public on pheasant ecology, management, and research, and the objectives of the National Wild Pheasant Conservation Plan.

*Justification*: Many national conservation plans have been written for numerous species, from those critically endangered to common game species. However, few people ever learn about these plans, and many of these plans have little effect on the species they were written for. So creating a national conservation plan for the ring-necked pheasant, an introduced, but naturalized species, may seem futile in its effort. However, the socio-economic importance of this species over much of its range, coupled with its precipitous decline in many parts of its range points to the critical need to have a cohesive and coordinated guide for conservation. Where our efforts must not fail is in the education of our stakeholders and the general public. This education must include the objectives of our plan, pheasant biology and habits, pheasant history, the tradition of pheasant hunting, the benefits of pheasant habitat to other species, to erosion prevention, to water quality, and to the pocket book. To achieve this in today's information-driven multi-media world, the technical committee will need to utilize the internet to its full extent, with its websites, email, blogs, videos, and social networks. From this media, partners can connect, events can be promoted, links can be created, and people can become educated. In addition to the internet, the national coordinator, along with state coordinators, will work to provide outreach at state and local levels, host hunter recruitment and retention events, speak to hunting and conservation groups, and work with state agencies, NRCS, FSA, and extension services to get out information on habitat programs. Finally, to enhance regional and range-wide coordination and provide current research and information to biologists, partners, and stakeholders, and to promote the benefits of the ring-necked pheasant, the technical committee will host an annual meeting.

Future Actions

- Promote the ring-necked pheasant and its national plan by establishing a dedicated website and creating social media pages.

- Host an annual National Ring-necked Pheasant Technical Committee meeting within the pheasant range that invites stakeholders from partner organizations, and has portions open to the general public.
- Establish an annual presence (National Coordinator and local state biologists) at the Pheasant Fest event.
- Create video promos for the website, social media pages, and outreach events.
- Hire an Education/Outreach Director, under the supervision of the National Coordinator.

## RESEARCH

*Objective:* Identify needed science-based research on pheasant biology and habitat needs.

*Justification*: In order to be effective in the long term, a management plan must adapt to new information and actively seek out such information. This adaptive management approach is the key to the long-term success of any management plan. Pheasants, along with many other species, will face unique challenges in the not-too-distant future resulting from climate change, alternative energy development, and habitat changes (*see Current Research Needs*). As new challenges emerge, they must be understood and addressed. To that end, a strong research agenda within the framework of the management plan is essential, as is a mechanism to periodically disseminate the findings of this research to the management community.

Future Actions

- Investigate establishing a funding mechanism to award grants to conduct research addressing priority information needs.
- Finalize information needs related to the impacts of climate change on pheasant populations (see Research Needs section for initial research questions).
- Finalize information needs related to alternative energy production and potential impacts (see Research Needs section for initial research questions related to biofuels and wind energy).
- Develop prioritized list of information needs related to population viability by habitat type and by the effects of various agricultural practices on pheasant populations.
- Solicit research projects related to the priority needs with funds available through state funding streams (e.g., Federal Aid), or other dedicated funding mechanism.

# CURRENT RESEARCH NEEDS

### *CLIMATE CHANGE*

Predicted changes to the global climate (IPCC 2007) will impact almost every corner of the globe and have consequences for ecological systems. In addition, climate change will increase the level of uncertainty attendant to most wildlife management decisions (Nichols et al. 2011). To be effective, comprehensive management and conservation plans must consider the potential effects climate change will impose on future management of the species or system. When such information is lacking, identifying and prioritizing information needs is essential. Below is a summary of some general impacts of climate change on resident, ground-nesting species. This will be followed by needed research to address gaps in this knowledge.

The effects of climate change will be most apparent in the shifts in species range. The effects of climate change on a species range can be direct (i.e., affecting the species itself) or indirect (i.e., affecting the species through changes in habitat or community interactions). Each species has a unique climate tolerance, being the combination of climate conditions within which a species presence on an otherwise suitable landscape is possible. Shifts in climate will result in changes in where such suitable climate spaces occur, resulting in shifts in species' range given the presence of suitable habitat. These changes will result from local extinctions along the range border as well as colonization of new areas as they become suitable. Because each species will respond to climate change in a unique manner, community composition will change, leading to novel and altered interactions among species. Occupancy within the new climate-suitable range will also be determined by the new competitive interactions within novel communities, as well as changes in the plant communities that provide necessary habitat.

At a species level, climate change effects will occur through changes in the timing of breeding. Extensive evidence exists showing that the spring phenology of many species of plants and animals have advanced in response to climate change (Root and Hughes 2005). As spring plant phenology advances, bird species must also advance their breeding phenology to take advantage of peaks in food availability (for hens leading up to breeding and for chicks after hatch) and suitable nesting cover (Visser et al. 2004). Although more of an issue for migratory birds, asynchronies such as these can reduce production for all avian species.

There are also direct impacts on individual birds that can result in population changes. For example, in some ground nesting species, increased temperatures has resulted in elevated ground temperatures that, in some cases has resulted in pre-mature incubation of eggs in nests. For species that lay large clutches, such premature incubation can result in hatching asynchrony and abandonment of later-laid eggs.

The pheasant is resilient enough to rebound from periodic weather catastrophes. However, climate change is expected to increase the frequency and severity of storm events across seasons (IPCC 2007). Such changes will likely have an impact of populations across the pheasant range. To date, no research has been conducted specifically related to the impacts of predicted climate changes on ring-necked pheasants. Although some impacts can be deduced from existing knowledge of pheasant biology and ecology, profitable areas of future research include:

1) Determining the suitable climate space for pheasants using data from across the pheasant range and techniques such as niche modeling.

2) Determining how pheasant populations will respond to changes in the frequency in severe weather events and how these responses are attenuated by habitat composition at a landscape level.

3) Determining how pheasant habitat will shift and change in response to climate change.

### *ALTERNATIVE ENERGY*

*Biofuels* - The use of fuels derived from plant biomass produce less carbon-dioxide emissions than fossil fuels and lessens US dependence on foreign sources of fuel. Currently, US law requires that biofuel production ramp up to 136 billion liters by 2022 (Sissine 2007). Currently, corn ethanol is the main form of biofuel, and as demand increases in order to meet mandated production targets, pressure to convert native grasslands to corn production will likely increase. For example, between 2005 and 2008, demand for land for corn for ethanol increased to 4.9 million hectares in the US (Fargione et al. 2009). Most of these hectares came from conversion of other crop types (including corn-soybean rotations) into continuous corn production, but some came from conversion of native prairie (Fargione et al. 2009).


NRCS Biologist in Switchgrass/J. Johnson, USDA-NRCS (Iowa)

Despite the environmental benefits of biofuels, conversion of land to corn production will have negative consequences for wildlife, including pheasants. The extent of these consequences for wildlife will also be determined by the type of land cover that is being replaced by corn. Alternative modes of producing biofuels, such as cellulosic methods involving a variety of feed-stocks, are available. These feed-stocks, such as native, perennial grasses (e.g, switchgrass [*Panicum virgatum*], big bluestem [*Andropogan gerardii*]), can be produced using agri-

cultural practices that are more compatible with wildlife than row-crop agriculture (Fargione et al. 2009). However, native wildlife species have not evolved in grassland monocultures, and such monocultures might not provide adequate or suitable habitat. Therefore polycultures or high-diversity prairie communities would maximize benefits for wildlife, including pheasants. However, it is not known if such heterogeneous biomass sources are compatible with existing biofuel production technologies.

One factor that is common to all bioenergy crops is that the crop must eventually be harvested for conversion into biofuel. The timing and extent of bioenergy crop harvest will determine whether such crops offer any benefit to pheasants. Factors such as the seasonal timing of harvest, the height of residual stubble, and the proportion of available area harvested all play a role in determining the effect bioenergy crops have on pheasants and other wildlife (Fargione et al. 2009). To provide any benefit to wildlife, harvest must occur outside of the nesting season. For pheasants, this usually means that biomass harvest must occur before mid-April or after mid-July. However, pheasants rely on residual cover early in the nesting season to provide cover. Removal of this cover may impact production. Although leaving stubble in the field may provide such residual cover, because biomass is being left in the field, more area must be harvested to produce the same amount of biofuel. An optimal trade-off would need to be determined between maximizing biomass removal and maximizing pheasant production. The spatial arrangement of harvested and un-harvested fields in the landscape, and the habitat mosaic they create, might also impact local pheasant populations.

Related to non-corn based biofuel production, there are several issues related to pheasant management that need to be determined:

1) What is the optimal schedule for biomass harvest for pheasants and for biofuel producers?

2) Assuming biofuel producers can use non-uniform feed stocks, how does the habitat suitability for pheasants differ among proposed alternative biomass crops?

3) What is the optimum configuration for pheasants of harvested and un-harvested fields in the landscape?

4) Are the biomass yields of fields managed for pheasants sufficient for biofuel producers to adopt wildlife friendly practices and crops?

5) What field stubble height will balance the producers' need for biomass and the habitat needs of pheasants and other grassland wildlife? And how does this trade-off affect the total area that must be planted/harvested?

*Wind Energy Facilities* - Throughout the United States, wind energy development has become widespread (Kunz et al. 2007). Ecologists have researched and are concerned about the potential negative impacts of wind farms on migratory passerines, raptors, and bats because these animals fly at heights where they come into contact with the turbine blades. However, little information exists on the potential direct and/or indirect impacts of turbines to upland game birds (Brennan et al.). Ring-

necked pheasants spend most of their lives on the ground, thus the direct collisions with turbine blades are probably insignificant. The potential indirect effects of the construction and development of wind farms may have impacts on ring-necked pheasant populations. Limited studies suggest turbines may influence pheasant habitat use, more research is necessary to determine impacts of wind turbines on ring-necked pheasant populations (Johnson et al. 2000, Devereux et al 2008).

### *AGRICULTURAL PRACTICES, HABITAT, AND POPULATION VIABILITY*

Although a good deal of research has been undertaken to describe the suitability of various habitat types for pheasants (cf. Giudice and Ratti 2001, Snyder 1984) and the effects of Conservation Reserve Program (Rodgers 1999, Riley 1995, Nusser et al 2004, Nielson et al. 2006), only limited (Clark et al 2007) formal, comparative analysis of the viability of pheasant populations by habitat type, agriculture practice, or conservation practice. Such information will be crucial to the successful implementation of this plan, particularly with its emphasis on habitat goals to restore pheasant populations across their range.

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# APPENDICES: A - C

# APPENDIX A. HABITAT MANAGEMENT PRACTICES

## *A-1. GRASSLANDS (PLANTED COVER/GRAZING LAND/HAYLAND)*

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**Status**

As described in the introduction, early settlers quickly realized the rich soils beneath the prairies were excellent for crop production and put John Deere's moldboard plow to work converting prairie to cropland. Conversion of grassland to cropland continues today and in some areas the rate of conversion appears to be accelerating due to advances in agricultural technology (hybrid seed, equipment) and increased demand for grains (U.S. GAO 2007, Stubbs 2007).

In addition to the direct loss of grasslands, remaining grasslands are not exposed to the same disturbance regimes under which they evolved. Periodic and varying degrees of fire and grazing intensity by wild ungulates historically maintained high species and structural diversity on native prairie. Although grazing systems are increasing in popularity, season-long grazing of pastureland, which causes declines in species and structural diversity, remains common. The introduction of aggressive exotic cool season grasses such as smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), and cheatgrass (*B. tectorum)* have also degraded remaining native grasslands. Their aggressive early season growth can quickly out-compete later growing native warm-season grasses and forbs and cause substantial declines in species diversity. This problem can be locally compounded when grazing regimes do not focus grazing pressure early in the growing season when these exotic plants are growing most rapidly. Even native grasses such western wheatgrass (*Pascopyrum smithii*) can become aggressive and degrade habitat in southern states under certain grazing regimes.

In addition to the changes in grassland composition caused by changes in disturbance regime and exotic species, some grasslands have been impacted by conversion to tame pastureland or hayland. Tame pastures and hayland typically consist of near monotypic stands of exotic grass and/or forage valuable forbs for livestock grazing or forage harvest. Haylands that consist of primarily grass are typically harvested annually while fields with primarily forbs such as alfalfa may be harvested 3-4 times annually.

While many grasslands are now managed for livestock or forage production, some grasslands are planted and/or managed specifically for wildlife. Many of the grasslands managed specifically for wildlife occur on state or federal lands or private land enrolled in federal conservation programs. Specifically, many acres of private cropland have been converted to perennial vegetation through conservation programs such as the Conservation Reserve Program (CRP). The CRP was initially authorized by the Food Security Act of the 1985 Farm Bill and as many as 39 million acres of mainly cropland have been temporarily converted to primarily grassland or "planted cover" for 10-15 year contracts. We define planted cover as perennial herbaceous vegetation planted with the purpose of providing habitat for wildlife such as upland game birds. Many of the original plantings consisted of 1-2 native or exotic grasses and 1-2 native or exotic forbs. Although the original intention of the CRP was primarily intended to conserve soil on marginal croplands, the benefits to wildlife have been dramatic especially for upland nesting birds. In fact, the conservation community recognizes CRP as the single most important wildlife habitat program in the country. Changes in policy have improved the habitat provided by CRP by the encouragement of increased use of diverse native

plantings and requirements of periodic management to maintain diversity and productivity of established plantings. Currently, CRP is administered with a national cap of 32 million acres.

**Grasslands as Pheasant Habitat**

Pheasant densities increase as the proportion of grass in the landscape increases (Haroldson et al. 2006, Nielsen et al. 2008), up to a maximum of about 50% grass (Kimball et al. 1956, Wagner 1965, Trautman 1982, Johnsgard 1999). While it is true that initial conversions of grassland to cropland created a mosaic of habitats necessary for successful pheasant introductions, few landscapes exist in which additional conversion would benefit pheasants. The quantity and quality of grasslands which function primarily as nesting and brood-rearing habitat represent the major limiting factor for wild ring-necked pheasant populations across their current North American range. Although conservation of habitats necessary for all pheasant life cycle needs is important, management of grasslands is certainly critical.

The value of grasslands as nesting and brood-rearing habitat for pheasants varies by grassland type, management regimes, and landscape attributes. Pheasants seek out and initiate nests primarily in grasslands shortly after spring green up. Residual vegetation is important and grasslands with more residual cover are often selected, especially for initial nests before current year growth provides sufficient cover for concealment. Pheasants usually select and exhibit high nest success in large blocks (≥ 40 acres) of grass, but nest success and site selection are further improved in landscapes with grassland in several large blocks compared to concentrating cover in a single block (Clark et al. 1999). Hens with successful clutches lead chicks to areas with high forb abundance where insects are available to meet the high protein diet requirements of the rapidly growing young birds. Ideal brood-rearing habitat provides aerial concealment from predators, allows adequate movement at ground level, and contain abundant insects which are produced mostly by broad-leafed plants. Grasslands without proper management frequently fall short of providing ideal brood-rearing habitat.

***Planted Cover***

Per unit area, more pheasants are produced from planted herbaceous cover than any other habitat. Pheasants that nest in planted cover typically have higher nest success than those nesting in other habitats because of the excellent concealment this habitat provides as a result of limited and carefully timed disturbance. While this cover is extremely important, not all planted cover has equal value to pheasants. Differences in habitat structure (vegetation height-density, litter depth and cover, residual vegetation cover, and forb abundance [Sample and Mossman 1997]), which is influenced by plant species composition and management, dictates the overall value as pheasant nesting and brood-rearing habitat. Grass habitats should provide residual cover or new growth when hens begin nesting (about April 15 in the upper Midwest) and remain undisturbed until most re-nesting in completed (about August 1).

The use of warm-season versus cool-season grasses is a common discriminating feature among planted covers. Both types exhibit specific advantages as pheasant habitat. The aggressive early season growth of cool-season grasses supplement the concealment provided by residual grass which can provide excellent nesting habitat. Some cool-season grasses such as smooth brome and Kentucky bluegrass tend to become flattened beneath snow which reduces the value of residual cover as nesting habitat. Other cool season grasses such as intermediate (*Thinopyrum intermedium*) and tall wheatgrass (*T. ponticum*) retain their structure better and provide better nesting cover. Most warm-season grasses retain structure even when inundated under heavy snow, while some old world bluestem grasses (Bothrichloa spp.) are an exception. When desireable

species of warm or cool season grasses are established, both are very valuable to pheasants as nesting habitat.

Planted cover with an open understory and abundant forbs provide ideal brood habitat for pheasants. Without periodic management, the value of planted cover as brood habitat declines. When planted cover is left idle for multiple years, grasses become dominant and thick thatch inundates the understory. This results in poor habitat quality characterized by reduced nest success and brood survival (Matthews 2009, but also see Eggebo et al. 2003). The frequency and type of management required to maintain quality brood habitat varies by vegetation type and region. Specific management activities aimed at improving brood habitat include haying, grazing, burning, disking, inter-seeding, chemical suppression and combinations of these activities.

***Grazing Lands***

Native and non-native grasslands utilized primarily for grazing can provide nesting and brood-rearing habitat for pheasants. Because these lands are typically utilized annually for cattle grazing, the amount of residual vegetation available as nesting or brood-rearing habitat varies spatially and temporally. Highly utilized pastures which feature very little residual vegetation that could function as concealment cover for nesting or brood-rearing have little value to pheasants.

In eastern states, pastures tend to be scarce, small, isolated, and highly utilized by cattle and are not considered a particularly important contributor to regional pheasant production. In western states, pastures tend to be larger, incur lower rates of utilization, and are often a component of a larger operation which can result in more intensively managed grazing regimes. Pastures are considered an important contributor to pheasant production in many western states.

Specific management of grazing regimes dictates the value of pastures as nesting and brood-rearing habitat for pheasants. The traditional season-long grazing system exposes pasture vegetation to grazing during most of the growing season. When pastures experience similar season-long grazing pressure year after year, species diversity and structural heterogeneity decline. Declines in forb diversity reduce the value of pastures as brood habitat as fewer insects are produced. Additionally, diverse grasslands typically provide higher quality habitat than low diversity stands that can form after repetitive season-long grazing. While strategically stocked season-long pastures may provide enough residual cover to be considered valuable to nesting pheasants, pastures subject to other grazing strategies likely provide far superior habitat.

Rotational grazing systems utilize multiple paddocks with each paddock subject to regular and systematic grazing treatments with the intent of increasing quality and quantity of forage across the entire system. Because the grazing regime within each paddock varies seasonally and yearly, species diversity is maintained among forage species. Although the primary focus of rotational grazing systems is to increase forage production across the system, high quality pheasant nesting and brood-rearing habitat can be maintained by carefully controlling the timing and intensity of grazing. While every paddock may not provide ideal habitat every year, all paddocks may provide good habitat during some years. Because rotational grazing can encourage persistence of a diverse suite of forbs, pastures under well managed systems can provide particularly useful brood habitat. Although specific grazing systems will not be discussed here, in general, pastures that are subject to well designed grazing systems will benefit pheasants while concurrently increasing forage production.

***Hayland***

Hay fields can be attractive to pheasants for nesting and brood-rearing, but their success while using these fields is variable. Timing of haying operations in relation to pheasant reproductive chronology influences success. Haying operations destroy nests and can cause chick mortality if they are not mobile enough to avoid machinery. Hay fields provide decent nesting and brood-rearing habitat when haying is delayed until after the primary nesting season.

Grass hay fields likely contribute more to pheasant production than popular brad-leafed hay fields such as alfalfa because of later haying dates. Warm season grass hay fields are harvested late in the growing season which may make them quite valuable to nesting pheasants. Cool season grasses grown for hay do boast early season growth which can provide excellent concealment for nesting pheasants, although hay dates are generally earlier than for warm season stands. Grass hay fields likely provide better nesting habitat if adequate stubble height is left during harvest, or if fall growth produces residual cover for the following nesting season. The value of grass hay fields for brood-rearing likely depends on the amount of broad-leafed plants and subsequent insect production.

Broad-leafed hay fields such as alfalfa represent very attractive nesting habitat, although success is usually low. These fields are usually harvested multiple times per season with the first cut occurring within or near the peak nesting season. Alfalfa fields can provide excellent brooding habitat, but again, direct chick mortality can occur if they are not mobile enough to avoid machinery during haying operations.

***Specific Problems***

- Conversion of grasslands to cropland has reduced the amount of nesting and brood-rearing habitat available to pheasants throughout their range. In some regions such as the northern Great Plains, conversion of grasslands, primarily native prairie, to cropland is still occurring at astonishing rates (Stubbs 2007). Millions of acres of cropland were temporarily converted to grass through the CRP, but the future of this program is uncertain. Pheasants would benefit from any effort to restore and/or maintain grasslands on the landscape.

- Invasive species such as smooth brome, Kentucky bluegrass, cheatgrass, old world bluestem species, and tall fescue have reduced the quality of many remaining grasslands as nesting and brood-rearing habitat. These invasive plants lack ideal structure for nesting and because they can become monocultures their value as brood-rearing habitat is minimal. It was common practice to use some (smooth brome and old world bluestem species) of these invasive plants in plated cover plantings such as for land enrolled in the CRP. When subject to periodic management (haying, grazing, burning) there is some value as nesting or brood-rearing habitat

- Many planted cover fields have been subject to infrequent or inadequate management and their value as nesting and/or brood-rearing habitat has declined. Periodic management promotes species diversity, healthy plant growth, and an open understory which is an important component of brood habitat. Woody encroachment can also be controlled with periodic management such as prescribed fire. While the ideal technique varies by type of vegetation and desired outcome; prescribed fire, haying, grazing, disking, interseeding, and chemical application are all proven and effective management options to improve grasslands as pheasant nesting and brood-rearing habitat.

- Improper grazing has reduced the value of some grazing lands as nesting or brood-rearing habitat. Over utilized pastures do not provide adequate concealment for nesting pheasants. Additionally, pastures subject to season-long grazing typically lose species diversity and structural heterogeneity further reducing their value to nesting or brood-rearing pheasants.

- Hay dates for popular tame forages species such as smooth brome and alfalfa typically occur during the primary nesting season which results in destroyed nests. Native grasses are typically hayed later in the summer which increases nest and chick survival in those hay fields.

**Grassland Recommendations and Opportunities**

The quantity and quality of grasslands available in agricultural landscapes represent the major limiting resource for pheasant populations. Opportunities exist to improve the quality and maintain quantity of grasslands to improve pheasant nesting and brood-rearing habitat, such as discouraging the conversion of existing grasslands to cropland and non-agricultural uses.

***Planted Cover Establishment***

Planted cover provides critical nesting and brood rearing habitat for pheasants. While pheasants will use a variety of grassland types, we provide specific recommendations to maximize pheasant production from newly established planted cover such as land enrolled in the CRP.

1. Diverse warm or cool season native grass and forb mixes provide excellent nesting and brood rearing habitat. Seed mixes should include substantial amounts of forbs to enhance brood rearing habitat.

2. Tame mixes such as dense nesting cover which is comprised of tall and/or intermediate wheatgrass, sweet-clover (*Melilotus officinalis*), and alfalfa (*Medicago falcate*) is a tried and true economical alternative, although sweet-clover can be invasive in eastern and some midwestern states; in these states, Korean lespedeza (*Kummerowia stipulacea*) can be a less aggressive alternative. The use of exotics such as smooth brome, Kentucky bluegrass, and tall fescue is discouraged.

3. Planted cover is most valuable to pheasants when in an early successional state because of the seeds and insects produced from broad leafed plants and annual grasses. While methods exist to quickly establish perennial grass and selected forbs by using pre-emergent herbicides such as Plateau ®, the quality and duration of early successional habitat is reduced. When establishing planted cover into clean seedbeds (low risk of noxious weed outbreaks), the use of pre-emergent chemicals may not be necessary to establish the grass stand, and the quality and duration of early successional habitat can be maximized. When competition from weeds may reduce the chance of establishing planted cover, the use of a pre-emergent chemical such as Plateau ® is recommended.

4. Planted cover should be established in blocks rather than in linear patches to increase nest success. Blocks of at least 40 acres are recommended, but 80-160 acre blocks are ideal.

5. Planted cover should be periodically managed as to maintain a forb component, remove thatch build up, and to maintain an open understory which is important for brooding hens.

***Planted Cover Management***

Proper management of planted cover is important to maintain the intended value to pheasants. Grasslands left idle for too long can accumulate excess plant litter which can reduce productivity, growth, vigor and diversity of planted cover. The following management techniques are recommended to maintain the intended value of planted cover such as land enrolled in the CRP as nesting

and brood-rearing habitat for pheasants. The ideal frequency of management will depend on the rate of plant succession which is regulated by climate and stand type.

*Haying* - Periodic haying of planted cover removes excess litter build up and encourages fresh vegetation growth. Haying can encourage forb growth because litter is removed from the soil surface, but other management techniques incur more soil disturbance and encourage better forb growth. This management technique is easily accomplished and does not require complex planning to complete. Haying should be delayed until after the primary nesting season to protect nesting hens. This practice is particularly popular among warm season plantings because the hay is still valuable as forage after the primary nesting season. However, cool-season grass plantings also benefit from periodic haying.

*Grazing* – Prescribed grazing is a valuable tool managers can use to accomplish several planted cover management objectives. Like haying, grazing removes excess plant litter but the hoof action from livestock provides soil disturbance which encourages important forb growth. High intensity short duration grazing is a great way to quickly remove excess plant material and disturb the surface soil which sets the stage for healthy and diverse plant growth. Timing, intensity, and frequency of grazing will again depend on stand type and climate. Grazing can also be an effective way to encourage or discourage growth of specific vegetation types. For instance, encroachment of exotic cool season grasses into warm season plantings is a common problem. Intense grazing during the cool season grass growing season can shift the plant community towards the desirable warm season grasses.

*Prescribed burning* – Prescribed fire is an excellent management method to maintain healthy native plant communities. Periodic burning closely simulates the natural disturbance that our native plants are adapted to. The result can be a diverse suite of grasses and forbs which provide ideal nesting and brood-rearing habitat for pheasants. When timed appropriately, prescribed fire can reduce exotic cool season grass and woody encroachment into native warm season stands. While late spring burnings are effective at reducing cool season grass encroachment, some pheasant nests will inadvertently be destroyed. It is assumed the long term benefits of late spring burns outweigh the short term detriments. While prescribed fire can quickly accomplish management objectives, detailed planning is necessary to safely and effectively burn fields.

*Disking* – Disking is an aggressive management technique used to promote early successional habitat which is important for pheasant broods. Disking is usually used in conjunction with a vegetation removal practice such as haying, grazing, or burning which eases the disking process. During this management technique, the top 2-4 inches of soil are disturbed by one or two passes with a field disk. The aggressive soil disturbance promotes the growth of annual broad leafed plants while temporarily suppressing the growth of the perennial grasses. When executed properly, a broad leafed plant community emerges with an open understory which provides ideal brooding habitat for pheasants. As natural plant succession occurs, the stand will eventually convert back to a grass dominated community. It is popular to treat portions of a field in a strip formation with disking. While this method can deliver big results, managers should be aware of potential erosion issues and noxious weed outbreaks.

*Inter-seeding* – inter-seeding forbs into established grasslands is an excellent way to boost forb abundance and increase the value of planted cover as brood habitat. This practice is usually used in conjunction with a vegetation removal practice such as haying, grazing, burning or after disking. We recommend using a mixture of forbs with bloom dates that encompass the entire brood rearing season for maximum benefit to pheasants.

*Herbicide treatment* – Under certain circumstances, herbicides can be useful to achieve specific management goals. For instance, low doses of non-selective herbicides can be used to suppress grass growth prior to inter-seeding forbs so the survival and persistence of the valuable forbs is enhanced and extended. Chemical treatments can also be used to suppress or kill encroaching exotic cool season grasses in warm season grass stands. The chemical can be applied during spring when cool season grasses are actively growing and warm season grasses are dormant. This method is usually more effective when used in conjunction with a vegetative removal practice such as haying, burning, or grazing so the chemical can be applied easily to new growth. In the southern Great Plains biologists have had success applying herbicide (Round-Up) to cool season grass (smooth brome and western wheatgrass) invasions in the late fall during a periodic warming event (generally > 60° F) immediately after the first or second hard freeze.

***Grazing Lands Management***

1. Promote the use of grazing systems which increase forage production for livestock while concurrently providing adequate nesting and brood rearing habitat for pheasants. To provide nesting habitat, 10" of residual vegetation is recommended. Grazing systems which provide 10" of residual vegetation in at least some paddocks during some years are recommended.

2. Native grasslands should be grazed in a manner that growth of exotic *grasses is discouraged*. For pastures invaded by exotic cool season grasses, aggressive early season grazing may be needed to promote the growth of native warm season grasses. Non-selective herbicides can also be used to suppress/kill exotic cool season grasses when native grasses are still dormant, but some native forbs could also be killed.

3. Encourage the use of native grass and forb species when land is converted from other uses to grazing land.

4. Discourage annual burning of grazing lands as no residual cover is available for nesting pheasants.

***Hayland Management***

1. We recommend use of warm season grasses for grass hay because hay dates are usually after the primary nesting season for pheasants.

3. When hay is cut during the brood rearing season, we recommend that producers start in the middle of the field and work towards the outside. This will encourage hens with broods to move out of the field during the haying operation and will reduce chick mortality.

## A-2. *AGRICULTURAL CROPLAND*

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### Status

From the pheasants' introduction through the 1930s, the diverse style of farming they encountered provided ideal habitat. Starting in the 1940s, new farming techniques and technologies started to erode the quality and quantity of pheasant habitat. Chemical fertilizers allowed for more acres to be planted to grains. Herbicides and pesticides resulted in cleaner fields that provide much less food and cover. Small fields were often consolidated to create much larger fields. As corn and soybeans became more profitable, the amount of acres of these crops grew at the expense of hay, pasture, small grains, and sorghum. Warner et al. (1999) chronicled declines pheasant chick survival tied to these changes in land use in east central Illinois. These changes have occurred at differing rates with those states receiving rainfall rates most suitable for corn production experiencing quickest and most dramatic changes. Even those states that have maintained decent hay, wheat, and sorghum acreages have been impacted by technology changes. Modern varieties of alfalfa can be harvested earlier and more often, disrupting nesting and brood rearing. Changes in wheat farming in semi-arid portions of the pheasant range, especially Kansas, have also harmed pheasant numbers (Rodgers 2002). Increased herbicide use, the use of shorter wheat varieties and the resulting reduced wheat stubble height, and adding row crops into cropping rotations have all contributed to these declines.

Since their introduction in 1996, genetically modified crops have received widespread acceptance by producers. In 2010, it was estimated that 86% of the corn planted nationally was a biotech variety (Bt, Roundup Ready, or stacked) and 93% of soybeans were Roundup Ready varieties. These varieties provide producers with fields that are almost completely free of weeds and insect pests. Work continues to develop more herbicide resistant crops. In 2011, USDA approved Roundup Ready alfalfa for use. This trend can only continue to erode the habitat value of cropland for pheasants.

### Cropland Recommendations and Opportunities

#### Corn Belt

#### Specific Problem

Changes in farming techniques and technology have changed the cropland landscape from one typified by a patchwork of small grains, hay, fallow areas, and weedy row crops to one dominated by large, clean fields of corn and soybeans. This intensive farming has contributed to reduced nesting, brood rearing, and winter cover.

#### Possible Solutions

- *Promote Small Grains and Hay* – Planting more small grains and late-mowed hay could improve nesting and brood rearing habitat. Incentive based programs like the Conservation Stewardship Program (CSP) or other Farm Bill programs could be used to encourage producers to diversify their crop rotations.
- *Promote Grasslands and Wetlands* – Protecting or expanding grassland and ephemeral wetland habitat in the pheasant range could help provide nesting, brood rearing, and winter

cover in areas where corn and soybeans dominate. Farm Bill programs like the Conservation Reserve Program (CRP), the Wetland Reserve Program (WRP), and the Grassland Reserve Program (GRP) could be used to encourage producers to establish permanent cover on their farms. The replacement of farmed terraces and tile outlets with native-grassed waterways in conjunction with grass-backed terraces or grass contour strips could be encouraged

- *Establish a Set-Aside (Flex Fallow) Program* – Authors of the 2002 Northern Bobwhite Conservation Initiative (NBCI) (Dimmick et al. 2002) suggested a strategy of retiring cropland acreage for a two or three year period will provide quality nest and brood habitat for quail. Pheasants would similarly benefit from such a program.
- *Designate Focus Areas* – Scattering habitat randomly across the landscape would not have nearly the impact as a focused and concentrated approach. Authors of the NBCI (Dimmick et al. 2002) suggested designating focus areas to benefit quail. Pheasants could also benefit from large focus areas. Some states have employed the strategy of using CP38 - State Acres For wildlife Enhancement (SAFE) to develop focus areas for pheasants and other grassland birds.
- *Encourage Organic Farming* – Organic farms tend to have smaller fields and are weedier than conventional farms. Organic farms often have small grains and hay in their rotations and sometimes include fallow. The weedy nature of their corn and soybean fields could provide good brood habitat. Organic farming is not perfect as mechanical and manual weed control could be disruptive to nesting. The 2008 Farm Bill contains several provisions to promote organic farming. Transition to organic production is included as part of the Environmental Quality Incentives Program (EQIP). Also included is a provision streamlining coordination between CSP and the National Organic Program (NOP). This provision is intended to make it easier for organic producers to qualify for CSP.
- *Encourage the use of seasonal cover crops* – These cover crops not onlt conserve soil and increase water quality, but can provide winter cover and forage for pheasant and other wildlife.

**Wheat Belt**

**Specific Problem**

Changes in wheat farming in semi-arid portions of the pheasant range, especially Kansas, have also harmed pheasant numbers (Rodgers 2002). Increased herbicide use, the use of shorter wheat varieties and the resulting reduced wheat stubble height, and adding row crops into cropping rotations have all contributed to these declines.

**Possible Solutions**

- *Encourage Modified Wheat-Fallow Rotation* – Rogers (2002) determined that that increased stubble height and post-harvest weed growth in wheat stubble are keys to a modified wheat-fallow rotation that provides superior habitat quality, soil conservation benefits, and greater profitability than other wheat-fallow systems. Farm Bill programs like CSP or EQIP could be used to encourage modified wheat-fallow rotations.
- *Encourage the use of stripper headers* – Stripper headers allow farmers to harvest wheat and other small grains while leaving the "stubble" at virtually the same height it was before harvest. This taller stubble provides better cover than stubble left after harvest with a conventional sickle-bar header. Leaving the extra stubble helps the soil retain more moisture in the dryer parts of the Midwest. Farm Bill programs like CSP or EQIP could be used to encourage the use of stripper headers.

**A-3. *WINTER HABITAT/COVER***

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**Status**

Although long-term trends in pheasant abundance are largely determined by the availability of preferred grassland or agricultural habitats, the presence of appropriate cover types can influence how local or regional pheasant populations respond to severe winter weather. Though the specific composition of this cover varies considerably across North America, cattails, shrub carr, shelterbelts, dense herbaceous vegetation, food plots, brushy woodland edges or fencerows, pine plantations, and sage brush have all been mentioned as providing effective winter cover for pheasants. Even in landscapes where it comprises a small portion of the available habitat, this cover can significantly improve survival during periods of deep snow and cold. Across most of their range in North America, pheasants show little selection for these cover types during other seasons, although Leif (2005) found that male pheasants preferred, but did not require, woody cover during the breeding season. The vertical structure of various winter cover types, their dispersion on the landscape, and their spatial arrangement with respect to summer nesting areas and winter food sources should all be considered by biologists and managers interested in increasing winter survival and pheasant production by promoting specific cover types.

**Importance of Winter Cover**

As a popular game species, the ring-necked pheasant has received significant attention regarding the factors which affect long-term population trends. Most work has focused on the availability and quality of nesting and brood-rearing habitat, but numerous studies reveal that deep snow and cold temperatures during severe winters can negatively impact survival in the absence of protective cover. For example, Homan et al. (2000) noted that pheasant survival during winter increased 6% with each 1◦C increase in mean weekly maximum temperature, and declined 8% with each 2.5cm increase in snow depth. While this cover can take many forms, in upland areas woody cover types may provide the only protective or thermal cover available.

In early winter, with little snow and moderate temperatures, pheasants may select a variety of habitats but generally prefer dense herbaceous vegetation. Depending on the availability and distribution of these habitats, pheasants may remain widely dispersed throughout the landscape, utilizing erect stands of cool- or warm-season grasses or rank stands of broad-leaved plants for both feeding and roosting cover. In mild winters, pheasants may remain in these habitats throughout the winter season. The ability of these habitats to provide adequate cover, however, will decline with increasing snow depth as less residual cover remains available (Homan et al. 2000). As snow accumulates, herbaceous cover may become obscured or unavailable, necessitating pheasant movement to habitats that continue to provide protection from the weather. In North Dakota, pheasants remained in or near nesting areas in grassland habitats during mild winters, moving to emergent wetland cover (cattail marshes) in years when preferred grasslands were covered in snow. Pheasants only utilized available woody shelterbelts under very extreme conditions when large emergent wetlands were buried in snow (Homan et al. 2000). In this study, woody habitats were considered "emergency cover," and were only utilized when nothing else was available. The selection of winter habitat therefore appears to be sequential and dependent upon snow depth, with pheasants moving from preferred upland grass/forb-dominated cover to dense cattail-dominated wetlands to woody

habitats as snow depth increases, dependent upon the relative availability of each cover type (Homan et al. 2000, Lyon 1954).

Grondahl (1953) recorded specific thresholds at which pheasants actively sought out winter cover; at temperatures below -6.7◦C, wind speeds >16 km/hr, and snow depths >15.2 cm, the use of shelterbelts increased. These thresholds may vary depending upon region and availability of various cover types on the landscape. Such movements may lead to higher concentrations of pheasants in available patches of winter cover. Gates and Hale (1974) reported increased pheasant movement to both cattail and shrub carr habitats as snow depths increased on their Wisconsin study area throughout winter.

Though not preferred by pheasants during most of the year, quality winter cover of appropriate structure can lead to increased survival during extreme winter weather events. Gabbert et al. (1999) monitored pheasants during the second-most severe winter on record in South Dakota (1996-97) and found surviving pheasants utilized food plot and shelterbelt habitats containing conifers and dense underbrush almost exclusively during late winter. Within the context of this study, shelterbelts were considered "essential" to pheasant survival in South Dakota during extreme winter weather. In addition, Kimball (1948) used existing weather data to predict that, on average, pheasants face severe winter mortality in South Dakota one year out of six. Conversely, no relation was found between pheasant survival during a winter weather-induced pheasant decline in east-central Illinois (Warner and David 1982) and the abundance, growth form, or landscape configuration of linear woody vegetation established as windbreaks. The latter authors state, however, that "survival of pheasants may have been enhanced if multiple-row plantings of conifers and other dense tracts of timber were common on the landscape" (Warner and David 1982), suggesting that the narrow linear belts of timber present on their study area did not provide sufficient cover to reduce winter mortality. As a generalization, it is appropriate to suggest that winter cover can be an important component of quality pheasant habitat in regions prone to periodic severe winter weather, leading to increased survival and buffering the population against sharp declines during severe winter weather.

The benefits of improved winter pheasant survival concurrent with cover development may also translate into expanded hunting opportunities. Lyon (1961) collected information from hunters in Colorado on areas with varying amounts of woody cover (planted shelterbelts), and found more birds were killed with less effort where woody plantings were present. Additionally, planting shelterbelts in this area proved to be a more cost-effective means of increasing hunter opportunity than releasing pen-reared birds.

**Design and Structure of Winter Cover**

Winter habitats selected by pheasants exhibit significant variation in type and species composition, but the underlying feature of quality winter habitat as described in the literature is its ability to provide protective and thermal cover. Structure is likely a much more important determinant of a habitat's utility as winter cover than is species composition. Although a variety of cover types may provide benefit to pheasants during winter, managers can minimize the impact of winter weather on pheasant population dynamics through the thoughtful development of local types most likely to reduce weather-related mortality during severe winter weather.

In general, the type of winter cover developed will be constrained by site conditions, with wetland restoration or enhancement possible in areas with hydric soils, and woody cover development the most effective option in upland areas. Shallow wetland basins can most effectively provide winter cover for pheasants if dense stands of emergent vegetation (cattails, shrubs) are allowed to develop

(Homan et al. 2000). However, wetland management efforts often include cattail control in order to prevent monocultures of emergent vegetation from developing and to produce an intermixture of open water and emergent vegetation that maximizes diversity (Mitsch and Gosselink 1993). Managers must therefore weigh the relative costs and benefits of managing wetlands strictly as pheasant winter cover as opposed to other possible wildlife- or ecosystem-related goals. Trees that provide raptor perches in and immediately around these wetlands should be removed to minimize winter predation losses. This is especially important given that pheasants may be concentrated in these areas during severe winters. For example, Gabbert et al. (1999) noted that increased pheasant mortality during an especially harsh winter in South Dakota was primarily due to predation; mortality due directly to weather did not differ between this and a milder winter.

Patches of woody cover consisting of large deciduous or coniferous trees generally have little value as winter cover unless they possess a well-developed understory. Shrubby areas along the edge of woodlands or wetlands can provide an important winter refuge for pheasants, particularly if in close proximity to an adequate food source. Livestock grazing, if intense enough to thin the understory, can reduce the quality of winter cover and should be limited where pheasant production is a goal (Leptich 1992). Pheasants concentrating in woody cover during winter may also be more susceptible to increased predation rates if predator perches or wooded corridors are present. Dense woody cover that provides concealment and protection near the ground (15 – 200cm in height) is preferable to taller and/or more open types of woody cover.

Developing woody cover as a means of improving pheasant survival requires attention to the resulting physical structure of the patch and consideration of how it will function as protective and thermal cover. Biologists and managers should also take into consideration that the development of adequate woody cover may take 5-15 years following establishment, depending upon the species selected, and will need to determine which native species are best suited to the climate, topography, and soil types in their area.

Optimal woody cover or shelterbelt development in a traditional sense consists of a mixture of conifers and shrubs, often oriented perpendicular to the direction of prevailing winds. At least 2 rows of shrubs should be planted on the windward side to catch the blowing and drifting snow, with multiple rows of conifers on the leeward side. Optionally, a mixture of shrub species in a wide (10-30ft) band may be planted on the leeward side of the conifers. The shelterbelt should be wide enough to capture snow yet continue to provide residual cover for pheasants (whereas narrow strips consisting of only one or two rows of conifers can more readily become buried by wind-driven snow). Shrub species that spread by rhizomes will produce high stem densities, contributing to the value of the patch as protective cover, and those that either retain fruit (berries or nuts) through winter or produce catkins in late winter will provide pheasants with a winter food source. Conifer species that retain needles and lower branches (e.g., white spruce) will provide greater protection from weather and predators. Consideration of shelterbelt design prior to planting can help ensure benefits to wintering pheasants are maximized, especially in particularly harsh winters.

**Winter Cover Recommendations and Opportunities**

As important as the presence and composition of winter cover to pheasants during severe winters, is its spatial arrangement relative to other important habitat types on the landscape. High interspersion of grassland nesting cover, winter cover, and food resources increases the likelihood that each may be found within a given pheasant home range, and decreases the distance pheasants need to move in search of resources. Winter movements are energetically costly, and may increase mortality risk. In Wisconsin, pheasants which survived until spring moved less and had smaller home ranges than those which were depredated (Gatti et al. 1989).

The closer winter cover can be placed relative to grassland nesting areas and winter food sources, the better. Numerous telemetry studies reveal that most pheasants move less than a mile between summer nesting habitats and winter cover, with very few moving greater than two miles. This information allows winter cover to be distributed so as to ensure it is available to all birds present on the landscape. Wintering areas should be developed within one, or at the most two, miles of occupied nesting habitat, and no more than three miles from each other. Recommended upland winter cover in Minnesota consists of three acres of woody cover (conifers and shrubs) planted in association with 10 acres of dense herbaceous cover and a two-acre food plot. Establishment of cover near a food source also will minimize both energetic costs and predation risk associated with movement and foraging.

The development of woody cover in landscapes with large blocks of contiguous grassland will result in fragmentation and increase the amount of edge habitat present. This may negatively impact area-sensitive species (e.g., bobolink, grasshopper sparrow) and lead to increased use of the area by woodland-adapted predators (e.g., raccoon, opossum). Such effects should be considered prior to the development of woody cover in grassland landscapes. Increasing edge density has also been associated with increased pheasant mortality in certain landscapes (Schmitz and Clark 1999).

Appendix B. Mean number of pheasant hunters, days hunted, trips, birds/hunter, harvest, expenditures, and estimated cost of per bird harvested based on average hunter and harvest data from 2006 - 2009. Calculated by multiplying average cost of an upland hunting trip in ND, SD, NE, KS, IA, and MN by the number of pheasant hunting trips in each state based on 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

| | State | Hunters | Days Hunted | Trips | Birds/ Hunter | Harvest | Expenditures* | $/Bird Harvested |
|---|---|---|---|---|---|---|---|---|
| Resident Hunter | AZ[ag] | 142 | 1.80 | 255 | 1.04 | 147 | $13,180 | $90 |
| | CO[ab] | 13,633 | 4.67 | 63,706 | 2.96 | 40,417 | $3,290,907 | $81 |
| | DE[ah] | 397 | 5.16 | 2,048 | 6.03 | 2,395 | $105,795 | $44 |
| | IA | 76,948 | 7.21 | 555,072 | 5.06 | 389,454 | $28,673,757 | $74 |
| | ID | 22,285 | 5.30 | 118,024 | 3.48 | 77,623 | $6,096,838 | $79 |
| | IL[a] | 31,433 | 4.63 | 145,653 | 3.10 | 97,312 | $7,524,103 | $77 |
| | IN[ae] | 11,200 | 1.93 | 21,663 | 0.67 | 7,493 | $1,119,061 | $149 |
| | KS | 79,000 | 5.76 | 455,000 | 6.74 | 532,750 | $23,504,265 | $44 |
| | MI[ad] | 61,005 | 3.42 | 208,849 | 1.32 | 80,288 | $37,409,125 | $466 |
| | MN | 107,151 | 7.47 | 800,335 | 4.91 | 526,513 | $41,343,460 | $79 |
| | MO[ab] | 9,782 | 4.69 | 45,892 | 3.29 | 32,142 | $2,370,378 | $74 |
| | MT | 17,952 | 5.41 | 97,175 | 5.45 | 97,760 | $5,019,852 | $51 |
| | ND | 68,459 | 6.19 | 423,916 | 7.87 | 538,451 | $21,898,549 | $41 |
| | NE | 45,032 | 8.16 | 367,625 | 5.93 | 266,945 | $18,990,645 | $71 |
| | NJ[ai] | 1,464 | 10.44 | 15,276 | 13.41 | 19,629 | $789,108 | $40 |
| | NV[a] | 491 | 1.69 | 829 | 0.99 | 484 | $42,798 | $88 |
| | NY[af] | 10,954 | 3.74 | 40,954 | 1.69 | 18,517 | $2,115,565 | $114 |
| | OH[ac] | 57,746 | 5.00 | 288,730 | 1.00 | 57,668 | $14,915,792 | $259 |
| | OK[a] | 18,109 | 3.90 | 70,685 | 4.74 | 85,842 | $3,651,400 | $43 |
| | OR[a] | 12,034 | 4.61 | 55,525 | 2.77 | 33,354 | $2,868,269 | $86 |
| | SD | 75,918 | 7.51 | 569,845 | 11.34 | 861,067 | $29,436,905 | $34 |
| | TX[a] | 21,394 | 2.70 | 57,691 | 3.41 | 72,892 | $2,980,186 | $41 |
| | UT[a] | 16,003 | 3.45 | 55,225 | 2.29 | 36,623 | $2,852,798 | $78 |
| | WA[a] | 19,342 | 6.14 | 118,715 | 3.68 | 71,259 | $6,132,560 | $86 |
| | WI[d] | 68,475 | 8.63 | 590,664 | 4.96 | 339,969 | $30,512,359 | $90 |
| | Sum | 846,347 | | 5,169,349 | | 4,286,990 | $293,657,656 | |
| | Mean | | 6.11 | | 5.07 | | | $68 |

Appendix B (continued). Mean number of pheasant hunters, days hunted, trips, birds/hunter, harvest, expenditures, and estimated cost of per bird harvested based on average hunter and harvest data from 2006 - 2009. Calculated by multiplying average cost of an upland hunting trip in ND, SD, NE, KS, IA, and MN by the number of pheasant hunting trips in each state based on 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

| State | | Hunters | Days Hunted | Trips | Birds/ Hunter | Harvest | Expenditures* | $/Bird Harvested |
|---|---|---|---|---|---|---|---|---|
| **AZ**[ag] | Non-Resident Hunter | NA | NA | NA | NA | NA | NA | NA |
| **CO**[ab] | | NA | NA | NA | NA | NA | NA | NA |
| **DE**[ah] | | NA | NA | NA | NA | NA | NA | NA |
| **IA** | | 20,001 | 4.89 | 97,793 | 5.95 | 119,015 | $21,684,215 | $182 |
| **ID** | | 2,476 | 4.14 | 10,263 | 4.68 | 11,599 | $2,275,675 | $196 |
| **IL**[a] | | NA | NA | NA | NA | NA | NA | NA |
| **IN**[ae] | | NA | NA | NA | NA | NA | NA | NA |
| **KS** | | 35,625 | 4.29 | 153,000 | 6.71 | 239,000 | $33,925,587 | $142 |
| **MI**[ad] | | NA | NA | NA | NA | NA | NA | NA |
| **MN** | | 3,184 | 4.30 | 13,683 | 3.98 | 12,664 | $3,033,901 | $240 |
| **MO**[ab] | | NA | NA | NA | NA | NA | NA | NA |
| **MT** | | 6,372 | 4.58 | 29,170 | 6.09 | 38,785 | $6,468,091 | $167 |
| **ND** | | 32,515 | 3.83 | 124,686 | 7.17 | 233,226 | $27,647,414 | $119 |
| **NE** | | 12,262 | 4.80 | 58,824 | 6.27 | 76,840 | $13,043,335 | $170 |
| **NJ**[ai] | | NA | NA | NA | NA | NA | NA | NA |
| **NV**[a] | | NA | NA | NA | NA | NA | NA | NA |
| **NY**[af] | | NA | NA | NA | NA | NA | NA | NA |
| **OH**[ac] | | NA | NA | NA | NA | NA | NA | NA |
| **OK**[a] | | NA | NA | NA | NA | NA | NA | NA |
| **OR**[a] | | NA | NA | NA | NA | NA | NA | NA |
| **SD** | | 99,716 | 4.43 | 442,013 | 10.30 | 1,027,214 | $98,010,080 | $95 |
| **TX**[a] | | NA | NA | NA | NA | NA | NA | NA |
| **UT**[a] | | NA | NA | NA | NA | NA | NA | NA |
| **WA**[a] | | NA | NA | NA | NA | NA | NA | NA |
| **WI**[d] | | 1,776 | 6.69 | 11,885 | 6.08 | 10,798 | $2,635,331 | $244 |
| **Sum** | | 213,927 | | 941,317 | | 1,769,140 | $208,723,629 | |
| **Mean** | | | 4.40 | | 8.27 | | | $118 |

Appendix B (continued). Mean number of pheasant hunters, days hunted, trips, birds/hunter, harvest, expenditures, and estimated cost of per bird harvested based on average hunter and harvest data from 2006 - 2009. Calculated by multiplying average cost of an upland hunting trip in ND, SD, NE, KS, IA, and MN by the number of pheasant hunting trips in each state based on 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

| State | | Hunters | Days Hunted | Trips | Birds/ Hunter | Harvest | Expenditures* | $/Bird Harvested |
|---|---|---|---|---|---|---|---|---|
| AZ[ag] | Total Hunter | 142 | 1.80 | 255 | 1.04 | 147 | $13,180 | $90 |
| CO[ab] | | 13,633 | 4.67 | 63,706 | 2.96 | 40,417 | $3,290,907 | $81 |
| DE[ah] | | 397 | 5.16 | 2,048 | 6.03 | 2,395 | $105,795 | $44 |
| IA | | 96,949 | 6.73 | 652,865 | 5.24 | 508,468 | $50,357,972 | $99 |
| ID | | 24,761 | 5.18 | 128,287 | 3.60 | 89,222 | $8,372,514 | $94 |
| IL[a] | | 31,433 | 4.63 | 145,653 | 3.10 | 97,312 | $7,524,103 | $77 |
| IN[ae] | | 11,200 | 1.93 | 21,663 | 0.67 | 7,493 | $1,119,061 | $149 |
| KS | | 114,625 | 5.30 | 608,000 | 6.73 | 771,750 | $57,429,852 | $74 |
| MI[ad] | | 61,005 | 3.42 | 208,849 | 1.32 | 80,288 | $37,409,125 | $466 |
| MN | | 110,335 | 7.38 | 814,017 | 4.89 | 539,177 | $44,377,361 | $82 |
| MO[ab] | | 9,782 | 4.69 | 45,892 | 3.29 | 32,142 | $2,370,378 | $74 |
| MT | | 24,324 | 5.19 | 126,346 | 5.61 | 136,545 | $11,487,943 | $84 |
| ND | | 100,974 | 5.43 | 548,603 | 7.64 | 771,677 | $49,545,963 | $64 |
| NE | | 57,294 | 7.44 | 426,448 | 6.00 | 343,784 | $32,033,981 | $93 |
| NJ[ai] | | 1,464 | 10.44 | 15,276 | 13.41 | 19,629 | $789,108 | $40 |
| NV[a] | | 491 | 1.69 | 829 | 0.99 | 484 | $42,798 | $88 |
| NY[af] | | 10,954 | 3.74 | 40,954 | 1.69 | 18,517 | $2,115,565 | $114 |
| OH[ac] | | 57,746 | 5.00 | 288,730 | 1.00 | 57,668 | $14,915,792 | $259 |
| OK[a] | | 18,109 | 3.90 | 70,685 | 4.74 | 85,842 | $3,651,400 | $43 |
| OR[a] | | 12,034 | 4.61 | 55,525 | 2.77 | 33,354 | $2,868,269 | $86 |
| SD | | 175,634 | 5.76 | 1,011,858 | 10.75 | 1,888,280 | $127,446,986 | $67 |
| TX[a] | | 21,394 | 2.70 | 57,691 | 3.41 | 72,892 | $2,980,186 | $41 |
| UT[a] | | 16,003 | 3.45 | 55,225 | 2.29 | 36,623 | $2,852,798 | $78 |
| WA[a] | | 19,342 | 6.14 | 118,715 | 3.68 | 71,259 | $6,132,560 | $86 |
| WI[d] | | 70,251 | 8.58 | 602,549 | 4.99 | 350,767 | $33,147,689 | $95 |
| Sum | | 1,060,273 | | 6,110,666 | | 6,056,129 | $502,381,285 | |
| Mean | | | 5.76 | | 5.71 | | | $83 |

[a] All hunter expenditures calculated as residents

[b] 2006, 2007, and 2008 data only

[c] 2009 data only

[d] 2006 and 2007 data only

[e] 2008 data only

[f] Based on pheasant hunting zone A of western NY. An estimated 60% of the hunters and harvest involved wild pheasants so hunter and harvest values were reduced by 40%.

[g] based on 1.8 days hunted per season as estimated by Jonathan O'Dell, Arizona Game and Fish Department

[h] 2006 and 2008 data only

[i] An estimated 7.5% of the hunters and harvest involved wild pheasants so hunter and harvest values were reduced by 92.5%, based on 2007 and 2009 data only.

## Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**Idaho**

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative nest success | 0.100 | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.000 | 0.401 | 0.258 | 0.090 | 0.252 |
| Weighted Nest Success | 0.000 | 0.118 | 0.349 | 0.066 | 0.467 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the state harvest |
|---|---|---|
| 45% | 50% | 100% |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed Harvest | | 12,415 | 36,689 | 6,942 | 49,135 |
| Prehunt Pop | | 36,784 | 108,708 | 20,568 | 145,584 |
| Acres/live bird | | 34.64 | 7.53 | 13.86 | 5.50 |
| Acres/Harvested Bird | | 102.64 | 22.31 | 41.06 | 16.29 |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | | Estimated Harvest (survey data) | Calculated Harvest |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | | |
| 1993 | | 1,044,600 | 849,900 | 280,000 | 846,147 | 129,100 | 107,024 |
| 1994 | | 1,015,200 | 789,000 | 230,000 | 846,147 | 115,400 | 102,790 |
| 1995 | | 1,096,000 | 769,400 | 300,000 | 844,526 | 114,600 | 104,305 |
| 1996 | | 995,600 | 859,600 | 280,000 | 819,035 | 166,500 | 105,317 |
| 1997 | | 1,938,932 | 859,200 | 300,000 | 782,466 | 63,300 | 112,733 |
| 1998 | | 1,095,900 | 769,300 | 300,000 | 763,467 | 94,000 | 99,324 |
| 1999 | | 1,142,900 | 710,000 | 280,000 | 739,644 | 110,100 | 95,175 |
| 2000 | | 1,122,900 | 709,000 | 260,000 | 780,955 | 113,100 | 96,984 |
| 2001 | | 1,112,900 | 645,900 | 300,000 | 791,830 | 87,100 | 95,700 |
| 2002 | | 2,177,379 | 1,225,082 | 320,000 | 790,755 | 58,600 | 132,449 |
| 10 yr Ave | | 1,274,231 | 818,638 | 285,000 | 800,497 | 105,180 | 105,180 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest (with varied habitat levels) |
|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2010 NASS Habitat Data | | 1,130,000 | 710,000 | 340,000 | 719,806 | 95,293 |
| Increased CRP | | 1,130,000 | 710,000 | 340,000 | 800,000 | 100,215 |
| Increased Small Grain | | 1,130,000 | 820,000 | 340,000 | 719,000 | 100,173 |
| Harest without the CRP | | 1,130,000 | 710,000 | 340,000 | 0 | 51,111 |

Harvest Goal: 100,000
Acres added: 80,194
Acres added: 110,000
Acres subtracted: 719,806

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments -**

**No Comments**

# Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**Utah**

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative nest success | 0.100 | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.000 | 0.487 | 0.199 | 0.139 | 0.175 |
| Weighted Nest Success | 0.000 | 0.171 | 0.321 | 0.122 | 0.387 |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed Harvest | | 10,702 | 20,119 | 7,668 | 24,248 |
| Prehunt Pop | | 317 | 596 | 227 | 718 |
| Acres/live bird | | 1,743.96 | 379.12 | 697.58 | 276.82 |
| Acres/Harvested Bird | | 51.67 | 11.23 | 20.67 | 8.20 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the state harvest |
|---|---|---|
| 45% | 75% | 100% |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | | Estimated Harvest (survey data) | Calculated Harvest |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | | |
| 1996 | | 545,000 | 294,000 | 160,000 | 224,331 | 83,987 | 44,461 |
| 1997 | | 545,000 | 294,000 | 170,000 | 216,415 | 78,693 | 44,944 |
| 1998 | | 545,000 | 265,000 | 165,000 | 180,160 | 77,889 | 42,121 |
| 1999 | | 550,000 | 259,000 | 160,000 | 186,027 | 77,545 | 41,442 |
| 2000 | | 575,000 | 251,000 | 150,000 | 189,486 | 60,108 | 40,729 |
| 2001 | | 560,000 | 212,000 | 160,000 | 196,650 | 47,521 | 37,451 |
| 2002 | | 565,000 | 148,000 | 150,000 | 197,340 | 40,048 | 31,367 |
| 2003 | | 545,000 | 178,000 | 155,000 | 198,074 | 46,382 | 33,892 |
| 2004 | | 560,000 | 180,000 | 155,000 | 200,255 | 32,532 | 34,360 |
| 2005 | | 540,000 | 179,000 | 160,000 | 200,112 | 82,671 | 34,126 |
| 10 yr Ave | | 553,000 | 226,000 | 158,500 | 198,885 | 62,738 | 38,489 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest (with varied habitat levels) |
|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2010 NASS Habitat Data | | 540,000 | 162,000 | 160,000 | 139,310 | 49,598 |
| Increased CRP | | 540,000 | 162,000 | 160,000 | 225,310 | 60,083 |
| Increased Small Grain | | 540,000 | 279,000 | 160,000 | 139,310 | 60,013 |
| Harest without the CRP | | 540,000 | 279,000 | 160,000 | 0 | 43,028 |

Harvest Goal: 60,000
Acres added: 86,000
Acres added: 117,000
Acres subtracted: 139,310

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments -**

**No Comments**

## Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**Washington**

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative nest success | 0.100 | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.000 | 0.106 | 0.628 | 0.037 | 0.230 |
| Weighted Nest Success | 0.000 | 0.023 | 0.637 | 0.020 | 0.319 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the state harvest |
|---|---|---|
| 40% | 50% | 75% |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed Harvest | | 2,377 | 64,851 | 2,059 | 32,530 |
| Prehunt Pop | | 11,883 | 324,254 | 10,295 | 162,652 |
| Acres/live bird | | 38.88 | 8.45 | 15.55 | 6.17 |
| Acres/Harvested Bird | | 194.39 | 42.26 | 77.76 | 30.86 |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | | Estimated Harvest (survey data) | Calculated Harvest |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | | |
| 1996 | | 464,000 | 3,692,600 | 148,000 | 982,925 | 132,288 | 123,526 |
| 1997 | | 465,000 | 2,642,300 | 139,000 | 1,016,718 | 164,595 | 99,656 |
| 1998 | | 455,000 | 2,890,900 | 135,000 | 1,046,475 | 109,405 | 106,401 |
| 1999 | | 448,000 | 2,641,200 | 120,400 | 1,046,475 | 131,787 | 100,268 |
| 2000 | | 473,200 | 2,672,500 | 144,000 | 1,044,586 | 93,792 | 101,381 |
| 2001 | | 472,000 | 2,634,400 | 166,000 | 1,033,074 | 134,505 | 100,383 |
| 2002 | | 470,000 | 2,664,000 | 280,600 | 1,016,988 | 176,245 | 102,025 |
| 2003 | | 470,000 | 2,530,400 | 141,000 | 809,778 | 155,499 | 90,353 |
| 2004 | | 442,600 | 2,574,600 | 143,000 | 957,903 | 127,738 | 96,084 |
| 2005 | | 460,000 | 2,462,500 | 184,000 | 1,082,594 | 131,701 | 98,090 |
| 10 yr Ave | | 461,980 | 2,740,540 | 160,100 | 1,003,752 | 101,817 | 101,817 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest (with varied habitat levels) |
|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2010 NASS Habitat Data | | 377,500 | 2,171,300 | 181,000 | 1,439,780 | 102,312 |
| Increased CRP | | 377,500 | 2,171,300 | 181,000 | 2,140,780 | 125,030 |
| Increased Small Grain | | 377,500 | 3,130,300 | 181,000 | 1,439,780 | 125,005 |
| Harest without the CRP | | 377,500 | 2,171,300 | 181,000 | 0 | 55,650 |

Harvest Goal: 125,000
Acres added: 701,000
Acres added: 959,000
Acres subtracted: 1,439,780

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments - (Joey J. McCanna WDFW)**
Because of the great importance of CRP to pheasant habitat and hunting in Washington, I decided to select a 10-year period during the CRP era (1991-2000) when harvest representative of the CRP era. Wild rooster pheasant harvest is estimated by surveying 25,000 licensed small game hunters. I used 75% proportion of harvested state wild birds due to a survey we conduct. I used a 50% harvest rate and default relative nest success values because of a lack of better information.

# Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**Colorado**

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative nest success | 0.100 | 0.050 | 0.600 | 0.050 | 0.470 |
| Relative Habitat Availability | 0.000 | 0.065 | 0.547 | 0.030 | 0.358 |
| Weighted Nest Success | 0.000 | 0.006 | 0.655 | 0.003 | 0.336 |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed Harvest | | 476 | 48,370 | 223 | 24,800 |
| Prehunt Pop | | 2,644 | 268,723 | 1,238 | 137,775 |
| Acres/live bird | | 96.38 | 8.03 | 96.38 | 10.25 |
| Acres/Harvested Bird | | 535.45 | 44.62 | 535.45 | 56.96 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the state harvest |
|---|---|---|
| 45% | 40% | 100% |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | | Estimated Harvest (survey data) | Calculated Harvest |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | | |
| 1990 | | 220,300 | 2,116,500 | 155,800 | 1,391,677 | 98,316 | 72,566 |
| 1991 | | 237,100 | 2,014,500 | 150,900 | 1,393,166 | 76,005 | 70,329 |
| 1992 | | 245,300 | 2,045,000 | 124,400 | 1,406,693 | 77,624 | 71,215 |
| 1993 | | 246,700 | 2,181,300 | 93,700 | 1,416,104 | 75,000 | 74,381 |
| 1994 | | 264,000 | 2,273,000 | 75,000 | 1,416,104 | 60,549 | 76,433 |
| 1995 | | 264,000 | 2,274,000 | 105,000 | 1,413,298 | 65,000 | 76,462 |
| 1996 | | 271,000 | 2,214,800 | 126,000 | 1,405,002 | 80,000 | 75,042 |
| 1997 | | 267,500 | 2,284,500 | 133,100 | 1,394,085 | 65,000 | 76,419 |
| 1998 | | 253,800 | 2,163,200 | 117,000 | 1,393,114 | 71,108 | 73,628 |
| 1999 | | 278,300 | 2,016,500 | 112,500 | 1,497,384 | 70,082 | 72,208 |
| 10 yr Ave | | 254,800 | 2,158,330 | 119,340 | 1,412,663 | 73,868 | 73,868 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest (with varied habitat levels) |
|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2010 NASS Habitat Data | | 304,100 | 1,918,500 | 126,700 | 1,588,359 | 71,684 |
| Increased CRP | | 304,100 | 1,918,500 | 126,700 | 1,920,359 | 77,512 |
| Increased Small Grain | | 304,100 | 2,178,500 | 126,700 | 1,588,359 | 77,511 |
| Harest without the CRP | | 304,100 | 1,918,500 | 126,700 | 0 | 43,800 |

Harvest Goal: 70,000 - 85,000 (77,500; midpoint)
Acres added: 332,000
Acres added: 260,000
Acres subtracted: 1,588,359

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments -**

**No Comments**

## Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**Kansas**

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative nest success | 0.100 | 0.100 | 0.590 | 0.250 | 0.240 |
| Relative Habitat Availability | 0.000 | 0.063 | 0.681 | 0.080 | 0.176 |
| Weighted Nest Success | 0.000 | 0.013 | 0.854 | 0.042 | 0.090 |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed Harvest | | 8,742 | 554,759 | 27,481 | 58,317 |
| Prehunt Pop | | 25,903 | 1,643,732 | 81,425 | 172,792 |
| Acres/live bird | | 35.37 | 6.00 | 14.15 | 14.74 |
| Acres/Harvested Bird | | 104.81 | 17.76 | 41.93 | 43.67 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the state harvest |
|---|---|---|
| 45% | 75% | 100% |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | | Estimated Harvest (survey data) | Calculated Harvest |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | | |
| 1996 | | 1,569,300 | 11,108,000 | 223,600 | 2,651,681 | 512,000 | 706,298 |
| 1997 | | 829,500 | 10,804,200 | 1,100,600 | 2,640,815 | 766,000 | 702,808 |
| 1998 | | 926,600 | 10,155,200 | 1,151,600 | 2,475,977 | 681,000 | 664,644 |
| 1999 | | 830,600 | 9,668,400 | 1,114,800 | 2,399,740 | 824,000 | 633,702 |
| 2000 | | 835,400 | 9,298,000 | 1,123,400 | 2,389,539 | 692,000 | 612,870 |
| 2001 | | 821,500 | 9,311,600 | 1,441,800 | 2,508,310 | 426,000 | 623,817 |
| 2002 | | 867,000 | 9,166,900 | 1,323,400 | 2,513,580 | 497,000 | 613,402 |
| 2003 | | 899,300 | 9,908,400 | 1,343,600 | 2,514,038 | 646,000 | 655,942 |
| 2004 | | 844,600 | 9,409,200 | 1,455,900 | 2,664,877 | 685,000 | 633,452 |
| 2005 | | 739,300 | 9,723,100 | 1,242,800 | 2,709,922 | 764,000 | 646,066 |
| 10 yr Ave | | 916,310 | 9,855,300 | 1,152,150 | 2,546,848 | 649,300 | 649,300 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest (with varied habitat levels) |
|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2008 NASS Habitat Data | | 246,300 | 8,687,800 | 1,404,500 | 2,716,000 | 587,081 |
| Increased CRP | | 246,300 | 8,687,800 | 1,404,500 | 7,649,000 | 700,036 |
| Increased Small Grain | | 246,300 | 10,694,800 | 1,404,500 | 2,716,000 | 700,056 |
| Harest without the CRP | | 246,300 | 8,687,800 | 1,404,500 | 0 | 524,890 |

Harvest Goal: 700,000
Acres added: 4,933,000
Acres added: 2,007,000
Acres subtracted: 2,716,000

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments - (Dave Dahlgren, Kansas Game, Fish, & Parks )**
Small grains in KS are nearly all winter wheat during the 1996-2005 period, and 0.59 apparent nest success was taken from Snyder 1984 nest study in winter wheat on the high plains of northeastern Colorado · CRP on the High Plains differs from other areas, and nest success was reported at 0.24 in Berthelsen et al. 1989 on the High Plains in Texas CRP

# Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**Oklahoma**

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative nest success | 0.100 | 0.100 | 0.100 | 0.250 | 0.280 |
| Relative Habitat Availability | 0.000 | 0.023 | 0.715 | 0.065 | 0.197 |
| Weighted Nest Success | 0.000 | 0.016 | 0.493 | 0.112 | 0.380 |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed Harvest | | 1,304 | 40,959 | 9,272 | 31,586 |
| Prehunt Pop | | 5,798 | 182,041 | 41,207 | 140,381 |
| Acres/live bird | | 13.54 | 13.54 | 5.42 | 4.84 |
| Acres/Harvested Bird | | 60.18 | 60.18 | 24.07 | 21.49 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the state harvest |
|---|---|---|
| 45% | 50% | 100% |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | | Estimated Harvest (survey data) | Calculated Harvest |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | | |
| 1999 | | 86,000 | 3,840,000 | 190,500 | 628,140 | 73,907 | 102,369 |
| 2000 | | 73,000 | 2,830,000 | 173,000 | 662,690 | 120,203 | 86,252 |
| 2001 | | 84,500 | 2,875,000 | 186,000 | 677,834 | 73,233 | 88,435 |
| 2002 | | 100,100 | 1,863,000 | 280,000 | 676,368 | 57,358 | 75,716 |
| 2003 | | 73,000 | 2,690,000 | 222,000 | 676,480 | 98,114 | 86,603 |
| 2004 | | 93,300 | 2,665,000 | 252,000 | 688,665 | 82,714 | 88,338 |
| 2005 | | 85,700 | 2,485,000 | 229,000 | 686,597 | 97,037 | 84,169 |
| 2006 | | 81,000 | 2,235,000 | 243,000 | 698,888 | 71,053 | 81,091 |
| 2007 | | 90,000 | 1,965,000 | 227,000 | 713,229 | 80,783 | 76,756 |
| 2008 | | 18,500 | 1,203,000 | 229,500 | 680,287 | 76,807 | 61,479 |
| 10 yr Ave | | 78,510 | 2,465,100 | 223,200 | 678,918 | 83,121 | 83,121 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest (with varied habitat levels) |
|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2010 NASS Habitat Data | | 100,000 | 1,790,000 | 290,000 | 610,000 | 71,829 |
| Increased CRP | | 100,000 | 1,790,000 | 290,000 | 1,109,000 | 95,045 |
| Increased Small Grain | | 100,000 | 3,190,000 | 290,000 | 610,000 | 95,091 |
| Harest without the CRP | | 100,000 | 1,790,000 | 290,000 | 0 | 43,450 |

Harvest Goal: 95,000
Acres added: 499,000
Acres added: 1,400,000
Acres subtracted: 610,000

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments - (Doug Schoeling, Upland Game Biologist, ODWC)**
Oklahoma has a small proportion of the state in pheasant range. It is hard to come up with accurate numbers for Oklahoma for all categories. I used some of SD numbers due to lack of data in Oklahoma. Wild rooster pheasant harvest is estimated by surveying licensed hunters. The Conservation cove habitat type is CRP data and can be a little misleading because not all of the CRP is in native grasses so it might not be as beneficial to pheasants. I used SD estimates for the prehunt sex ratio and Harvest rate due to lack of data in OK. Generally for OK the birds are associated with summer agriculture so if there is a large number of summer crops and have normal rainfall amounts the population generally get a population response.

# Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**Texas**

| Production Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Rangeland | Sm Grains | Playas | CRP |
| Relative nest success | 0.100 | 0.400 | 0.500 | 0.630 |
| Relative Habitat Availability | 0.700 | 0.123 | 0.034 | 0.143 |
| Weighted Nest Success | 0.310 | 0.218 | 0.075 | 0.398 |

| Variable | Habitat Types | | | |
|---|---|---|---|---|
| | Rangeland | Sm Grains | Playas | CRP |
| Distributed Harvest | 23,235 | 16,324 | 5,608 | 29,850 |
| Prehunt Pop | 103,265 | 72,553 | 24,926 | 132,666 |
| Acres/live bird | 70.21 | 17.55 | 14.04 | 11.14 |
| Acres/Harvested Bird | 312.03 | 78.01 | 62.41 | 49.53 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the state harvest |
|---|---|---|
| 45% | 50% | 100% |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | Estimated Harvest (survey data) | Calculated Harvest |
|---|---|---|---|---|---|---|
| | Rangeland | Sm Grains | Playas | CRP | | |
| 1999 | 7,250,000 | 1,528,000 | 350,000 | 1,324,114 | 80,584 | 75,164 |
| 2000 | 7,250,000 | 930,000 | 350,000 | 1,437,000 | 93,012 | 69,778 |
| 2001 | 7,250,000 | 1,463,000 | 350,000 | 1,495,635 | 86,650 | 77,794 |
| 2002 | 7,250,000 | 765,000 | 350,000 | 1,492,887 | 57,522 | 68,791 |
| 2003 | 7,250,000 | 1,344,000 | 350,000 | 1,489,677 | 65,990 | 76,148 |
| 2004 | 7,250,000 | 1,505,000 | 350,000 | 1,495,037 | 59,220 | 78,321 |
| 2005 | 7,250,000 | 1,572,000 | 350,000 | 1,483,144 | 72,418 | 78,939 |
| 2006 | 7,250,000 | 584,500 | 350,000 | 1,521,941 | 48,982 | 67,064 |
| 2007 | 7,250,000 | 1,850,000 | 350,000 | 1,539,244 | 86,592 | 83,636 |
| 2008 | 7,250,000 | 1,193,000 | 350,000 | 1,505,780 | 99,203 | 74,538 |
| 10 yr Ave | 7,250,000 | 1,273,450 | 350,000 | 1,478,446 | 75,017 | 75,017 |

| Habitat Variable | Habitat Types | | | | Predicted Harvest (with varied habitat levels) |
|---|---|---|---|---|---|
| | Rangeland | Sm Grains | Playas | CRP | |
| 2010 NASS Habitat Data | 7,250,000 | 1,250,000 | 350,000 | 1,500,000 | 75,152 |
| Increased CRP | 7,250,000 | 1,250,000 | 350,000 | 2,240,000 | 90,093 |
| Increased Small Grain | 7,250,000 | 2,410,000 | 350,000 | 1,500,000 | 90,022 |
| Harest without the CRP | 7,250,000 | 1,250,000 | 350,000 | 0 | 44,867 |

Harvest Goal: 700,000
Acres added: 740,000
Acres added: 1,160,000
Acres subtracted: 1,500,000

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments - (Robert Perez, TPWD)**

Because of the great importance of weather in a semi-arid environment and recent trends in a reduction of grains and an increase in cotton production, a ten year period (1999-2008) was chosen which represents the fluction of pheasant abundance as related to climate and crop trends. Wild rooster pheasant harvest is estimated by surveying licensed small game hunters. Shooting preserves in the Texas Panhadle region are few and we do not feel contribute to estimates of wild bird harvest. There is very little tame pasture due to climate so this category is re-named to rangeland which only has a fair value for Texas pheasants. Playas and wheat are both good to excellent nesting habitat in most years both having drawbacks such as destruction of nests during harvest and higher than average rainfall filling in playa basins completely. District 11 was used in the NASS database because it captures over 95% of the area where pheasants are hunted. Rangeland acreage was estimated using the 2002 and 2007 USDA Census of Agriculture for the 23 counties in District 11. In 2012, 817,000 acres are coming out of Texas CRP and the majority of this is in the pheasant range. Whether or not this acreage is re-enrolled or if additional acreage is enrolled is largely dependent on weather. If Texas remains in drought, producers will likely re-enroll but if we continue to get rains producers will likely plant cotton in expired CRP or otherwise break it out. Prehunt sex ratio of 45% males based on sex ratios observed in other states and a 50% harvest rate based on winter sex ratio data and default relative nest success values because of a lack of better information.

# Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**Nebraska**

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative nest success | 0.100 | 0.060 | 0.620 | 0.190 | 0.690 |
| Relative Habitat Availability | 0.000 | 0.057 | 0.287 | 0.476 | 0.179 |
| Weighted Nest Success | 0.000 | 0.009 | 0.450 | 0.229 | 0.313 |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed Harvest | | 4,197 | 216,639 | 110,035 | 150,537 |
| Prehunt Pop | | 17,059 | 880,645 | 447,295 | 611,938 |
| Acres/live bird | | 21.98 | 2.13 | 6.94 | 1.91 |
| Acres/Harvested Bird | | 89.36 | 8.65 | 28.22 | 7.77 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the state harvest |
|---|---|---|
| 30% | 82% | 100% |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | | Estimated Harvest (survey data) | Calculated Harvest |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | | |
| 1995 | | 450,000 | 2,216,000 | 3,150,000 | 1,377,246 | 642,744 | 550,167 |
| 1996 | | 350,000 | 2,239,000 | 3,150,000 | 1,370,687 | 549,415 | 550,864 |
| 1997 | | 600,000 | 2,011,000 | 3,200,000 | 1,245,419 | 477,857 | 512,946 |
| 1998 | | 400,000 | 1,915,000 | 3,200,000 | 1,046,416 | 650,000 | 473,996 |
| 1999 | | 400,000 | 1,793,000 | 3,200,000 | 997,878 | 564,000 | 453,641 |
| 2000 | | 250,000 | 1,700,000 | 2,950,000 | 1,044,703 | 487,000 | 438,375 |
| 2001 | | 400,000 | 1,664,000 | 3,200,000 | 1,133,239 | 336,000 | 456,144 |
| 2002 | | 350,000 | 1,579,000 | 3,050,000 | 1,140,754 | 334,757 | 441,407 |
| 2003 | | 250,000 | 1,914,000 | 3,150,000 | 1,149,499 | 366,594 | 483,696 |
| 2004 | | 300,000 | 1,703,000 | 2,800,000 | 1,191,300 | 405,701 | 452,832 |
| 10 yr Ave | | 375,000 | 1,873,400 | 3,105,000 | 1,169,714 | 481,407 | 481,407 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest (with varied habitat levels) |
|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2010 NASS Habitat Data | | 120,000 | 1,700,000 | 2,705,000 | 1,092,760 | 434,422 |
| Increased CRP | | 120,000 | 1,700,000 | 2,705,000 | 1,602,760 | 500,057 |
| Increased Small Grain | | 120,000 | 2,270,000 | 2,705,000 | 1,092,760 | 500,337 |
| Harest without the CRP | | 120,000 | 1,700,000 | 2,705,000 | 0 | 293,789 |

Harvest Goal: 500,000
Acres added: 510,000
Acres added: 570,000
Acres subtracted: 1,092,760

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments - (Dr. Jeffrey J. Lusk, Nebraska Game & Parks Commission)**
Pre-hunt sex ratio (% males) data was obtained from Baxter & Wolfe 1973 from sex-ratio surveys conducted from 1 April through 12 May 1961-1965. Likewise, harvest rate (% of pre-hunt males harvested) was based on data presented in Baxter & Wolfe 1973. I used estimates of bird per 100 acres, to calculate total birds on the study site, then calculated the number of males based on sex ratio, then used adjusted harvest estimates to determine mean harvest rate between 1956-1964. Hunters are instructed to only count wild birds they harvested, not captive-reared/game-farm kills. Relative nest success on CRP based on Matthews 2009 from comparison of grasslands to managed CRP in Northeast Nebraska in 2005-6. The remaining relative nest success estimates are based on data from Baxter & Wolfe 1973.

## Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**North Dakota**

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative nest success | 0.100 | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.548 | 0.088 | 0.052 | 0.072 | 0.239 |
| Weighted Nest Success | 0.214 | 0.034 | 0.093 | 0.071 | 0.588 |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed Harvest | 97,881 | 15,749 | 42,351 | 32,269 | 269,160 |
| Prehunt Pop | 290,017 | 46,664 | 125,484 | 95,612 | 797,512 |
| Acres/live bird | 26.11 | 26.11 | 5.68 | 10.44 | 4.14 |
| Acres/Harvested Bird | 77 | 77.36 | 16.82 | 30.94 | 12.28 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the state harvest |
|---|---|---|
| 45% | 75% | 100% |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | | Estimated Harvest (survey data) | Calculated Harvest |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | | |
| 1997 | | 1,164,000 | 859,960 | 1,026,500 | 2,875,000 | 136,076 | 333,499 |
| 1998 | | 1,153,500 | 805,870 | 906,500 | 3,750,000 | 219,873 | 397,529 |
| 1999 | | 1,206,500 | 841,230 | 1,106,500 | 3,200,000 | 258,335 | 361,988 |
| 2000 | | 1,111,500 | 807,680 | 765,500 | 3,125,000 | 283,759 | 341,637 |
| 2001 | | 1,346,500 | 837,110 | 835,000 | 3,300,000 | 421,586 | 362,923 |
| 2002 | 10,772,643 | 1,170,000 | 691,020 | 1,413,000 | 3,325,000 | 517,821 | 511,928 |
| 2003 | 6,771,570 | 1,355,000 | 598,840 | 1,035,000 | 3,325,000 | 592,066 | 444,900 |
| 2004 | 6,771,570 | 1,084,000 | 624,830 | 895,000 | 3,375,000 | 584,019 | 442,489 |
| 2005 | 6,771,570 | 1,468,000 | 567,950 | 1,044,000 | 3,375,000 | 809,775 | 448,886 |
| 2006 | 6,771,570 | 1,124,000 | 487,560 | 958,000 | 3,400,000 | 750,787 | 438,916 |
| 10 yr Ave | 7,571,785 | 1,218,300 | 712,205 | 998,500 | 3,305,000 | 457,410 | 457,410 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest (with varied habitat levels) |
|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2010 NASS Habitat Data | 6,300,000 | 1,525,000 | 591,960 | 948,000 | 2,656,000 | 383,297 |
| Increased CRP | 6,300,000 | 1,525,000 | 591,960 | 948,000 | 5,325,000 | 600,661 |
| Increased Small Grain | 6,300,000 | 1,525,000 | 4,241,960 | 948,000 | 2,656,000 | 600,342 |
| Harest without the CRP | 6,300,000 | 1,525,000 | 591,960 | 948,000 | 0 | 166,992 |

Harvest Goal: 600,000
Acres added: 2,669,000
Acres added: 3,650,000
Acres subtracted: 2,656,000

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments - (Stan Kohn, ND Game and Fish Dept)**
Because of the great importance of CRP to pheasant habitat and hunting in North Dakota, I followed Kurts outline for Minnesota,by selecting a 10-year period during the CRP era (1987-2009) that most closely matched the average CRP-era harvest of 437,000 roosters. The best fit was 1997-2006 when harvest averaged 457, 410 roosters/year. Furthermore, the period included a range of weather conditions including 2 severe winters (1997 and 2001) with resulting low pheasant populations and 2 mild winters (2005 and 2006) with resulting high pheasant populations. Similar to Kurt (MN), I assumed pheasant harvest estimates from Minnesota's small game survey included only wild birds because Minnesota has no formal stocking program and survey respondents are asked to exclude birds taken on shooting preserves and game farms. I estimated habitat data for only the 34-county pheasant range of North Dakota. Since only a small percentage of small grains provide nesting cover in the spring for pheasants in North Dakota, I compiled NASS data for each of the major small grains for 1997-2006, then multiplied it by 10% as the the amount of each small grain available for pheasant nesting in the spring. Only a small percentage of small grains provide nesting cover in the spring for pheasants in North Dakota. Consequently, I compiled NASS data for each of the major small grains for 1997-2006, then multiplied it by 10% as the the amount of each small grain available for pheasant nesting in the spring. I chose to estimate pasture acres because it seems to be important nesting cover in North Dakota when grass is of sufficient height even though it became difficult to extract exact acreage for each year. I estimated the prehunt sex ratio to be 45% males based on the average sex ratio of 29% adult male birds observed on our winter pheasant counts during 1958-1970 and average recruitment of young (see Stokes 1954:87) and assuming a

# Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**South Dakota**

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative nest success | 0.100 | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.527 | 0.164 | 0.079 | 0.109 | 0.121 |
| Weighted Nest Success | 0.252 | 0.078 | 0.175 | 0.130 | 0.365 |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed Harvest | 320,124 | 99,638 | 221,806 | 165,064 | 464,449 |
| Prehunt Pop | 1,422,771 | 442,838 | 985,803 | 733,616 | 2,064,217 |
| Acres/live bird | 5.62 | 5.62 | 1.22 | 2.25 | 0.89 |
| Acres/Harvested Bird | 24.99 | 24.99 | 5.43 | 10.00 | 3.97 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the state harvest |
|---|---|---|
| 45% | 50% | 100% |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | | Estimated Harvest | Calculated Harvest |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | (survey data) | |
| 1993 | 8000000 | 2,300,000 | 1,450,000 | 1,700,000 | 1,997,269 | 1,213,800 | 1,352,634 |
| 1994 | 8000000 | 2,500,000 | 1,350,000 | 1,600,000 | 1,997,269 | 1,370,600 | 1,332,226 |
| 1995 | 8000000 | 2,600,000 | 1,520,000 | 1,700,000 | 1,997,538 | 1,292,400 | 1,377,591 |
| 1996 | 8000000 | 2,500,000 | 1,580,000 | 1,800,000 | 1,958,722 | 1,191,700 | 1,384,852 |
| 1997 | 8000000 | 2,300,000 | 1,150,000 | 1,800,000 | 1,923,930 | 920,700 | 1,288,928 |
| 1998 | 8000000 | 2,400,000 | 1,420,000 | 1,600,000 | 1,998,912 | 1,186,700 | 1,341,524 |
| 1999 | 8000000 | 2,400,000 | 1,260,000 | 1,600,000 | 1,699,103 | 1,464,200 | 1,236,491 |
| 2000 | 8000000 | 2,650,000 | 1,280,000 | 1,400,000 | 1,551,402 | 1,447,700 | 1,192,934 |
| 2001 | 8000000 | 3,000,000 | 370,000 | 1,700,000 | 1,642,033 | 1,361,300 | 1,092,294 |
| 2002 | 8000000 | 2,250,000 | 670,000 | 1,600,000 | 1,657,212 | 1,261,700 | 1,111,326 |
| 10 yr Ave | 8000000 | 2,490,000 | 1,205,000 | 1,650,000 | 1,842,339 | 1,271,080 | 1,271,080 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest (with varied habitat levels) |
|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2010 NASS Habitat Data | 8,000,000 | 2,150,000 | 1,300,000 | 1,450,000 | 1,250,000 | 1,105,627 |
| Increased CRP | 8,000,000 | 2,150,000 | 1,300,000 | 1,450,000 | 1,900,000 | 1,269,490 |
| Increased Small Grain | 8,000,000 | 2,150,000 | 2,200,000 | 1,450,000 | 1,250,000 | 1,271,291 |
| Harest without the CRP | 8,000,000 | 2,150,000 | 1,300,000 | 1,450,000 | 225,000 | 847,227 |

Harvest Goal: 1,270,000
Acres added: 650,000
Acres added: 900,000
Acres subtracted: 1,025,000

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments - (Travis Runia, SD GFP)**
Because of the great importance of CRP to pheasant habitat and hunting in South Dakota, I decided to select a 10-year period during the CRP era (1993-2002) when harvest representative of the CRP era. The best fit was 1997-2006 when harvest averaged 1,270,000 roosters/year. Harvest was lowest in 1997 following one of the most severe winters in South Dakota history.
Wild rooster pheasant harvest is estimated by surveying licensed small game hunters. South Dakota's small game surveys are not sent to hunters only posessing a shooting preserve license, hunters licensed for small game hunting are allowed to hunt on shooting preserves. In an attempt to exclude released birds from the harvest estimate, a 5 bird per day maximum is used during analyses. I used statewide habitat data, except for pasture in which only acres for east of the Missourri River and the Counties of Lyman, Tripp, and Gregory Counties east of the river. Pastureland in western SD is likely of limited value to nesting pheasants because of climatic, soil, and landscape limitations. Pastureland acreage was estimated using the 2006 FSA cropland GIS data set (56 meter resolution). Land identified as grass/pasture/non-ag was extracted and summed for the area of interest Because land depicted as grassland in this data set also includes the conservation cover category and grass hay, the total acreage was reduced. Additionally, interior portions of very large tracts of pastureland likely attract few pheasants (e.g. Missouri river breaks, portions of the Missourri and prairie coteau escarpments), the total acreage was adjusted downward by approximately 2.5 million acres.
The conservation cover habitat class is a sumation of CRP, state owned game production areas (GPA), and federal waterfowl production areas (WPA). There is an estimated 225,000 acres of non-CRP conseravtion cover in South Dakota's primary pheasant range. The total acres were adjusted downward as much of the GPA and WPA acreage is permanent open water and not available to nesting pheasants. I estimated the prehunt sex ratio to be 45% males based on sex ratios observed during August roadside surveys during 1993-2002. I used a 50% harvest rate based on winter sex ratio data and default relative nest success values because of a lack of better information.

## Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**Illinois**

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative nest success | 0.100 | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.000 | 0.351 | 0.256 | 0.096 | 0.298 |
| Weighted Nest Success | 0.000 | 0.096 | 0.323 | 0.066 | 0.515 |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed Harvest | | 17,160 | 57,506 | 11,704 | 91,708 |
| Prehunt Pop | | 50,845 | 170,387 | 34,679 | 271,727 |
| Acres/live bird | | 7.25 | 1.58 | 2.90 | 1.15 |
| Acres/Harvested Bird | | 21.49 | 4.67 | 8.60 | 3.41 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the state harvest |
|---|---|---|
| 45% | 75% | 100% |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | | Estimated Harvest (survey data) | Calculated Harvest |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | | |
| 1996 | | 420,500 | 320,700 | 115,800 | 276,746 | 237,382 | 182,797 |
| 1997 | | 432,600 | 327,100 | 118,000 | 259,818 | 215,326 | 180,024 |
| 1998 | | 423,900 | 363,000 | 100,400 | 245,117 | 188,740 | 180,946 |
| 1999 | | 357,000 | 288,600 | 111,100 | 250,579 | 138,368 | 164,755 |
| 2000 | | 374,100 | 243,000 | 100,200 | 276,778 | 171,639 | 162,203 |
| 2001 | | 375,300 | 200,300 | 86,200 | 328,787 | 158,304 | 166,736 |
| 2002 | | 354,200 | 193,600 | 92,900 | 360,577 | 142,026 | 174,418 |
| 2003 | | 328,900 | 255,700 | 89,200 | 367,364 | 181,976 | 188,092 |
| 2004 | | 310,500 | 288,900 | 94,600 | 374,033 | 200,059 | 196,924 |
| 2005 | | 311,100 | 205,900 | 97,800 | 388,787 | 146,961 | 183,885 |
| 10 yr Ave | | 368,810 | 268,680 | 100,620 | 312,859 | 178,078 | 178,078 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest (with varied habitat levels) |
|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2010 NASS Habitat Data | | 242,400 | 91,800 | 83,100 | 405,600 | 159,486 |
| Increased CRP | | 242,400 | 91,800 | 83,100 | 475,600 | 180,005 |
| Increased Small Grain | | 242,400 | 187,800 | 83,100 | 405,600 | 180,033 |
| Harest without the CRP | | 242,400 | 91,800 | 83,100 | 0 | 40,593 |

Harvest Goal: 180,000
Acres added: 70,000
Acres added: 96,000
Acres subtracted: 405,600

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments - (Mike Wefer, Illinois DNR)**
Small grains included only winter wheat and oats as rye and flaxseed did not appear in the Illinois NASS data. I looked at our August brood count dataand it did not look very dependable. Many of the routes have gone from gravel to paved with yellow lines. We discontinued them last year. I assumed that our harvest survey is only counting wild birds.

# Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**Iowa**

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative nest success | 0.100 | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.000 | 0.339 | 0.062 | 0.105 | 0.494 |
| Weighted Nest Success | 0.000 | 0.085 | 0.072 | 0.065 | 0.778 |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed Harvest | | 91,568 | 77,433 | 70,770 | 841,705 |
| Prehunt Pop | | 308,622 | 260,980 | 238,525 | 2,836,889 |
| Acres/live bird | | 4.11 | 0.89 | 1.64 | 0.65 |
| Acres/Harvested Bird | | 13.85 | 3.01 | 5.54 | 2.20 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the state harvest |
|---|---|---|
| 43% | 69% | 100% |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | | Estimated Harvest (survey data) | Calculated Harvest |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | | |
| 1994 | | 1,250,000 | 475,000 | 500,000 | 2,205,788 | 1,245,580 | 1,341,853 |
| 1995 | | 1,350,000 | 260,000 | 350,000 | 2,201,355 | 1,443,010 | 1,248,557 |
| 1996 | | 1,200,000 | 230,000 | 450,000 | 2,178,228 | 1,367,060 | 1,235,291 |
| 1997 | | 1,200,000 | 255,000 | 450,000 | 1,759,678 | 1,340,050 | 1,053,176 |
| 1998 | | 1,250,000 | 217,000 | 320,000 | 1,513,278 | 1,237,980 | 908,594 |
| 1999 | | 1,300,000 | 206,000 | 400,000 | 1,485,946 | 899,174 | 910,558 |
| 2000 | | 1,300,000 | 198,000 | 430,000 | 1,600,662 | 1,001,867 | 965,507 |
| 2001 | | 1,250,000 | 148,000 | 400,000 | 1,804,170 | 470,116 | 1,032,457 |
| 2002 | | 1,250,000 | 191,000 | 350,000 | 1,867,303 | 729,460 | 1,066,437 |
| 2003 | | 1,330,000 | 151,000 | 270,000 | 1,884,556 | 1,080,466 | 1,052,333 |
| 10 yr Ave | | 1,268,000 | 233,100 | 392,000 | 1,850,096 | 1,081,476 | 1,081,476 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest (with varied habitat levels) |
|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2010 NASS Habitat Data | | 880,000 | 80,000 | 320,000 | 1,680,000 | 912,215 |
| Increased CRP | | 880,000 | 80,000 | 320,000 | 1,880,000 | 1,003,205 |
| Increased Small Grain | | 880,000 | 360,000 | 320,000 | 1,680,000 | 1,005,227 |
| Harest without the CRP | | 880,000 | 80,000 | 300,000 | 0 | 144,285 |

Harvest Goal: 1,000,000
Acres added: 200,000
Acres added: 280,000
Acres subtracted: 1,680,000

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments - (Todd Bogenschutz, Iowa DNR)**
Iowa's average pheasant harvest thru the peak CRP years (1987-06) was 1.09M birds. Iowa has suffered extreme weather from 2007-09 so I did not include these years. I selected the 10 yr period of 1994-03 as representative for Iowa. Average harvest was 1.08M and we saw a range of habitat and weather conditions, good weather years in 1995-96, and wet and snowy 1999 and 2001. A big decline in G-CRP in 1997 and recovery of some C-CRP from 1999 on. Iowa small grain data only includes wheat and oat acres as NASS website reported no acres for Barely, Flax, or Rye in Iowa.

Iowa's small game survey only asks respondents to report wild bird harvest, so harvest is assumed to be only wild birds. Habitat data for Iowa includes the entire state, as pheasants are found statewide. I chose not to estimate pasture acres because of the difficulty of extracting meaningful information from the Census of Agriculture reports. I estimated the (1987-06) FYg/FAd age ratio to be1.89 based on our August pheasant counts (hen totals corrected for broods seen without a hen). I then used Stokes table (1954:88) and our 1963-90 adult winter sex ratio (3.43F:1M) to calculate a prehunt sex ratio of 43% males. I used an estimated harvest rate of 69% from winter sex ratio counts (1962-90). I used the default relative nest success values because of a lack of better information.

## Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**Minnesota**

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative nest success | 0.100 | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.000 | 0.290 | 0.233 | 0.091 | 0.386 |
| Weighted Nest Success | 0.000 | 0.072 | 0.267 | 0.056 | 0.605 |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed Harvest | | 28,859 | 106,637 | 22,540 | 242,063 |
| Prehunt Pop | | 85,509 | 315,962 | 66,785 | 717,225 |
| Acres/live bird | | 12.37 | 2.69 | 4.95 | 1.96 |
| Acres/Harvested Bird | | 36.64 | 7.97 | 14.66 | 5.82 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the state harvest |
|---|---|---|
| 45% | 75% | 100% |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | | Estimated Harvest (survey data) | Calculated Harvest |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | | |
| 1997 | | 1,087,700 | 1,159,700 | 397,600 | 1,446,815 | 248,000 | 451,122 |
| 1998 | | 1,138,500 | 1,019,400 | 412,700 | 1,176,195 | 309,000 | 389,401 |
| 1999 | | 1,186,700 | 1,109,900 | 389,800 | 1,203,088 | 339,000 | 405,138 |
| 2000 | | 1,125,100 | 933,600 | 321,000 | 1,265,956 | 375,000 | 387,441 |
| 2001 | | 1,075,300 | 864,200 | 317,100 | 1,349,260 | 267,000 | 391,426 |
| 2002 | | 1,013,100 | 872,600 | 287,300 | 1,453,882 | 358,000 | 406,736 |
| 2003 | | 993,400 | 827,400 | 297,100 | 1,501,232 | 511,000 | 409,334 |
| 2004 | | 979,300 | 748,400 | 270,200 | 1,538,629 | 420,000 | 403,627 |
| 2005 | | 986,600 | 795,500 | 296,900 | 1,555,661 | 586,000 | 414,488 |
| 2006 | | 989,700 | 164,300 | 314,200 | 1,589,221 | 588,000 | 342,288 |
| 10 yr Ave | | 1,057,540 | 849,500 | 330,390 | 1,407,994 | 400,100 | 400,100 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest (with varied habitat levels) |
|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2010 NASS Habitat Data | | 773,900 | 731,300 | 414,000 | 1,550,400 | 407,709 |
| Increased Sm Grains | | 773,900 | 1,068,300 | 414,000 | 1,550,400 | 450,012 |
| Increased CRP | | 773,900 | 731,300 | 414,000 | 1,796,400 | 450,001 |
| Increased Sm Grains | | 773,900 | 3,458,300 | 414,000 | 1,550,400 | 750,028 |
| Increased CRP | | 773,900 | 731,300 | 414,000 | 3,541,400 | 750,003 |
| Harvest without CRP | | 773,900 | 731,300 | 414,000 | 712,408 | 263,641 |

Harvest Goal: 450,000 and 750,000
Acres added: 337,000
Acres added: 246,000
Acres added: 2,727,000
Acres added: 1,991,000
Acres subtracted: 2,716,000

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments - (Kurt Haroldson, MN DNR)**
Because of the great importance of CRP to pheasant habitat and hunting in Minnesota, I decided to select a 10-year period during the CRP era (1987-2009) that most closely matched the average CRP-era harvest of 407,000 roosters. The best fit was 1997-2006 when harvest averaged 400,100 roosters/year. Furthermore, the period included a range of weather conditions including 2 severe winters (1997 and 2001) with resulting low pheasant populations and 2 mild winters (2005 and 2006) with resulting high pheasant populations.
I assumed pheasant harvest estimates from Minnesota's small game survey included only wild birds because Minnesota has no formal stocking program and survey respondents are asked to exclude birds taken on shooting preserves and game farms. I estimated habitat data for only the 63-county pheasant range of Minnesota, and I chose not to estimate pasture acres because of the difficulty of extracting meaningful information from the Census of Agriculture reports. I estimated the prehunt sex ratio to be 45% males based on the average sex ratio of 29% adult male birds observed on our winter pheasant counts during 1958-1970 and average recruitment of young (see Stokes 1954:87) and assuming a 50:50 sex ratio of young . I used the default harvest rate and relative nest success values because of a lack of better information.

# Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**Missouri**

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative nest success | 0.100 | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.000 | 0.032 | 0.200 | 0.360 | 0.407 |
| Weighted Nest Success | 0.000 | 0.007 | 0.209 | 0.204 | 0.580 |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed Harvest | | 417 | 11,856 | 11,596 | 32,976 |
| Prehunt Pop | | 1,235 | 35,128 | 34,357 | 97,708 |
| Acres/live bird | | 60.79 | 13.21 | 24.31 | 9.65 |
| Acres/Harvested Bird | | 180.10 | 39.15 | 72.04 | 28.59 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the state harvest |
|---|---|---|
| 45% | 75% | 100% |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | | Estimated Harvest (survey data) | Calculated Harvest |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | | |
| 1991 | | 77,718 | 618,650 | 863,000 | 866,109 | 68,622 | 58,508 |
| 1992 | | 74,719 | 543,600 | 831,600 | 916,687 | 33,711 | 57,908 |
| 1993 | | 73,325 | 610,600 | 817,000 | 978,796 | 57,002 | 61,581 |
| 1994 | | 71,864 | 431,500 | 801,700 | 978,796 | 64,918 | 56,786 |
| 1995 | | 71,692 | 497,400 | 799,900 | 978,453 | 82,001 | 58,431 |
| 1996 | | 79,962 | 546,800 | 886,500 | 998,170 | 50,793 | 61,631 |
| 1997 | | 71,787 | 360,200 | 800,900 | 956,165 | 59,976 | 54,162 |
| 1998 | | 77,651 | 411,500 | 862,300 | 890,168 | 59,935 | 54,048 |
| 1999 | | 78,568 | 296,300 | 871,900 | 910,839 | 46,203 | 51,968 |
| 2000 | | 73,506 | 325,300 | 818,900 | 953,086 | 45,284 | 53,422 |
| 10 yr Ave | | 75,079 | 464,185 | 835,370 | 942,727 | 56,845 | 56,845 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest (with varied habitat levels) |
|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2010 NASS Habitat Data | | 49,200 | 193,400 | 735,800 | 927,292 | 47,863 |
| Increased CRP | | 49,200 | 193,400 | 735,800 | 1,274,292 | 60,001 |
| Increased Small Grain | | 49,200 | 669,400 | 735,800 | 927,292 | 60,020 |
| Harest without the CRP | | 49,200 | 193,400 | 735,800 | 0 | 15,426 |

Harvest Goal: 60,000
Acres added: 347,000
Acres added: 476,000
Acres subtracted: 927,292

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments - (Beth Emmerich, Missouri Dept. of Conservation)**
I chose 1991-2000 for our goals because it represents a range of conditions from high (1995) to average to lower end (1992) harvest levels. I did not adjust the sex ratio or harvest rates due to a lack of information.
I used county estimates for Missouri's pheasant range, which includes 32 counties, with the primary pheasant range being in the northern 1/3 of the state and 3 counties in the bootheel that may or may not still have pheasants remaining. The northern range includes: Atchison, Nodaway, Worth, Harrison, Mercer, Putnam, Schuyler, Scotland, Clark, Holt, Andrew, Dekalb, Gentry, Daviess, Grundy, Sullivan, Adair, Knox, Lewis, Buchanan, Livingston, Linn, Macon, Shelby, Monroe, Audrain, Platte, Carroll, and Saline. The included bootheel counties are New Madrid, Pemiscot, and Dunklin.

# Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**Wisconsin**

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative nest success | 0.100 | 0.170 | 0.310 | 0.170 | 0.630 |
| Relative Habitat Availability | 0.000 | 0.527 | 0.150 | 0.068 | 0.256 |
| Weighted Nest Success | 0.000 | 0.290 | 0.150 | 0.037 | 0.523 |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed Harvest | | 55,335 | 28,652 | 7,123 | 99,762 |
| Prehunt Pop | | 175,667 | 90,960 | 22,612 | 316,704 |
| Acres/live bird | | 7.28 | 3.99 | 7.28 | 1.97 |
| Acres/Harvested Bird | | 23.12 | 12.68 | 23.12 | 6.24 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the state harvest |
|---|---|---|
| 45% | 70% | 79% |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | | Estimated Harvest (survey data) | Calculated Harvest |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | | |
| 1997 | | 1,421,000 | 407,900 | 206,000 | 662,017 | 157,228 | 208,633 |
| 1998 | | 1,415,000 | 382,100 | 182,000 | 603,165 | 157,117 | 195,868 |
| 1999 | | 1,530,000 | 365,700 | 165,000 | 598,632 | 173,027 | 198,087 |
| 2000 | | 1,292,000 | 351,200 | 107,000 | 592,320 | 196,993 | 183,131 |
| 2001 | | 1,227,000 | 304,500 | 124,000 | 636,558 | 177,916 | 184,462 |
| 2002 | | 1,220,000 | 368,000 | 146,000 | 634,889 | 196,295 | 189,851 |
| 2003 | | 1,184,000 | 348,100 | 182,000 | 640,450 | 169,591 | 189,173 |
| 2004 | | 1,183,000 | 378,700 | 164,000 | 619,790 | 141,884 | 187,453 |
| 2005 | | 1,141,000 | 337,200 | 180,000 | 620,082 | 272,619 | 183,103 |
| 2006 | | 1,182,000 | 389,800 | 191,000 | 616,709 | 266,051 | 188,959 |
| 10 yr Ave | | 1,279,500 | 363,320 | 164,700 | 622,461 | 190,872 | 190,872 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest (with varied habitat levels) |
|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2010 NASS Habitat Data | | 887,000 | 446,800 | 378,000 | 426,400 | 158,283 |
| Increased CRP | | 887,000 | 446,800 | 378,000 | 624,400 | 190,016 |
| Increased Small Grain | | 887,000 | 849,800 | 378,000 | 426,400 | 190,064 |
| Harest without the CRP | | 887,000 | 446,800 | 378,000 | 0 | 89,944 |

Harvest Goal: 190,000
Acres added: 198,000
Acres added: 403,000
Acres subtracted: 426,400

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments - Sharon G Fandel, WI DNR**

Because of the great importance of CRP to pheasant habitat and hunting in Wisconsin, a 10-year period was selected during the CRP era (1987-2009) which closely matched the average CRP-era harvest of roughly 250,000 birds. The time frame of 1997-2006 was chosen and total harvest averaged 243,150. , or 190,900 wild birds/year. Furthermore, the period included a range of weather conditions with resulting low pheasant populations and 2 mild winters (2005 and 2006) with resulting high pheasant populations. Wisconsin has a long-running stocking program (circa 1937), historically stocking over 130,000 pheasants on average each year, including DNR-led public hunting ground releases and Day-Old Chick (DOC) led releases on public lands. Current stocking levels are much lower, averaging around 90,000 birds each year. Both roosters (primarily) and hens are released and a few, selected public hunting grounds are open to hen harvest. For this exercise, all harvest was assumed to be rooster due to lack of hen stocking/harvest information. Pheasant harvest estimates from Wisconsin's small game survey include both **wild** and **stocked** birds. Survey respondents are not asked to differentiate between wild and stocked birds (identification would not be accurate enough to do so), but they are asked to exclude birds taken on shooting preserves and game farms. Harvest rates for stocked pheasants have not been estimated in Wisconsin; as a result, Diefenback 2000 (Pennsylvania) estimates were used. In this study, roosters had a 62.3% harvest rate and hens a 50.4% harvest rate, both on public lands. For this analysis, an average of these two (56%) was utilized. The resulting proportion of harvested game farm birds was then subtracted from the overall pheasant harvest estimate to arrive at a wild pheasant harvest estimate. Habitat data for Wisconsin was estimated for USDA Cropping Districts 40 through 90 only, which includes the primary core pheasant range in the southern third of the state. Pastured acres were not estimated because of the difficulty of extracting meaningful information from the Census of Agriculture reports. Pre-hunt sex ratio was estimated to be 45% males based on the average recruitment of young (Stokes 1954:87 used), assuming a 50:50 sex ratio of young. Harvest rate for Wisconsin estimated at 70% based on (1) the near 1:1 hen:rooster ratio of the pre-hunt population (Stockes 1954:87) and (2) the 2.5:1 hen:rooster ratio ( =sex ratio of 29% adult male birds) observed on previous winter pheasant counts from the long-term Dodge County Project in Wisconsin, resulting in a 60% harvest of roosters + an estimated 10% due to crippling loss/hen harvest. Relative nest success values estimated from previous Wisconsin studies; note that unharvested hay nest success was used for CRP

# Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**Indiana**

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative nest success | 0.100 | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.000 | 0.264 | 0.335 | 0.079 | 0.322 |
| Weighted Nest Success | 0.000 | 0.065 | 0.382 | 0.049 | 0.503 |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed Harvest | | 1,839 | 10,728 | 1,378 | 14,137 |
| Prehunt Pop | | 5,448 | 31,787 | 4,084 | 41,888 |
| Acres/live bird | | 30.29 | 6.59 | 12.12 | 4.81 |
| Acres/Harvested Bird | | 89.76 | 19.51 | 35.90 | 14.25 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the state harvest |
|---|---|---|
| 45% | 75% | 100% |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | | Estimated Harvest (survey data) | Calculated Harvest |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | | |
| 1991 | | 166,065 | 285,100 | 49,735 | 187,794 | 21,911 | 31,028 |
| 1992 | | 154,506 | 154,100 | 46,094 | 212,279 | 22,627 | 25,803 |
| 1993 | | 168,471 | 266,500 | 50,629 | 235,332 | 32,493 | 33,463 |
| 1994 | | 154,011 | 250,500 | 45,989 | 235,332 | 26,852 | 32,353 |
| 1995 | | 169,487 | 197,700 | 50,413 | 234,413 | 35,825 | 29,878 |
| 1996 | | 163,495 | 248,500 | 50,105 | 223,768 | 31,385 | 31,659 |
| 1997 | | 169,025 | 206,300 | 50,475 | 201,351 | 29,753 | 27,995 |
| 1998 | | 171,355 | 193,500 | 51,345 | 177,109 | - | 25,687 |
| 1999 | | 161,953 | 144,100 | 48,747 | 154,748 | - | 21,409 |
| 2000 | | 171,897 | 147,000 | 51,303 | 152,023 | 23,811 | 21,548 |
| 10 yr Ave | | 165,027 | 209,330 | 49,484 | 201,415 | 28,082 | 28,082 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest (with varied habitat levels) |
|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2010 NASS Habitat Data | | 145,000 | 87,300 | 41,700 | 148,200 | 17,653 |
| Increased CRP | | 145,000 | 87,300 | 41,700 | 324,200 | 30,006 |
| Increased Small Grain | | 145,000 | 328,300 | 41,700 | 148,200 | 30,004 |
| Harest without the CRP | | 145,000 | 87,300 | 186,700 | 0 | 11,290 |

Harvest Goal: 30,000
Acres added: 176,000
Acres added: 241,000
Acres subtracted: 148,200

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments - (Budd Veverka, Indiana Division of Fish and Wildlife)**
Due to a lack of current established data, the predetermined default values were used [pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181)].

# Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**Michigan**

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative nest success | 0.100 | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.000 | 0.409 | 0.374 | 0.069 | 0.148 |
| Weighted Nest Success | 0.000 | 0.126 | 0.532 | 0.053 | 0.288 |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed Harvest | | 19,833 | 83,585 | 8,373 | 45,250 |
| Prehunt Pop | | 58,763 | 247,659 | 24,810 | 134,075 |
| Acres/live bird | | 12.20 | 2.65 | 4.88 | 1.94 |
| Acres/Harvested Bird | | 36.14 | 7.86 | 14.45 | 5.74 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the state harvest |
|---|---|---|
| 45% | 75% | 100% |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | | Estimated Harvest (survey data) | Calculated Harvest |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | | |
| 1996 | | - | 929,890 | - | 174,675 | 162,830 | 148,825 |
| 1997 | | - | 652,180 | - | 192,471 | 187,130 | 116,576 |
| 1998 | | 728,220 | 705,410 | 122,972 | 232,918 | 143,150 | 159,063 |
| 1999 | | 787,301 | 629,390 | 132,483 | 300,244 | 193,446 | 163,416 |
| 2000 | | 784,248 | 648,580 | 131,126 | 300,244 | 179,422 | 165,681 |
| 2001 | | 742,731 | 664,270 | 124,729 | 299,505 | 178,748 | 165,958 |
| 2002 | | 702,658 | 609,250 | 118,585 | 301,607 | 175,543 | 157,786 |
| 2003 | | 656,893 | 552,800 | 112,806 | 289,765 | 109,751 | 146,870 |
| 2004 | | 651,023 | 599,000 | 110,852 | 257,084 | 106,456 | 146,756 |
| 2005 | | 680,333 | 575,400 | 114,710 | 246,990 | 133,936 | 143,070 |
| 10 yr Ave | | 716,676 | 656,617 | 121,033 | 259,550 | 157,041 | 157,041 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest (with varied habitat levels) |
|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2010 NASS Habitat Data | | 530,500 | 500,100 | 90,000 | 217,435 | 122,476 |
| Increased CRP | | 530,500 | 500,100 | 90,000 | 375,435 | 150,022 |
| Increased Small Grain | | 530,500 | 717,100 | 90,000 | 217,435 | 150,099 |
| Harest without the CRP | | 530,500 | 500,100 | 90,000 | 0 | 84,568 |

Harvest Goal: 150,000
Acres added: 158,000
Acres added: 217,000
Acres subtracted: 217,435

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments - (Al Stewart, MI DNR)**

Because of the great importance of CRP to pheasant habitat and hunting in Michigan, I decided to select a 10-year period during the CRP era (1990-1999) that most closely matched the average CRP-era harvest of 157,000 roosters. The best fit was 1990-1999 when harvest averaged 157,041 roosters/year. Furthermore, the period included a range of weather conditions including 2 severe winters (1996 and 1997) with resulting low pheasant populations and 2 mild winters (1993 and 1999) with resulting higher pheasant population responses. The harvest goal of 150,000 roosters/year is based on goals of Michigan Pheasant Restoration Initiative with baseline monitoring results of 1.5 broods/mail-carrier day in summer mail-carrier brood survey. I assumed pheasant harvest estimates from Michigan's small game survey included only wild birds because Michigan has no formal stocking program and survey respondents are asked to exclude birds taken on shooting preserves and game farms. I estimated habitat data for only the 43-county pheasant range of Michigan. I estimated the prehunt sex ratio to be 45% males based on the average sex ratio of 29% adult male birds observed on our winter pheasant counts during 1958-1970 and average recruitment of young (see Stokes 1954:87) and assuming a 50:50 sex ratio of young. I used the default harvest rate and relative nest success values because of a lack of better information.

# Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**New York**

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative nest success | 0.100 | 0.100 | 0.308 | 0.440 | 0.630 |
| Relative Habitat Availability | 0.000 | 0.340 | 0.268 | 0.360 | 0.032 |
| Weighted Nest Success | 0.000 | 0.115 | 0.280 | 0.537 | 0.068 |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed Harvest | | 876 | 2,125 | 4,071 | 513 |
| Prehunt Pop | | 5,346 | 12,976 | 24,855 | 3,129 |
| Acres/live bird | | 22.33 | 7.25 | 5.08 | 3.54 |
| Acres/Harvested Bird | | 136.34 | 44.27 | 30.99 | 21.64 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the West NY harvest |
|---|---|---|
| 45% | 26% | 37% |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | | Estimated Harvest (survey data) | Calculated Harvest |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | | |
| 2001 | | 120,800 | 100,000 | 123,400 | 11,092 | 8,537 | 7,640 |
| 2002 | | 142,100 | 115,000 | 117,600 | 11,092 | 7,029 | 7,948 |
| 2003 | | 138,900 | 98,100 | 113,200 | 11,092 | 6,534 | 7,400 |
| 2004 | | 129,500 | 96,300 | 138,800 | 11,092 | 8,700 | 8,117 |
| 2005 | | 124,000 | 105,300 | 90,900 | 11,092 | 5,513 | 6,734 |
| 2006 | | 102,000 | 84,900 | 162,400 | 11,092 | 8,471 | 8,419 |
| 2007 | | 115,800 | 80,800 | 161,800 | 11,092 | 8,303 | 8,409 |
| 2008 | | 101,100 | 82,200 | 120,200 | 11,092 | 7,905 | 6,990 |
| 2009 | | 100,300 | 74,300 | 122,400 | 11,092 | 8,230 | 6,877 |
| 2010 | | 119,500 | 104,000 | 110,900 | 11,092 | 6,629 | 7,317 |
| 10 yr Ave | | 119,400 | 94,090 | 126,160 | 11,092 | 7,585 | 7,585 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest (with varied habitat levels) | |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | | |
| 2010 NASS Habitat Data | | 119,500 | 104,000 | 110,900 | 11,092 | 7,317 | Harvest Goal: 8,500 - 9,000 |
| Increased CRP | | 119,500 | 104,000 | 110,900 | 37,092 | 8,519 | Acres added: 26,000 |
| Increased CRP | | 119,500 | 104,000 | 110,900 | 48,092 | 9,027 | Acres added: 37,000 |
| Increased Grass Hay | | 119,500 | 104,000 | 147,900 | 11,092 | 8,511 | Acres added: 37,000 |
| Increased Grass Hay | | 119,500 | 104,000 | 178,900 | 11,092 | 9,512 | Acres added: 68,000 |
| Increased Small Grain | | 119,500 | 156,500 | 110,900 | 11,092 | 8,503 | Acres added: 52,500 |
| Increased Small Grain | | 119,500 | 178,500 | 110,900 | 11,092 | 9,000 | Acres added: 74,500 |
| Harest without the CRP | | 119,500 | 104,000 | 110,900 | 0 | 6,805 | Acres subtracted: 11,092 |

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments - (Michael Schiavone, NYSDEC)**

The ring-necked pheasant population in New York remains at an all-time low after reaching its peak in the late 1960s. The major surveying tool of the pheasant population is the Department's Farmer Pheasant Inventory which began in 1945 and continues today. Each spring and summer, farmers in the Lakes Plain of western New York are asked to observe pheasants on their farms. The data is collected and summarized in an annual report. A look at the pheasant broods per observer index data show a decline from 3.0 broods per observer in 1969 to 0.19 broods per observer in 2010, over a 90% decline. More recent NYS Breeding Bird Atlas data indicates a 77% decline in the number of confirmed pheasant breeding blocks from 1980-85 to 2000-05 (see http://www.dec.ny.gov/cfmx/extapps/bba/bbaMaps.cfm?bndcode=RPHE&order=2&year=2000&comp=1). For the period 1980-07, the USGS North American Breeding Bird Survey showed a 4.5% decline in pheasants per year. Pheasant abundance is linked to federal farm programs that set-aside large acreage of fallow grasslands. Since the Soil Bank Program set-aside 333,000 acres in 1968 in the Great Lakes Plain of western New York, no other farm program has benefitted pheasants here. In addition, reversion to a forested landscape, changing farming practices, and urbanization have reduced the quantity and quality of pheasant habitat. Pheasant harvest strategies are based on production of about 90,000 pheasants annually (30,000 adult birds released by DEC; 60,000 day-old chicks raised and released by cooperators) by the state-owned and operated game farm and on available pheasant range. The best pheasant range in the Lake Plains of western NY allows cock-only harvest to protect hens, while marginal habitat allows the taking of hens and cocks (the vast majority of which are captive-bred birds). The bag limit is two birds, except for Long Island where the bag is four birds. The season is shorter in the best pheasant range in the Lake Plains of western New York and longer elsewhere to encourage the harvest of released pheasants that generally do not survive to breed and produce offspring. The Department operates one pheasant propagation facility. Production in 2010 included about 30,000 adult pheasants released just prior to and during the fall pheasant hunting season. All birds were released on lands open to public hunting. DEC's Small Game Hunter Survey for 2010-11 indicated that about 18,000 hunters harvested roughly 43,000 pheasants while spending about 87,000 days afield. This is below the five-year average participation (26,000/year from 2005-06 - 2009-10), and harvest (54,000/year from 2005-06 - 2009-10).

## Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**Ohio**

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative nest success | 0.100 | 0.100 | 0.460 | 0.250 | 0.630 |
| Relative Habitat Availability | 0.000 | 0.062 | 0.593 | 0.202 | 0.143 |
| Weighted Nest Success | 0.000 | 0.015 | 0.650 | 0.120 | 0.215 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the state harvest |
|---|---|---|
| 45% | 75% | 100% |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed Harvest | | 1,761 | 77,890 | 14,401 | 25,783 |
| Prehunt Pop | | 5,216 | 230,786 | 42,668 | 76,394 |
| Acres/live bird | | 16.47 | 3.58 | 6.59 | 2.61 |
| Acres/Harvested Bird | | 48.79 | 10.61 | 19.52 | 7.74 |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | | Estimated Harvest (survey data) | Calculated Harvest |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | | |
| 1992 | | 85,900 | 842,900 | 302,800 | 183,591 | 138,817 | 120,449 |
| 1993 | | 85,900 | 769,900 | 272,500 | 221,119 | 139,471 | 116,859 |
| 1994 | | 85,900 | 882,700 | 289,100 | 221,119 | 136,916 | 128,345 |
| 1995 | | 85,900 | 903,500 | 283,700 | 220,512 | 136,632 | 129,951 |
| 1996 | | 85,900 | 984,300 | 273,200 | 213,603 | 132,641 | 136,138 |
| 1997 | | 85,900 | 811,200 | 278,900 | 197,782 | 128,334 | 118,068 |
| 1998 | | 85,900 | 863,200 | 249,800 | 197,412 | 121,802 | 121,431 |
| 1999 | | 85,900 | 757,200 | 270,700 | 182,255 | 120,536 | 110,552 |
| 2000 | | 85,900 | 804,000 | 280,300 | 172,303 | 70,312 | 114,171 |
| 2001 | | 85,900 | 642,800 | 309,500 | 187,108 | 72,883 | 102,381 |
| 10 yr Ave | | 85,900 | 826,170 | 281,050 | 199,680 | 119,834 | 119,834 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest (with varied habitat levels) |
|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | |
| 2010 NASS Habitat Data | | 116,020 | 627,000 | 73,900 | 216,382 | 93,217 |
| Increased CRP | | 116,020 | 627,000 | 73,900 | 423,882 | 120,009 |
| Increased Small Grain | | 116,020 | 911,100 | 73,900 | 216,382 | 120,001 |
| Harest without the CRP | | 116,020 | 627,000 | 73,900 | 0 | 65,277 |

Harvest Goal: 120,000
Acres added: 207,500
Acres added: 284,100
Acres subtracted: 216,382

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments - (Nathan Stricker, OhioDepartment of Natural Resources)**

In Ohio, pheasant populations during the "CRP period" are not really that different from what they are today. Our harvest rates (recorded annually as # cocks harvested per 100 gun hours) are highly variable over time, so my best estimate is that our harvest today is likely not statistically different from what it was 25 years ago or for the intervening years. Our best attempt at identifying a 10-year time period in which pheasant conditions were apparently better than the most recent 25 years is to select the period 1965-1975. This period is also the decade before the 2 blizzard years that affected much upland game in the lower Midwest. Unfortunately, it was not the practice during that time to preserve data for monitoring long-term trends and so we have no annual estimates of harvest (other than # per 100 gun hours). Perusing our archived literature, one annual estimate for that time period was 300,000 wild pheasants harvested, We chose 200,000 as a harvest goal because that is approximately half way between our 10 yr average from 1992-2001 and our estimate for 1965-1975 harvest.

# Appendix C: Habitat model and calculations for each state in the ring-necked pheasant range

**Pennsylvania**

| Production Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Relative nest success | 0.100 | 0.100 | 0.240 | 0.280 | 0.610 |
| Relative Habitat Availability | 0.000 | 0.323 | 0.214 | 0.424 | 0.039 |
| Weighted Nest Success | 0.000 | 0.143 | 0.227 | 0.525 | 0.104 |

| Variable | Habitat Types | | | | |
|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP |
| Distributed Harvest | | 12,384 | 19,681 | 45,446 | 9,013 |
| Prehunt Pop | | 30,960 | 49,202 | 113,616 | 22,532 |
| Acres/live bird | | 19.67 | 8.20 | 7.03 | 3.22 |
| Acres/Harvested Bird | | 49.18 | 20.49 | 17.56 | 8.06 |

| Prehunt Sex Ratio (males) | Harvest Rate (prehunt males harvested) | Wild birds within the state harvest |
|---|---|---|
| 50% | 80% | 45% |

**Procedure**

**Selected a 10-year period representative of pheasant harvest goals for the state.**
**Entered annual estimates of pheasant harvest (wild birds only) for the selected 10-year period.**
**Entered annual estimates of CRP abundance for the selected 10-year period.**
**Downloaded crop data from the National Agricultural Statistics Service website.**

- **Small grains are the sum of barley (all), oats, rye, wheat [all], and flaxseed categories.**
- **Grass hay was estimated as the difference between all hay and alfalfa hay.**
- **If desired, pasture land could be estimated in the NASS Census of Agriculture. Because the census is conducted every 5 years (2007, 2002, 1997, etc.), you would have to interpolate acreages for intervening years.**

**Adjusted prehunt sex ratio and harvest rate as appropriate for the state and document rationale.**
**Adjusted relative nest success values as appropriate for the state and document rationale.**

NASS habitat data and state harvest info used in table above to estimate average production values.

| Year | Habitat Types | | | | | Estimated Wild Harvest | |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | (survey data) | Calculated Harvest |
| 1990 | | 652,200 | 474,290 | 765,900 | 69,921 | 129,938 | 88,692 |
| 1991 | | 638,400 | 431,091 | 796,700 | 71,832 | 104,625 | 88,294 |
| 1992 | | 624,600 | 435,192 | 777,300 | 75,370 | 91,125 | 87,548 |
| 1993 | | 620,100 | 424,293 | 785,300 | 77,968 | 89,438 | 87,702 |
| 1994 | | 634,600 | 372,994 | 801,900 | 77,969 | 81,000 | 86,438 |
| 1995 | | 621,000 | 389,695 | 803,700 | 77,624 | 82,688 | 87,037 |
| 1996 | | 599,700 | 371,696 | 799,300 | 78,179 | 75,938 | 85,543 |
| 1997 | | 587,500 | 364,197 | 795,800 | 74,602 | 72,563 | 84,286 |
| 1998 | | 557,100 | 392,398 | 806,300 | 65,328 | 70,875 | 84,492 |
| 1999 | | 554,700 | 376,799 | 849,500 | 57,778 | 67,050 | 85,205 |
| 10 yr Ave | | 608,990 | 403,265 | 798,170 | 72,657 | 86,524 | 86,524 |

| Habitat Variable | Habitat Types | | | | | Predicted Harvest (with varied habitat levels) | |
|---|---|---|---|---|---|---|---|
| | Pasture | Alfalfa Hay | Sm Grains | Grass Hay | CRP | | |
| 2010 NASS Habitat Data | | 381,800 | 237,400 | 663,400 | 158,713 | 76,810 | Harvest Goal: 100,000 |
| Increased CRP | | 381,800 | 237,400 | 663,400 | 345,713 | 100,006 | Acres added: 187,000 |
| Increased Grass Hay | | 381,800 | 237,400 | 1,071,400 | 158,713 | 100,041 | Acres added: 408,000 |
| Increased Small Grain | | 381,800 | 713,400 | 663,400 | 158,713 | 100,041 | Acres added: 476,000 |
| Harest without the CRP | | 381,800 | 237,400 | 663,400 | 0 | 57,123 | Acres subtracted: 158,123 |

Relative nest success: estimate of relative productivity of each habitat type. Values used here based on Chesness et al. (1968), Trautman (1982), Clark & Bogenschutz (1999), and expert opinion.
Relative habitat availability: proportional abundance of the 4 habitat types, based on the 10-year average.
Weighted nest success: proportion of the pre-hunt population arrising from each habitat type, **assuming habitat use=availability**.
Distributed Harvest: distribution of harvest among habitats based on proportional habitat abundance.
Prehunt population: estimated population prior to the hunting season. Default values - pre-hunt sex ratio of 45% males (Stokes 1954:87) and a harvest rate of 75% of available males (Hill and Robertson 1988: 181).
Acres/live bird: distribution of the pre-hunt population among habitats based on proportional habitat abundance.
Acres/harvested bird: distribution of the harvest among habitats based on proportional habitat abundance and harvest rate.
Calculated Harvest: proportion of habitat multiplied by acres/harvested bird

**Comments - (Scott Klinger, PA Game Commission)**

The 10 year average cock harvest from 1990-1999 was estimated at 192,000 birds. Of this harvest, we estimated that 104,000 were probably pen reared birds, based on the estimated release of 260,000 cock pheasants state wide. This would leave a harvest of 88,000 wild pheasants. At an estimated harvest rate of 45% wild birds and 55% pen reared birds, the model predicts a harvest of 86,524 wild cock pheasants. This is very close to the 88,000 reported harvest. When we apply this same model to 2010 data it estimates a harvest of 77,306 wild cock pheasants under existing habitat conditions in PA. If we assume that the proportion of wild pheasants in the harvest is 20%, the model predicts a wild harvest of 34,358. Based on our Game Take Survey and Propagation survey, we estimated the actual wild pheasant harvest in 2010 at 18,000 wild cock pheasants or 20% of the harvest. If we assume the proportion of wild birds in the harvest is actually 10%, the model predicts an annual harvest of 17,179 wild pheasants based on existing habitat–very close to the 18,000 actual wild cock harvest. Th same model also predicts a wild cock harvest of 140,000 annually, if you assume that 0.80 of the harvest is wild cocks. In the 1970-1980 period, we estimated that the annual pheasant harvest was 80-85% wild pheasants statewide and 95% in primary pheasant range. The wild cock harvest exceeded 500,000 annually. Based on existing habitat, we should be harvesting 140,000 wild cocks annually. Our best estimate is 18,000 annually. The Habitat Model has opened many questions. Our PA Pheasant Plan assumes that secure nesting cover is the limiting factor to pheasant abundance in PA. However, The Habiat Model shows that increasing nesting cover will have only a small effect on abundance of wild pheasants in PA. In states with large amounts of grass cover (Hay, small grains) in an otherwise cropland landscape (most Dairy states), grass cover for nesting may not be the main limiting factor to pheasant abundance. Hen survival, not nesting cover, may be the limiting factor in states with more diverse cropland landscapes, such as PA, NY, WI (. Another possibility is that we have over estimated the value of relative nest success for some cover types. The actual contribution of wild vs Pen reared pheasants to the harvest are only estimates made with cured assumptions. These estimates could be wrong. Finally, we have know information on the genetics of wild and pen reared pheasants. In states such as PA, the release of millions of pen reared pheasants over the past 3 decades may have diluted the gene pool of wild pheasant populations. The impacts of this have not been investigated, but may help to exlain why this Habitat Model predicts much larger wild pheasant populations than current lexist on the landscape. Clearly, more research and monitoring will be necessary to determine the future of pheasants, especially in the states with diverse landscapes and the release of large numbers of pen reared pheasants.