RING-NECKED PHEASANT MANAGEMENT PLAN FOR PENNSYLVANIA 2008-2017

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December 2008

EXECUTIVE SUMMARY

The ring-necked pheasant is one of the most popular game birds in North America. Its native range is Asia. The first recorded attempts to establish the ring-necked pheasant in Pennsylvania (PA) occurred in 1892. Populations grew through the late 1960s and early 1970s, but have declined to a very low level today. The PA Game Commission (PGC) has propagated pheasants since 1929. Pheasant hunting in PA today is largely a product of game farm pheasants. Still, there is a desire to return to wild pheasant hunting in the Commonwealth.

The mission of the Ring-necked Pheasant Management Plan is *"to provide a quality ring-necked pheasant hunting experience in Pennsylvania."* To support this mission statement, the plan identifies supporting goals, objectives and strategies for guiding restoration and management decisions over a 10-year horizon, 2008-2017. This plan provides the most comprehensive look at the ring-necked pheasant ever conducted in PA. Information on taxonomy, biology, habitat relationships, population and habitat trends, propagation, hunting, restoration and partnerships are discussed in detail. The most important part of this Plan is Section I, which outlines the management goals, objectives and strategies. In addition, Appendix 1 contains a schedule to implement, and Appendix 2 includes public comments on the plan.

There are 6 strategic goals identified in the plan. Goal 1 calls for restoring self-sustaining and huntable ring-necked pheasant populations in suitable habitat by establishing Wild Pheasant Recovery Areas (WPRAs). These WPRAs shall be at least 10,000 acres in size and contain required breeding and wintering habitats. Habitat improvements will be implemented to meet habitat targets within WPRAs. Once met, wild-trapped pheasants will be released to establish populations of at least 10 hens per mi^2 in the spring. It is recommended that WPRAs remain closed to game farm pheasant stocking and pheasant hunting and that dog training be restricted during the population establishment period. To reach this goal, an ambitious habitat development program will be required, establishing WPRAs on 2 million acres of potential pheasant habitat. Creation of a PGC Farmland Habitat Incentive Program, expansion and creation of new Conservation Reserve Enhancement Programs (CREP), creation of a U.S. Department of Agriculture (USDA) short term set aside program, and developing and promoting forages that are harvested from July 15-August 15 are strategies that will need to be employed to reach this goal.

Goal 2 seeks to provide pheasant hunting opportunities by annually producing at least 250,000 pheasants at the PGC game farms and maximizing their harvest by sportsmen. This will require upgrading propagation facilities at the game farms and revising stocking protocols to maximize harvest of game farm pheasants on game lands or other lands under cooperative agreement with the PGC. Youth pheasant hunting opportunities will be supported and expanded. In those areas of the Commonwealth that will not support wild pheasant restoration, stocking of game farm pheasants will occur and either-sex pheasant hunting will be permitted.

Informing and educating the public on the status of the pheasant management plan will be key to garnering support needed for habitat improvements (Goal 3). Development of habitat management guidelines and training of PGC, USDA, Pheasants Forever (PF), Farm Bill partners and nongovernmental organizations (NGOs) will aid in this effort.

Creation of pheasant habitat management demonstration areas on SGLs will aid private and public landowners in developing pheasant habitat.

Goal 4 seeks to develop partnerships to restore wild pheasant populations in PA. Cooperative agreements with PF, USDA, U.S. Fish and Wildlife Service (USFWS) and other partners will be required to meet the various habitat objectives identified in the plan. Integration of pheasant recovery efforts into existing federal farm bill and state conservation programs, and collaboration with state and federal agencies, state legislature, counties, townships, and NGOs on planning, zoning, tax incentives, and easements will be necessary.

Population monitoring and research to insure the best management of the pheasant resource are stated in Goal 5. Conducting surveys of hunters and landowners will be valuable in assessing interest and participation in the plan objectives. Monitoring trends in pheasant populations, habitat, harvests and hunter numbers statewide and on WPRAs will be essential. Research in pheasant ecology and propagation will improve the cost-effective management of the pheasant resource. The Plan seeks to determine the genetic diversity of our wild and game farm pheasants, determine the influence of CREP on pheasant abundance and the adequacy of adult and chick food supplies and effects of predators on wild pheasant recovery. The Plan proposes to use adaptive management by developing several models to predict and test pheasant restoration efforts under different land-use conditions in WPRAs.

Lastly, Goal 6 seeks to provide sustainable funding and the resources necessary to implement the pheasant management plan. To offset the cost of pheasant propagation, the Plan recommends establishing a pheasant hunting license that would be required of all pheasant hunters, exempting junior hunters. Implementation of the pheasant management plan will require a substantial annual expenditure on habitat improvements, monitoring and research and pheasant propagation. Game funds, Growing Greener funds and other state and federal revenues will be required. Additional personnel resources may be required to enhance the PGC private lands wildlife management technical assistance program for farmers and other landowners interested in improving pheasant habitat.

Restoring wild pheasant populations will not be easy. We cannot go back to the 600-900 thousand acres of secure nesting and brood rearing cover that were in place in the 1960s and 1970s. However, providing better hunting and more hunting opportunities for pheasants is possible. Only a large-scale habitat restoration effort can restore wild pheasant populations. Implementation of the goals, objectives and strategies of this plan will require the commitment of considerable financial and personnel resources. It will require the support of the sportsmen and women of PA. Most importantly, it will require working with farmers and private landowners, the USDA, PF and other conservation partners to restore farmland ecosystems.

SECTION I. MANAGEMENT GOALS, OBJECTIVES AND STRATEGIES

MISSION STATEMENT: To provide a quality ring-necked pheasant hunting experience in Pennsylvania.

GOAL 1. Restore self-sustaining and huntable ring-necked pheasant populations in suitable habitats throughout PA.

Objective 1.1: Identify all currently suitable and recoverable ring-necked pheasant habitats in PA for wild pheasant releases by 2009.

Strategies

1.1.1. Develop models of potential ring-necked pheasant habitat that can be applied to PA, including land use elements, juxtaposition of habitats, and minimum area.
1.1.2. Using remote sense data and geographic information system tools, apply the pheasant habitat model to identify areas of the Commonwealth that currently are suitable habitat and areas that are nearly suitable but recoverable (i.e., can cost effectively have habitat elements enhanced to make the habitat 'suitable' prior to releases of wild pheasants).
1.1.3. Prioritize identified habitat areas of at least 10,000 acres as Wild Pheasant Recovery Areas (WPRAs) in PA.

Objective 1.2: Maintain or restore 250,000 acres of secure nesting and brood cover and 50,000 acres of winter cover within 2,000,000 acres of farmland in WPRAs by 2015.

Strategies

1.2.1. Within each WPRA establish 25% of cropland in secure nesting/brood cover and 5% of land in winter cover within each 2 mi^2 block of potential habitat.
1.2.2. Prepare and distribute via the agency website and through technical workshops a pheasant habitat manual that identifies pheasant habitat needs and requirements for population recovery.
1.2.3. Identify public lands within WPRAs, develop habitat management guidelines and implement improvements through partnerships, cooperative agreements, contract and food and cover employees.
1.2.4. Develop and implement a Farmland Habitat Incentive Program to provide financial incentives to farmers and other landowners that fit into farming operations to establish and maintain pheasant habitat .
1.2.5. Work with USDA, PF and other partners to enroll WPRA acres in Farm Bill Programs to provide needed pheasant breeding, brood rearing, and winter cover requirements and meet deficiencies outlined in previous objectives.
1.2.6. Reopen the original 20 CREP counties to further CREP enrollment if needed to facilitate habitat enhancements in WPRAs in this area of the state and increase the authorized CREP acres to 350,000 acres state wide.
1.2.7. Establish a Delaware River Basin CREP with a goal of enrolling 15,000 acres by 2015.

1.2.8. Collaborate with USDA, Association of Fish and Wildlife Agencies (AFWA), other partners and Congressional delegation to develop and implement a short term set aside program to reduce soil erosion, return organic matter to the soil, sequester carbon, reduce fertilizer inputs, improve water quality, improve wildlife habitat and improve net farm income. Establish as a USDA Farm Bill Program by 2012.
1.2.9. Collaborate with USDA, The PA State University College of Agriculture and Cooperative Extension to develop forages and biofuel stocks that are harvested after July 15 and before August 15. Promote native warm season grass/forb plantings and rotational grazing.

Objective 1.3: Establish criteria and protocols for WPRA wild ring-necked pheasant acquisitions, releases and monitoring by 2008.

Strategies

1.3.1. Identify characteristics, criteria and procedures for wild pheasants that are to be obtained for releases on WPRAs.
1.3.2. Identify standards for monitoring the survival and dispersal of wild pheasants released on WPRAs.
1.3.3. Identify standards for annually assessing population levels of ring-necked pheasants on WPRAs.

Objective 1.4: Establish wild ring-necked pheasant populations of 10 hens per mi^2 in the spring by the third year after trap and transfer is completed in at least 4 WPRAs by 2015.

Strategies

1.4.1. Establish multi-year agreements with organizations and states to obtain wild-trapped ring-necked pheasants for WPRAs.
1.4.2. When the WPRA habitat targets have been met for an area, conduct baseline pheasant surveys of WPRAs using standard protocols to determine pre-release populations.
1.4.3. Release a minimum of 300 wild pheasants per year for 3 years with a sex ratio of no less than 3 females to 1 male on areas throughout the WPRA. Close pheasant hunting seasons for 6 years, allow no game farm pheasant releases by the PGC or private individuals (excluding permitted shooting preserves), and prohibit dog training within the WPRA during winter, nesting and brood rearing periods after trap and transfer has begun.
1.4.4. Annually assess WPRA pheasant populations using standard protocols.
1.4.5. Annually assess habitat conditions within the WPRAs for suitability and, if needed, implement improvements in cooperation with landowners and partners.
1.4.6. WPRAs with established populations of 10 hens per square mile in the spring by the third year after trap and transfer is completed will be opened to male pheasant only (cocks only) hunting but remain closed to game farm pheasant stocking.
1.4.7. WPRAs with populations less than 10 hens per square mile in the spring by the third year after trap and transfer is completed will be open to either sex pheasant hunting and stocked with game farm pheasants.
1.4.8. Determine habitat characteristics that result in successful pheasant population restoration on WPRAs, starting in 2010.

GOAL 2. Annually provide pheasant hunting opportunities across the Commonwealth by releasing game farm raised ring-necked pheasants.

Objective 2.1: Annually produce and release 250,000 pheasants from 4 PGC game farms with an annual harvest rate of 60%.

Strategies

2.1.1. Adequately staff four game farms to produce 225,000 pheasants for fall releases.
2.1.2. Upgrade all PGC game farms to modern, up-to-date incubation, brood rearing and holding facilities. Upgrade farm and other needed equipment to maintain farm infrastructure and provide proper holding pen habitats.
2.1.3. Monitor game farm pheasants at each game farm for presence of infectious diseases and maintain up-to-date bio-security protocols.
2.1.4. Review and revise as needed PGC stocking protocols and standards to maximize hunting opportunity for game farm releases and increase game farm pheasant harvest rates to 60% or greater.
2.1.5. Based on pheasant hunter surveys and demand, the number of pheasant hunters may be restricted and bag limits, seasons and other regulations may be modified on public hunting areas and WPRAs to improve pheasant hunter success, hunter participation and to maintain wild pheasant populations.
2.1.6. Annually provide a minimum of 20,000 game farm pheasants for youth pheasant hunts statewide.
2.1.7. Determine harvest rates of game farm pheasants by 2014.

GOAL 3. Inform and educate the public on the status and priority objectives of the PA pheasant management program.

Objective 3.1: Annually provide training to commission personnel and conservation partners on the ecology and management of pheasants in PA, as well as recovery and restoration projects.

Strategies

3.1.1. Prepare and disseminate a Pheasant Habitat Handbook.
3.1.2. Prepare and disseminate a Pheasant Propagation Program Handbook.
3.1.3. Provide training to PGC field employees, USDA employees, PF and other partners on Farm Bill Programs, State, and NGO habitat programs beneficial to pheasants.

Objective 3.2: Annually inform and educate public and private landowners on pheasant management projects, habitat needs and the status of WPRA initiatives.

Strategies

3.2.1. Inform and encourage all public landowners through news releases, bulletins and workshops to incorporate pheasant habitat management plans into their management plans to maintain habitat values in areas of suitable habitat and to enhance potential pheasant habitat areas.

3.2.2. Establish Pheasant Habitat Management Demonstration Areas on State Game lands where potential suitable pheasant habitat exists and annually provide at least one public workshop/tour per year for each demonstration area.
3.2.3. Inform and encourage private landowners, particularly PGC Public Access and Working Together for Wildlife Cooperators to enroll in federal and state conservation programs that will benefit pheasants.
3.2.4. Use all forms of media to educate the public on the PGC pheasant management and propagation programs.
3.2.5. Publish a Summary of the PA Ring-necked Pheasant Management Plan by 2009.
3.2.6. Annually report research findings and conclusions, pheasant harvest and population trends and propagation program results to the public through various media.

GOAL 4. Develop partnerships to restore wild pheasant populations in suitable habitats across PA and support the PA pheasant hunting tradition.

Objective 4.1: Establish formal partnerships to facilitate restoring wild pheasant populations in suitable habitat across PA.

Strategies

4.1.1. By 2009, establish a formal Cooperative Agreement between PF, USDA, and the USFWS Partners for Fish and Wildlife to restore wild pheasant populations in WPRAs.
4.1.2. Coordinate with the PDA, PA Farm Bureau, and other farm organizations to incorporate pheasant habitat management into their Farmland Preservation and other technical and financial assistance farm programs.
4.1.3. Coordinate individual, government and NGO efforts to improve pheasant habitat. Integrate pheasant recovery efforts with other habitat enhancement and conservation programs, such as EPA Stream Bank Fencing program, Chesapeake Bay Program, DCNR Riparian Buffer Initiative, and others.
4.1.4 Collaborate with state and federal agencies, legislature, counties, townships, and NGOs on planning, zoning, tax incentives, and easements to improve pheasant habitat.
4.1.5. Collaborate with pheasant biologists in other states and countries to obtain wild pheasants and collaborate on research projects.
4.1.6. Serve as a member of AFWA's National Pheasant Plan Team, Resident Game Bird Working Group, and Agricultural Conservation Committee.
4.1.7. Serve as a member of the Northeast Upland Game Bird Technical Committee and the Northeast Habitat Technical Committee.

Objective 4.2: Establish partnerships to support PA pheasant hunting.

Strategies

4.2.1. Coordinate with PF and sportsmen clubs for at least 7 days of youth pheasant hunting each year and at least 20 mentored youth hunts.
4.2.2. Coordinate with sportsmen clubs and others by providing technical assistance to Cooperators in raising and releasing pheasants. Provide Day Old chicks to Cooperators for a nominal fee.

GOAL 5. Conduct monitoring and research to ensure the best management of pheasant populations and maximize hunting opportunities.

Objective 5.1: Determine hunter and landowner interest and support of the PGC's pheasant management program.

Strategies

5.1.1. Conduct pheasant hunter surveys every 5 years, beginning in 2009, to obtain information and feedback on what they know about and expect from the pheasant management program.
5.1.2. Survey PGC Public Access Cooperators, Working Together for Wildlife Partners, and other owners of farmland every 5 years, beginning in 2010, to determine their knowledge of and interest in PA pheasant recovery efforts and the incentives required for participation in a wildlife habitat improvement program.

Objective 5.2: Determine the annual pheasant harvest and number of pheasant hunters by Wildlife Management Unit (WMU) and WPRAs.

Strategies

5.2.1. Continue the annual Game Take Survey to estimate the annual pheasant harvest and number of pheasant hunters by WMU.
5.2.2. Conduct annual surveys in WPRAs to estimate the pheasant harvest and number of pheasant hunters.

Objective 5.3: Conduct research in pheasant ecology and propagation to improve the cost effective management of the pheasant resource.

Strategies

5.3.1. Determine the genetic variability in wild trapped (WPRAs) and game farm pheasants by 2010.
5.3.2. Resume the CREP research project with The PA State University, by running routes from 2009-2017, and evaluating the effects of land use at multiple spatial scales on pheasants by 2017.
5.3.3. Determine the adequacy of winter food supplies and arthropod populations to support a sustainable wild pheasant population by 2012.
5.3.4. Determine the best habitat model to predict pheasant abundance by 2014.

GOAL 6. Provide sustainable funding and resources for plan implementation.

Objective 6.1: Determine and provide the financial and personnel resources to implement the pheasant management plan.

Strategies

6.1.1. Develop and approve an annual budget to implement each Goal, Objective and Strategy of the pheasant management plan from July 1, 2008-June 30, 2017, as outlined in Appendix 1.

6.1.2. Ensure sufficient personnel are available to implement the various parts of the plan.
6.1.3. Continue the Cooperative Agreement with NRCS, as needed, to support Wildlife Services Biologists statewide in NRCS Offices.

Objective 6.2: Establish and provide sources of funding to implement the pheasant management plan.

Strategies

6.2.1. Seek legislation to establish an annual Pheasant Hunting License required for all pheasant hunters to support pheasant propagation; exempt youth hunters 12-15 years of age.
6.2.2. Use Game Funds, other State funds and Federal funds to support technical assistance and financial assistance to farmers and other private landowners to improve pheasant habitat and implement the Pheasant Plan.

ACKNOWLEDGEMENTS

This Plan would not have been possible without the support and efforts of many others.

Staff from the PGC were very helpful in completing this Plan. John Dunn, Chief of the Game Bird Section, Tom Hardisky, Wildlife Research Biologist and Matt Lovallo, Chief of the Game Mammal Section reviewed the Plan, worked on various Sections, and made recommendations. Cal DuBrock, Director of the Bureau of Wildlife Management, reviewed the Plan and made many helpful recommendations and improvements. Bob Boyd, Assistant Bureau Director, wrote the Hunting Section, and was a major force in the completion of this plan. His careful editorial leadership and knowledge of pheasants has made this a much better Plan. Mike Pruss, Wildlife Biologist and Bob Thomas, Biological Aide in the Bureau of Wildlife Habitat Management, provided data and support when we needed it.

Bill Foose, Conservation Program Manager, with PA Farm Service Agency and Barry Isaacs, PA NRCS State Biologist provided up to date USDA habitat data and have been strong supporters of restoring farmland wildlife through CREP in PA.

We remember the PA pheasant biologists that pioneered the way in pheasant management: Richard Gerstell, Pierce Randall, Fred Hartman and Hugh Palmer. We thank the pheasant biologists from other states and countries that have shared their knowledge with us.

Ongoing efforts to restore farmland habitat and wild pheasant populations by many Pennsylvanians gave us the inspiration to complete the Ring-necked Pheasant Management Plan for PA. The Farm Service Agency county and state office employees and biologists, soil conservationists, and district conservationists with NRCS and the PGC work with farmers and private landowners across PA to provide technical assistance and financial incentives to improve farmland habitat. PGC land managers and food and cover employees put habitat on the ground. PF and the PF chapter members across PA, in cooperation with USFWS Partners for Fish and Wildlife, California University, the Pennsylvania State University and PGC, restored farmland habitat and have introduced wild pheasants. We thank the Richard King Mellon Foundation for their support of pheasant recovery.

We realize that parts of PA will not support wild pheasant populations. However, many hunters in those areas enjoy pheasant hunting. We are thankful to the men and women at our four game farms that care about pheasants and annually provide hunting opportunities.

We thank the PGC Board of Commissioners for caring about pheasants and being patient enough to allow us the time to complete the first comprehensive pheasant plan in PA History.

This Plan is dedicated to the many PA sportsmen and women that enjoy seeing and hunting the ring-necked pheasant.

All data contained herein are subject to revision from corrections, improved analyses, and/or regrouping of data. Cover painting by Susan Bankey Yoder, 2001. Pennsylvania

Game News 72 (11): 51. No part of this document may be copied or reproduced without the written permission of the PGC. This Plan should be cited as: Klinger, Scott R. and Carl F. Riegner. 2008. Ring-necked pheasant management plan for Pennsylvania 2008-2017. Pennsylvania Game Commission, Harrisburg, USA.

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SECTION II. TAXONOMY AND RANGE

Taxonomy and Native Range

Pheasants are birds of the order Galliformes and the family Phasianidae. This family includes 177 species of pheasants, quail, and partridges from the old world (Johnsgard 1999). The subfamily Phasianinae includes the pheasants and peafowl. This subfamily includes 20 Genera and 67 species (Madge and McCowan 2002). The majority of pheasants are forest species and 23 species are considered globally threatened (ICUN 2006). The Genus Phasianus includes 2 species, the common pheasant (*Phasianus colchicus*) and the green pheasant (*Phasianus versicolor*). These species make up the true pheasants and there are some pheasant biologists that place the green pheasant as a subspecies of the common pheasant. The two species will mate and produce viable offspring. However, the green pheasant prefers more forested habitat than the common pheasant and is only native to Japan.

There are 30 recognized subspecies of the common or ring-necked pheasant; about 50% do not have a white neck ring. The Black-necked pheasants include 4 subspecies: *Phasianus c. colchicus*, *P.c. septentrionalis*, *P.c. talischensis*, *P.c. persicus*. This is a western Asian group with the males having pale brown to buff wing coverts and well-developed purplish tones. They lack a white neck collar. The White-winged pheasants include 5 subspecies (*P.c. principalis*, *P.c. zarudnyi*, *P.c. bianchii*, *P.c. chrysomelas*, *P.c. zerafschanicus*) that are native to central Asia. They are redder, less purplish with white wing coverts, and often a partial white neck ring. The Kirghiz group includes 2 subspecies (*P.c. mongolicus*, *P.c. turcestanicus*) that are native to western China, Kazakhstan and Kryrgyzstan. They have coppery-maroon and green feathers and a partial white neck ring. The Tarmin Basin pheasants include 2 subspecies (*P.c. tarimensis*, *P.c. shawii*) native to the Tarmin basin of western China. They generally have olive yellow to reddish rumps and no white neck collar. The Grey-rumped pheasants include 17 subspecies (*P.c. hagenbecki*, *P.c. pallasi*, *P.c. karpowi*, *P.c. kiangsuensis*, *P.c. alaschanicus*, *P.c. edzinensis*, *P.c. satscheuensis*, *P.c. vlangalli*, *P.c. strauchi*, *P.c. sohokhotensis*, *P.c. suehschanensis*, *P.c. elegans*, *P.c. rothschildi*, *P.c decollatus*, *P.c. takatsukasae*, *P.c. torquatus*, *P.c. formosanus*). In most of this group, the males have a white eyebrow and white neck collar. The lower back and rump are greenish-gray. However, there are many integrades of colors. These subspecies range from Northeast Russia through Korea and south through Eastern and NW China to Vietnam and Taiwan (Johnsgard 1999, Figure 1).

Although the common male pheasant is quite variable in plumage across its range, the adult males always have a purplish/green head and neck, a maroon breast and an elongated and barred tail. The wings of adult males range from 205-276mm, tail lengths of 370-675mm, and body weight of 770-1,990g (Johnsgard 1999). Males have short spurs and adult males have longer spurs than juveniles. Adult females of the common pheasant are dull sandy-brown. The wings of adult females range from 184-240mm, tail lengths of 197-315mm, and body weights of 545-1,018g (Madge and McGowan 2002).

Introduced Range

While the native range of the common pheasant is Asia, primarily China, many subspecies have been crossed and introduced in other parts of the world. Introduced populations have been established throughout most of temperate Europe, Northern North America, parts of Australia and New Zealand. Populations, particularly in Europe, are maintained at very high densities by raising and releasing large numbers of pheasants for shooting.

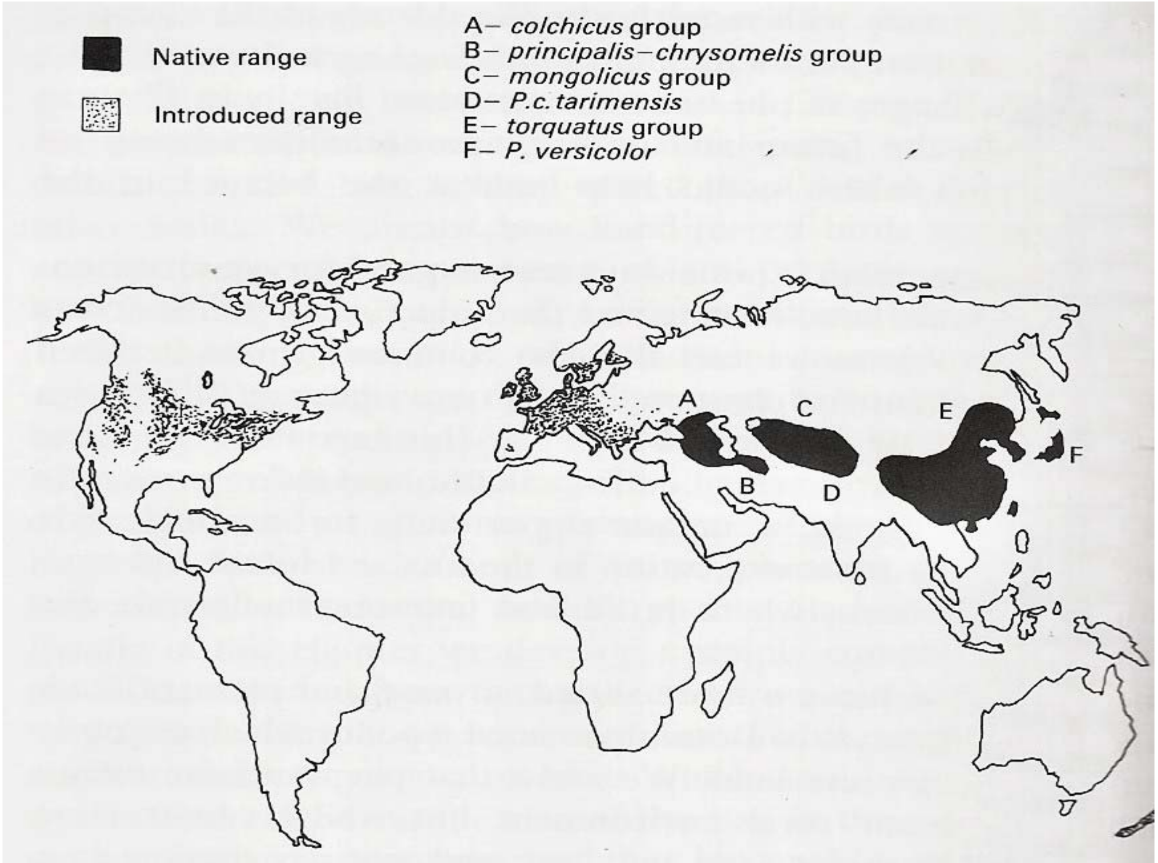


Figure 1. The native and introduced ranges of the common pheasant (*P. colchicus*) showing the ranges of the major sub-species groups. Common pheasant in the introduced range is a mixture of many subspecies (Long 1981, Hill and Robertson 1988, and Johnsgard 1999).

The first recorded introduction of the common or ring-necked pheasant in the United States was in 1881 in the Willamette Valley of Oregon. Populations in the United States occur from Washington and California east to Maine, and south to PA and North Texas (Long 1981). In the early 1970s pheasants were very abundant in PA, New York, Michigan and Wisconsin. The highest populations in North America currently occur in the plains states of North Dakota, South Dakota, eastern Montana, and western Kansas. Medium populations exist through the Midwest in Minnesota, Iowa, and Illinois. Lowest populations exist in the northeastern portion of the species introduced range in North America (Figure 2).

Studies have been conducted to determine what influences the distribution of pheasants in North America. Leopold (1931) suggested that pheasants in the Midwest are restricted to soils that developed on tills from glaciation. Other studies have focused on limestone soils and calcium distribution and other inorganic chemicals (Jones et al. 1968, Anderson and Stewart 1973). However, none of these studies were conclusive.

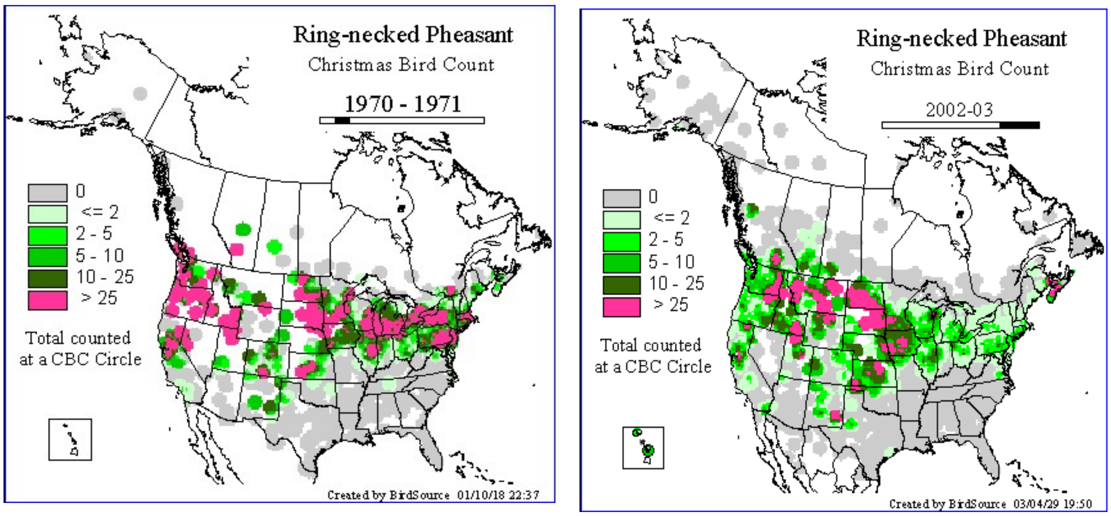


Figure 2. Distribution and relative abundance of pheasants in North America, December 1970 and 2002. Data from Christmas Bird Counts, National Audubon Society 2006.

SECTION III. BIOLOGY

Food Habits

The annual diet of adult ring-necked pheasants consisted of 89% seeds, 5% plant foliage, 5% animal matter, and 1% mineral grit in Minnesota (Minnesota DNR 2005). Adults consume insects in spring and summer. Ring-necked pheasant hens increase consumption of insects and calcium rich foods in spring, prior to egg laying (Fried 1940). Chicks feed primarily on insects and other arthropods during the first 4-6 weeks post hatching, after which the amount of weed seeds and cultivated grains increase (Whitmore et al. 1986).

When available, waste corn, wheat, grain sorghum, barley, oats, buckwheat, and sunflowers are consumed in harvested crop fields. Trautman (1952) examined 1,416 crops of South Dakota ring-necked pheasants and reported corn and wheat made up 57% and 11% respectively of the diet. Seeds of legumes, ragweed, smartweed, and other forbs are readily consumed. Hard and soft mast such as acorns, pine seeds, and various wild berries are consumed in summer and autumn (NRCS 1999). Most seeds consumed by ring-necked pheasants were cultivated grains, corn being the most important (47-67%, Korschgen 1964). Dalke (1937) recorded 106 species of seeds and fruit in the guts of pheasants in October. Pheasants are omnivorous during the fall eating grain, seeds, berries, green shoots, and small arthropods. Major winter foods of ring-necked pheasants in Wisconsin were corn and oats, but burdock seeds, nightshade berries, and grassy plant material were also consumed (Gates and Hale 1974). Unharvested corn standing taller than 15 cm is important to ring-necked pheasants because snow cover greater than 15 cm is too deep for the birds to obtain waste grain (USFWS 1964). Unharvested corn is also important winter cover (Hartman and Sheffer 1971).

Fall and Winter Biology

Beginning in late September and early October ring-necked pheasants begin to form groups. The size of groups and sex seems to be related to habitat, population density and weather conditions. In PA, with pheasant densities of over 100 hens per square mile in the spring, and sex ratios in the winter of 1 cock to 10 hens, Hartman (1971) found that pheasants of both sexes, in groups of several to several hundred roosted in woodlots and brushy areas over winter. Wintering areas with a southern exposure supported more pheasants. Pheasants fed during the day but returned to the same roosting area at night. In many cases, pheasants roosted in trees at night. Conifers provided good to excellent roosting cover. They seldom moved more than 1 mile from the roosting area to feeding areas in the morning and at dusk. Most feeding areas were crop fields, primarily cornfields with the corn stalks still standing. Losses of birds to winter weather were insignificant. Edminster (1954) reported similar results for pheasants in Nebraska and South Dakota, although wetlands and hedgerows were primary roosting areas. Gates and Hale (1974) found no segregation of the sexes over winter in Wisconsin. They also found daily movements and movements between food and cover in winter most often to be less than 0.5 miles. Hill and Ridley (1987) found that the sexes were very much segregated in the early winter in England.

The ring-necked pheasant is non migratory. The home range of pheasants seldom exceeds 2 square miles, although they have been known to travel 20-30 miles following release in new habitats (Hardisky et al. 2001). Daily movements and movements between food and cover in winter are most often less than 0.5 miles (Gates and Hale 1974).

Breeding and Nesting Biology

The ring-necked pheasant is polygynous. A harem mating system is well known for the species in its introduced range and likely occurs in its native range (Johnsgard 1999). The number of females within male territories seems to be related to male dominance and secondary sexual characteristics such as spur length and wattle size. Schantz et al. (1994) found in a Swedish population of wild pheasants females preferred to mate with long-spurred males. Male viability also correlated with male spur length. They used DNA fingerprinting to measure individual pheasants reproductive success in terms of both hatchlings and surviving offspring. The data showed that long-spurred males sired more hatchlings and surviving offspring, and also that the females production of surviving offspring correlated with their mate's spur length. The analyses also indicated that offspring of females who mated with long-spurred males experienced an increased survival rate. However, Mateos and Carranza (1996) studied a group of pheasants in captivity over 3 years and found that (1) females did not show any preference for males with larger spurs; (2) the spur length was positively correlated with physical condition and weight for juvenile males, and with wattle display and dominance when adults; (3) spur length showed a directional (not fluctuating) asymmetry; and (4) the repeatability of spur length between years was highly significant. These results do not provide any support to the hypothesis that spur length has a role in intersexual selection, but does support the importance of spurs in male to male dominance.

Papeschi et al. (2003) used morphological measurements and behavioral observations to investigate the relationship between male ornaments and male social rank during the breeding season in a free-ranging population of one-year-old ring-necks. The sample was of birds of the same age class to avoid the confounding effect of age differences. Tail length, used by females in mate choice, and spur length, used by males as a weapon in fights, were not correlated with male rank, whereas the size of the wattle was the most important trait. This, combined with recent studies showing that wattle size reliably indicates male testosterone levels at the beginning of the breeding season, suggest that wattle size may be used as a signal of aggression level and body condition among males. Males with larger wattles have well-established territories. In addition to the familiar crowing call, ring-necked pheasant males also display wing whirling and their facial wattles become engorged. Males will confront each other and fights may occur. Seldom does one male kill another. Male crowing and wing whirling decreases when females enter the male's territory. Males usually circle females and it may take several encounters and hours before copulation occurs. Crowing may occur every 3-10 minutes, but is most concentrated in the early morning.

Hartman and Sheffer (1971) reported that in March and April PA pheasants dispersed and males began establishing territories. Cock territories averaged about 30-40 acres and sometimes overlapped. They were usually within <2miles of the wintering area. Crowing territories remained the same year after year, even though a different cock may occupy the territory. Territories were frequently near good nesting cover. Leif (2005) found that pheasants in eastern South Dakota moved an average of 3.2±0.3 km (SE) from wintering sites to spring territories. Male pheasants in Wisconsin dispersed 700–1,100 m, and had a home territory of 6.2–18.4ha (Gates and Hale 1974). In Minnesota, male territory size generally was 3-10 acres (MDNR 2005). Troutman (1982) reported that cock territories are not absolute boundaries and may change throughout the breeding season in South Dakota. The size and location of pheasant territories may be related to amount of suitable nesting habitat and may also be density dependent (Edminster 1954). However, in England, Hill and Robertson (1988) concluded that nesting cover did not determine pheasant breeding territories and often found that females mated with the same male in subsequent years. Ridley (1983) found that territory size in California, Wisconsin, Canada, Sweden, the UK and Ireland ranged from 1.2-5.3 hectares. Pheasant males in North America appear to have larger movements and larger territories than in England. These differences may be the result of genetic and behavioral influence of artificial propagation. Pen-reared pheasants were relatively sedentary in both Great Britain (Hill and Ridley 1987) and North America (Krause et al. 1987, Leif 1994) compared to wild counterparts. Raising and releasing pheasants is central to management of estates for pheasant shooting in Great Britain (Hill and Ridley 1987). These authors found that the social structure of 2 separate pheasant populations was similar despite 1 being comprised of 60% released pheasants, whereas the other received no supplemental stocking. While they interpreted this similarity as adaptability of pen-reared birds to the wild, it is equally plausible that the population comprised of wild-reared pheasants still retained behavioral characteristics of their artificially propagated ancestors including low mobility. Ridley (1983) reviewed multiple studies and found that population density of cocks ranged from 1.2-95 per 100 hectares. In 80% of these studies, non-territorial cocks made up part of the spring population. In England, non-territorial cocks were mostly younger birds (Hill and Robertson 1988). In a four-year study in England, Lachlan and Bray (1976) found that 13-21% of cock pheasants did not hold territories. Burger (1966) found that 5% of males in Wisconsin had no territories. It is likely that number of territorial males, and territory size varies based on sex ratios, population density and quality, quantity and interspersion of cover types.

Hartman and Sheffer (1971) reported that crowing and display activities peaked on May 8. Some crowing activities continued through June. This may be important for re-nesting. The number of crows heard at each 2-minute stop during the peak period in May ranged from 5-10. Although male pheasants do not participate in raising the young, territorial males spend many hours mate-guarding their harem and the fittest males get to pass their genes on to the next generation (Hill and Robertson 1988).

The breeding season is highly variable throughout the range of the common pheasant. In PA, mating begins in March and may last into July. The peak of pheasant nesting and egg laying is May 8. The condition of the females in terms of energy reserves may affect the onset of breeding and egg laying (Gates and Hale, 1975). Pheasants will continue to renest if their nest is destroyed. Only 4 studies have documented female pheasants producing more than 1 brood in a breeding season (Dumke and Pils 1979, Penrod 1986, Hill and Robertson 1988, Casalena and Wallingford 1995). In PA, pheasants primarily nest on the ground in grass and weedy cover. In England, Hill and Robertson (1988) found that pheasants nested in woodlands in the early part of the nesting season and cereal grains later in the season.

Once egg laying begins, pheasants lay about one egg every 1.4 days. Clutch sizes are variable, but average about 11 eggs (Gates and Hale 1975). As the nesting season progresses clutch size declines. Clutches begun after May 15 in Wisconsin averaged 10 eggs compared to earlier nests which averaged 12.5. In PA, the earliest nest attempt was April 3. The latest recorded nest attempt was July 25. Most nests were started between

April 25 and May 26. The peak of nest initiation was May 1-14. The average clutch size was 12 (Hartman and Sheffer 1971).

The female pheasant incubates eggs for about 23 days. This may vary depending on the amount of time the hen is disturbed. The hen communicates with the chicks even while they are in the egg. Chicks average about 23g at hatching. As with other birds, imprinting on the mother occurs in the first few hours of hatching. The young are precocial and begin feeding almost immediately. The female cares for the chicks with no help from the male. During the first few weeks the chicks cannot maintain their own body temperature and are periodically brooded by the hen. This is critical during cold and wet weather. The hen warns her brood of predators with a low-pitched call causing the chicks to scatter and freeze in protective cover. The hen uses a clucking sound to call her brood together. The chicks also communicate with each other and the hen with various calls. At 14-21 days they take their first flight. At 3 months females average 750g and males 950g (Glutz von Blotzheim 1973). The brood stays with the mother for about 70-90 days.

The number of eggs laid annually by the average hen pheasant is considerably greater than that depicted by the bird's mean clutch size. This discrepancy occurs because the wild hen pheasant (1) lays some single eggs that are not associated with nests, that is, dropped eggs; (2) engages in intraspecific and interspecific nest parasitism, and (3) renests if her previous nesting effort was unsuccessful, thus laying additional eggs (Seubert 1952, Gates 1966, Labisky 1968, Hagen et al. 2002). The egg-laying capacity of 2-year-old hen pheasants, confined individually and fed a laying ration ad libitum, was superior to that of similarly treated yearling and 3-year-old breeders. The mean weights of eggs laid by individual hens were remarkably similar from year-to-year. Eggs laid by yearling and 2-year-old hens did not exhibit a seasonal decline in weight even though the hens incurred substantial losses in body weight during the laying season (Labisky and Jackson 1969). Thus, in any harvest management program where hen pheasants are to be included as legal game, careful consideration must be given to the problem of potential overexploitation of those hens that will constitute the 2-year-old breeders in the following spring.

Nest success of pheasants has been studied extensively. Nesting success of 74 Wisconsin pheasants was studied by radio telemetry during 4 breeding seasons, 1968-71 (Dumke and Pils 1979). Hens surviving the reproductive season established 1.8 nests (range 1-4); and overall nest success was 31%. Sixty-nine percent of 1st nests were disrupted and 68% of the hens renested; and 71% of 2nd clutches were disrupted and 41% of the females renested. Renesting efforts produced 40% of the broods. Four hens renested after loss of a brood. The average hen established a 1st nest within 0.8 km of the wintering area, and selected a site at the edge of her pre-nesting home range.

Randall (1940) studied the nesting ecology of a population of pheasants from 1938-1939 in southeastern PA. The earliest recorded laying date was April 6. Nesting occurred between April and early August. The peak of nesting was May 16-31. Nest success varied based on the beginning date of nesting. Fifty-percent of all successful nests were initiated between May 16-31, 20% between May 1-15 and 11% between June 1-15. Only 9% of nests started in April produced broods. No data was provided on the number of nests that were re-nesting attempts. There was no correlation between distance to field edge and nest success or placement. However, nests were grouped together and not randomly distributed in a field. This may have been related to male territories. Clutch sizes ranged from 4 to 23 eggs. The average clutch size was 11. Clutch size declined as the nesting season progressed.

Hartman and Sheffer (1971) studied ring-neck pheasant populations from 1961-1971 in Lebanon and York counties, PA. They found that the earliest nest attempt was April 3. The latest recorded nest attempt was July 25. Most nests were started between April 25 and May 26, with peak of nest initiation from May 1-14. The average hatching date was from June 12-28. The earliest hatching date was May 11 and the latest August 30. During late July and August, 74% of hens seen had broods. They estimated that about 11% of the broods resulted from re-nesting attempts.

Robertson and Hill (1988) summarized 8 nesting studies results from 1941-1984 in the United States and England. Nest success ranged from 10% to 51%. These variations in nest success were largely related to differences in nest predation and agricultural practices, such as earlier and more frequent hay mowing. Nest abandonment was higher in high-density populations.

Casalena and Wallingford (1996) monitored 36 radio-collared pen-reared Sichuan hens and 37 radio-collared pen-reared ringneck hens during the nesting season of 1994 and 1995 in Centre and Juniata counties, PA. Average clutch size of 14 Sichuan nests was 11.7 eggs, and the average of nine ringneck nests was 12.1. Overall nest success was 28%.

Based on the literature, it appears that overall nest success rates of 35% are indicative of stable to growing pheasant populations. Nest success rates below 20% are probably indicative of population sinks where reproduction cannot keep pace with mortality. We do not have current information on nest success rates in wild pheasant populations in PA.

Population Biology

Recruitment, mortality, survivorship, dispersal and the influence of habitat, weather, disease, genetics, and predation on these demographic factors are complex and often difficult to determine in wild pheasant populations. Some of these population parameters may be density dependent, further complicating the analysis of wild pheasant population dynamics. Still, these are the factors that determine pheasant numbers from year to year and over long periods of time. To understand pheasant populations and to be able to predict future population densities requires knowing or estimating these population parameters. The more assumptions and lack of data on any pheasant population the less accurate and precise will be the population estimates.

Brood Size and Survival

During the first 3 weeks of life pheasant chicks have a home range of about 2-11 hectares (Warner 1979, Hanson and Progulske 1973). The size of the home range increases as the chicks get older. Hill and Robertson (1988) found that survival rates of broods, which averaged 11 chicks at hatching, ranged from 0% to 88% in England. Those broods with the largest home ranges tended to suffer the highest mortality. The larger home ranges tended to contain lower densities of insects. In Illinois, Warner et al. (1984) documented the declining survival of pheasant chicks from the late 1940s through the early 1980s. On average, 78% of the chicks hatched during the early 1950s were alive at 5-6 weeks of age, but only 54% survived to this age during 1976-81.

Riley et al. (1998) reported on pheasant chick survival from hatch to 28 days in Iowa. They found that chick survival varied from 11%-57% on 2 study sites. The study demonstrated that chick survival was more variable in a landscape with a lower amount of grass. They observed the lowest value (11%) in 1993, when rainfall was >l00% above normal during the nesting and brood-rearing periods. Late hatches were noted over most of the state that year (Iowa Department of Natural Resources 1994). Their findings on hatch date were consistent with those noted by Etter et al. (1988) in Illinois. They concluded that juvenile hen pheasant survival decreased chronologically with later hatch dates.

We have very little information on brood survival in PA. Hartman and Sheffer (1971) estimated that chick survival to 8-10 weeks of age averaged about 40% in 1961-1971 in primary pheasant range during a period of high pheasant abundance.

Because of different sampling methods and time frames of analysis, we cannot compare brood survival between states. Based on the best available data, it appears that brood survival can vary significantly between years. This is probably related to weather, predation, available habitat and insect production. Chick survival may also be density dependent. Because of the high turn over rate and short life span of pheasants, brood survival could have a significant impact on fall pheasant populations. States have developed standardized brood surveys that are conducted in August along permanent routes.

We need better information on brood size and survival in PA. We also need better information on insect production in various habitats. In expanding pheasant populations we should expect long-term average brood survival to 8-10 weeks of age to be >50% and in declining populations <35%. Short-term (annual fluctuations) in brood survival are to be expected.

Adult Survival

The importance of survival to management of pheasants was illustrated by Jarvis and Simpson (1978), who showed that long-term population fluctuations (based on spring indices) resulted primarily because of changes in survival of hens and not from changes in reproductive performance. Indices of survival, productivity, and density were derived from annual censuses of ring-necked pheasants in the Willamette Valley, Oregon, from 1947 to 1975. Abundance of pheasants in spring was moderate and variable in the late 1940s and early 1950s (10-20 birds/40.5 ha), increased in the early 1960s (35-40/40.5 ha), and decreased in the early 1970s (3-8/40.5 ha). Reproductive performance remained relatively constant from 1949 to 1975. Survival of adult females during summer and winter were significantly correlated to annual percent change in total density of pheasants in spring. About 25 to 30 percent of the pheasant habitat in the Willamette Valley was lost between 1945 and 1970. Amount of land in soil bank was closely correlated to abundance of pheasants in spring. Survival of adult females was the most important factor affecting long-term trends in population size.

Petersen et al. (1988) reviewed 15 pheasant population studies across North America and concluded that hen survival is the primary factor in determining abundance. Reproductive success played a lesser role. They concluded that annual hen pheasant survival of 30-35% is necessary to maintain pheasant populations and 40% or higher is indicative of expanding populations. Short-term annual hen survival of 20% or less is insufficient for population maintenance. Anderson (1964) also concluded that factors affecting survival were more critical to range expansion of pheasants in Illinois than reproductive success.

Dumke and Pils (1973) in Wisconsin and Penrod et al. (1986) in New York found that survival of adult hens was 15-20% higher than juveniles. Etter et al. (1988) found that juvenile hens had lower survivorship than adult hens in the late fall in Illinois. The lower survival rate was not evident after early winter. The survivorship of juvenile hens was related to the date of hatching, as earlier hatched hens had higher survivorship. Snyder (1985) radio collard 101 hen pheasants in eastern Colorado in 1981-1982. The survival rate for the March-August (184-day) period averaged 56%. Adult hens had higher weights and survival rates than yearlings. The annual spring-to-spring survival rate was 51%. Seasonal variations (fall-spring) in hen survivorship have ranged from 77% for an expanding population in Washington (Einarsen 1942) to 28% in a declining population in Illinois (Anderson 1964).

Only 2 studies have provided information on hen survival in wild pheasant populations in PA. Randall (1940) reported a fall-spring survival rate of 67% and 81% survival from spring-fall in Lehigh County. Annual hen survival was estimated to be 54%. Hartman and Sheffer (1971) estimated that about 50% of hens survived between January and October with an annual hen survivorship of 35-40%.

Casalena and Wallingford (1996) studied populations of released game farm ring-necked and Sichuan pheasants from 1993-1995 in PA (Centre and Juniata counties). The areas were closed to pheasant hunting. Survivorship was determined for cock and hen pheasants from October-June. Hen pheasant survival was <20% in both years. While annual hen survivorship was not determined in this study, it was likely less than 15%. Numerous studies have shown that pen-reared game-farm pheasants while capable of laying eggs and nesting successfully, have low survivorship and produce small broods (Robertson 1988). October-June male pheasant survival was higher than females and averaged 30% with annual survival estimated at 25%.

Survival of male pheasants has been primarily reported from hunted populations. Estimated annual survival of cock pheasants range from 7% in Wisconsin (Gates 1971) to 34% in Minnesota (Shrader 1944). In hunted populations, the percent of pre-hunt cock populations reported shot by Michigan hunters ranged from 49% (Allen 1947) to 90% (Shick 1952). The best estimates we have from PA come from 1964-1971. Hartman (1971) estimated that 90% of the cock population was harvested by hunters each year with no evident impact on reproductive success. Wagner et al. (1965) also found no evidence that breeding is impaired by heavy hunting pressure on male pheasants. However, hen survival may be lower in heavily hunted populations, because of increased hunting mortality from mistaken kills. Also, long term heavy hunting pressure and removal of >90% of the male population, before the breeding season, may reduce the genetic variability in the population (Warner and Phillip 1988). They speculated that in small isolated populations this loss of genetic heterozygosity might lead to population declines and local extinction.

In California, Mallette and Harper (1964) found an 8-10% higher survivorship in adult males compared to juveniles. However, in states with heavy hunting pressure, such as

PA, most cock pheasants are harvested in the fall and most are juvenile birds. Age specific cock survival is probably not significant in population dynamics for most heavily hunted pheasant populations because of the high turn over rate.

Based on the literature and our own data from PA, we concur with Jarvis and Simpson (1978) and Petersen et al. (1988) that annual hen pheasant survival of 30-35% is necessary to maintain pheasant populations.

Dispersal and Population Genetics

Genetic information for ring-necked pheasants has not been available because analytical tools for delineating potential differences in genotypes have not been sufficient. The use of plumage or other traits to describe genetic variability has not been adequate (Trautman 1982). The importance of genetics to population viability has been overlooked. Yet, genetics can play a major role in population demographics. Loss of genetic diversity can have adverse affects on fecundity and survival (Barrowclough 1980). In pheasant populations, dispersal plays a key role in maintaining diversity.

Warner et al. (1988) used vertical starch gel electrophoresis for 11 groups of pheasants: 8 groups from the established range in Illinois, 1 from Illinois game-farm stock, 1 from a cross of game farm x wild pheasants, and 1 from wild pheasants from southern Iowa. Genetic differences along a north-south cline for wild pheasants in Illinois were detected. Game farm birds were also genetically different from some but not all wild populations. They concluded that regional differences in genetic variability provided further evidence that Midwestern pheasants may differ genetically along latitudinal or longitudinal lines (Baker et al. 1966, Vohs 1966). However, regional differences in genotypes could not have resulted strictly from environmental gradients (Warner and David 1987). They hypothesized that there have been relatively few generations of pheasants in Illinois for the effects of natural selection to be apparent at fine spatial scales-given that introductions of stock from various sources have been common. Regional differences must to some extent reflect founding populations and subsequent mixing.

More recent work by Giesel et al. (1997) investigated genetic variability in 34 pheasants from northeastern Iowa using randomly amplified polymorphic DNA (RAPD). They collected pheasants from 5 Conservation Reserve Program (CRP) habitats or longer-standing patches of over-wintering and breeding habitats. Each habitat patch was separated from the others by 5-30 km of unsuitable breeding habitat. Significant genetic differentiation was found in 9 of the 10 possible inter-patch comparisons, the exception being 2 sites that were separated by only 5 km. They also found that prairie grouse subspecies, and even species, appear to differ less from each other than the isolated pheasant populations.

This high level of genetic subdivision among closely neighboring patches suggests that populations are highly fragmented and may be more prone to extinction. The initial stocking pattern could have resulted in a random patchwork distribution of genotypes followed by limited gene flow. The isolated habitat patches formed by CRP acreage, which began to emerge in 1985, and the other cover patches included in the study may have further concentrated the birds and further enhanced the well-defined genetic patchwork. Given the apparent lack of gene flow among populations, effective population sizes may be constrained by individual habitat patch size and therefore may be quite small for many populations. Population structure in pheasants may be determined by founder effect (the post-1985 establishment of many small, habitat-limited, isolated populations), and inbreeding and drift may play an important role in structuring genetic diversity. This study confirmed through DNA analysis the importance of dispersal and habitat fragmentation on the genetics of wild pheasant populations.

Dispersal is a critical strategy for pheasants to expand and occupy new and changing habitats. The abundance and persistence of pheasants at the regional and local level may depend on their ability to disperse. Although studies of pheasants have shown that their home range is relatively small, the small number of pheasants that move >5 miles are potentially significant for gene flow, range extension, and population increases at the regional and local scale (Warner 1988). This ability to disperse to find habitats that are more suitable is an advantage in constantly changing environments. Dispersal may be density dependent, however, Edwards et al. (1981) found that dispersal in pheasants occurred over a wide range of densities. Habitat fragmentation from roads, changing agricultural practices and plant succession, which reduce survivorship and recruitment of dispersing pheasants, could reduce gene flow between populations and reduce regional and local pheasant abundance over time. Remaining isolated patches of habitat may be too small to support pheasant populations except at very low densities. If recruitment does not keep pace with mortality, these small populations become population sinks and eventually will support no wild pheasants. Intensive management of small habitat areas, in areas where pheasants are not or never were regionally abundant, has failed to increase pheasant populations (Warner and Etter 1985). However, extensive management programs, such as the CRP, that effect nesting and brood rearing cover over entire states, have positively influenced the regional abundance of pheasants (Riley 1995).

We know very little about the first releases of pheasants in PA and nothing about their genetics. We do not know the origin of these birds or the methods used to raise them or trap them. However, most pheasants in England were range-reared.

It is very probable that the first pheasants introduced in PA were heterogeneous because they came from old world hybridized stock. By 1930 pheasants occupied most of PA's suitable habitat and the population consisted of spatially heterogeneous genotypes. Over the past 80 years, production of game farm pheasants has changed dramatically in terms of methods of raising pheasants and the numbers being released. It is also very probable that our game farm pheasants are much more homogeneous than our original wild stock. Habitat has also changed dramatically over the past 80 years. This loss of habitat leads to habitat fragmentation and isolation of remaining wild pheasant populations. Predation may increase, especially on pheasants that are dispersing. Inbreeding increases and leads to greater homozygosity and results in lower reproductive and survival fitness. As populations and habitats shrink, genetic drift and the founder effects may further reduce populations. This would be true where small populations are inundated by a large number of homozygous, but less fit individuals. Overtime, this may lead to a genetic bottleneck and the population remains at very low densities or goes to extinction. Factors affecting the severity of a genetic bottleneck include the original genetic diversity of the population, the size of the population, the demographics, social structure and mating systems and the length of time (Marcot 1994). As populations get smaller (10-120 breeding individuals) genetic drift and inbreeding increase exponentially. Pheasant populations that become more homozygous overtime are more prone to extinction (Kendall and Lacher 1994).

Although we know very little about the genetics of pheasants in PA, recent studies and new technology will allow us to monitor the genetic structure of our wild and game farm pheasants in the future. RAPD analysis of DNA has emerged as an important tool for study of the genetics of small, fragmented populations. The RAPD technique is inexpensive, provides a potentially unlimited number of polymorphic markers and being based on the polymerase chain reaction, requires small amounts of tissue. Genetic analysis of PA pheasants is important for developing guidelines for preventing the loss of genetic variability in confined stocks (game farms), identifying characteristics that relate to fitness in the wild, and identifying where genetic mixing of stocks is appropriate (wild pheasant trap and transfer, release of game farm pheasants).

We hypothesize that as pheasant habitat in PA declined and what was left was more fragmented; survivorship of pheasants declined. Further, high levels of stocking of game farm pheasants from 1980-1984 may have reduced the genetic diversity of pheasants in PA. This loss of genetic diversity may be one of the reasons for the decline in pheasant populations. Extensive habitat restoration, reducing fragmentation of habitat, introducing wild pheasants that are highly heterozygous, and elimination of stocking of game farm pheasants in wild pheasant recovery areas (WPRAs) will be critical to restoring wild pheasants in PA.

Natural Mortality

Pheasants may live as long 6 years in the wild, but the average life span of pheasants in the wild is less than 1 year (MDNR 1986). High mortality is offset by large clutch sizes and aggressive renesting. Juvenile birds make up the majority of fall pheasant populations. It is not uncommon for the adult population to make up less than 25% of the fall population (Edminster 1954, Johnsgard 1999). Hartman and Sheffer (1971) found that 80-93% of the male harvest in PA from 1961-1970 was juveniles.

Predation

Most studies of pheasant ecology have found that predation is the leading cause of death (Gates 1971, Penrod et al. 1986). At least 37 days are required for a hen pheasant to complete a nesting cycle (Trautman 1982, Riley et al. 1998) and hens are at greatest risk of predation during incubation. Hen mortality rates in Wisconsin were 12% (8 of 68) during first nest attempts and 24% (9 of 38) during renesting (Dumke and Pils 1979). Studies suggest considerable variation in pheasant chick mortality (Gates and Hale 1975, Trautman 1982, Hill and Robertson 1988, Riley et al. 1998), with most mortality occurring during the first 2 weeks after hatching (Hill 1985, Meyers et al. 1988, Riley et al. 1998).

Some research has shown that mammals are the most serious predator of pheasants. During a 3-year study in southern Iowa, mammalian predators accounted for 45% of hen pheasant deaths (Riley et al. 1994). During a 5-year study in northern Iowa, 68% of 146 hen pheasant mortalities resulted from mammalian predation (Perkins et al. 1997). Of 217 nests destroyed by predators in Minnesota, 75% were destroyed by mammals (Chesness et al. 1968). In northern Iowa during a 5-year study, 85% of pheasant chick mortalities were caused primarily by weasels (*Mustela spp.*), red foxes (*Vulpes fulva*) and mink (*Mustela vison*) (Riley et al. 1998). Red fox have been identified as the primary mammalian predator of pheasants. Pheasant remains were found in 28% of red fox stomachs in South Dakota (Trautman et al. 1974), 5% in Iowa (Scott 1950), and 9% in Wisconsin (Besadny 1966).

In Southeastern Wisconsin, in a more diverse agricultural landscape, 11 mammals and 9 raptors were recorded as predators of adult pheasants (Wagner et al. 1965); however, the 3 main predators were red fox, great horned owl (*Bubo virginianus*) and red-tailed hawk (*Buteo jamaicensis*). Nest predators included 14 mammals, 3 birds and 2 snakes. In England, red fox and corvids (crows and magpies) are the primary nest predators. Average nest predation in several studies in the United States was 41% and ranged from 20-55% (Hill and Robertson 1988). In New York, from 1979-1982, Penrod et al. (1986) determined a 20% average annual loss of adult pheasants by red and gray fox from the beginning of snow cover to the onset of incubation. He also estimated that 42% of hen pheasants were lost to avian predators. In southern Wisconsin, pheasants were the leading prey item in the diet of red tailed hawks during the hawk nesting season (Orions and Kuhlmann 1956). Gates (1972) estimated that red-tailed hawks removed 7% of the hens present each winter and 5% each spring on a study area in Wisconsin. Petersen (1979) estimated that red fox, red-tailed hawks, and great horned owls removed 28% of the hen population from 1 December thru June 30, 1972-1975 on the Waterloo study area in Wisconsin. Red fox predation rates on pheasants ranged from 3-29% in winter and 3-9% in spring (Peterson et al. 1988). In Iowa, 32% of radio-collared hens were lost to avian predators. Snyder (1985) reported a 44% average mortality from avian predators in Colorado during spring and summer.

Robertson (1958) felt) that predation had little affect on pheasant populations in Illinois. Kimball et al.(1956) concluded predation did not control pheasant populations in the northern plains. Gerstell (1935) reported on pheasant predators in PA identified by Wildlife Conservation Officers. The most often reported predators were hawks, crows (*Corvus brachyrhynchos*), skunks (*Mephitis mephitis),* foxes, and house cats (*Felis domesticus*). Randall (1940) concluded that predation was not preventing the expansion of pheasant populations in PA. Hartman and Sheffer (1971) concluded that hay mowing, road kills and physiological stress resulted in the greatest loss of hen pheasants in PA in 1970. Casalena and Wallingford (1996) reported that about 20% of mortality of pen reared and released Sichuan and ring-necked pheasants was due to mammalian predation, 20% to avian predation, 10% to road kills, 10% stress, and 40% unknown in Centre and Juniata counties, PA.

Changes in human population growth, agricultural land uses and habitat availability have affected predator populations (Sargeant 1982). Mortality attributed to the red fox and other mammalian and avian predators has increased in recent years compared with earlier periods when critical components of pheasant habitat were more abundant (Petersen et al. 1988, Sargeant et al. 1993). Populations of red fox, raccoon (*Procyon lotor*), and striped skunk have expanded in density and range during the past half-century (Sargeant et al. 1993). Additionally, populations of domestic dogs (*Canis familiarus*) and cats have increased with human populations, and these predators can pose a serious threat to ground-nesting birds (Rasmussen and McKean 1945, Coleman and Temple 1993).

Information on trends in pheasants, grassland dependent birds, great horned owls and red-tailed hawks are available from the Breeding Bird Survey (BBS) (Robbins et al. 1986, Sauer et al. 1997). In PA, between 1966 and 1995 great horned owl populations increased by 0.97% annually and red-tailed hawks by 4% annually. During the same period, pheasants declined by 2% annually. However, we do not know if increasing raptor populations had any affect on pheasant populations. During the same period, all grassland nesting birds declined by about 2% annually across PA farmland. The relative abundance of pheasants in PA in 1995 was 2.3 pheasants, 0.1 great horned owls, and 0.5 red-tailed hawks per BBS route. In Kansas (1995), relative abundance of pheasants was 30.1, 0.71 great horned owls, and 1.88 red-tailed hawks. During the same period, great horned owls were 7 times more abundant, red-tailed hawks 3 times more abundant, and pheasants 15 times more abundant in Kansas than in PA. This same pattern holds true throughout the pheasants range. Generally, states with higher pheasant population indices also have higher raptor population indices. We recognize that BBS data may be biased because it is conducted from roadways; nevertheless, based on the predation studies we do have, it does not appear that hawks and owls take sufficient numbers of adult pheasants to control pheasant densities.

Penrod et al. (1986), on the Avon study area in New York, estimated an annual predation rate of 65% for hen pheasants. Gates (1971) and Dumke and Pils (1973) reported average annual hen predation rates of 38% and 62% on 2 different study areas in Wisconsin.

We do not have any recent data (1970 or later) on predator populations or predation rates on wild pheasant nests, chicks or adult pheasants in PA. Based on the literature, predation is highly variable between years and areas. Annual predation may remove >60% of the hen population. Nest predation rates vary from 20-55%. Predation is complex and may be influenced by predator densities, prey densities, weather, habitat, social behavior and other unknown factors. Predator populations may negatively impact pheasant populations if the predation is additive and not compensatory (Newton 1998). We propose that winter and the nesting season seem to be the most vulnerable times for hen pheasants to predation over most of their North American Range. Loss of winter and secure nesting cover forces hens to over winter and nest in fragmented and sparse habitat. These isolated patches of habitat may be more prone to predation.

Several studies involving reduction of mammalian predators to increase pheasant populations have been conducted with mixed results. Trautman et al. (1974) found 74% more pheasants on areas in eastern South Dakota where red fox, badger (*Taxidae taxus*), and skunk (*Mephitus mephitus* and *Spilogale interrupta)* were annually reduced by 22-46% over a 4 year period (1967-1970). However, over a 5-year period from 1965-1969, on an area where only red fox were removed (85% annually), pheasant numbers increased only 19%. In Minnesota, the removal of nest predators (skunks, raccoons and crows) over a 3 year period (190-1962) did increase pheasant nest success and chick production, but did not increase late summer pheasant populations (Chesness et al. 1968). Frey et al. (2003) found that size of the study area affected success of predator reductions in Utah. From 1995 to 1999, USDA Wildlife Services (WS) removed mammalian predator species, beginning in December and continuing through June of each year. Predator species removed from treated plots included red fox, coyote (*Canis latrans*), raccoon, striped skunk, badger, and mink. Plots that were 10.5km^2 showed no increase in pheasant numbers. Plots that were 40.5km^2 had twice the number of pheasants. This study demonstrated that mammalian-predator removal by itself is not always an effective means of increasing pheasant recruitment, especially in regions that have a robust and diverse predator community. Size of the treated area may also affect the ability of a predator-removal program to suppress predator densities. In small areas (10.4 km^2), they could not decrease predator numbers enough to increase pheasant recruitment; instead these areas may have become sinks that attracted predators from outside areas. It is doubtful that predator removal projects would work in areas less than 25km^2. Predator populations quickly recovered to previous densities after the conclusion of predator removal.

While large-scale predator removal projects may temporarily increase ground nesting bird populations, predators would have to be removed every year from December to June. We don't know what the cost of this removal would be over such large areas with a very diverse predator population. More diverse landscapes, as we have in PA, support many predator generalists. We do not believe it would be possible to reduce predator numbers to a level where pheasant populations would respond with increased recruitment and survival. Further, predator removal programs are not supported by most of the public.

Improving cover for breeding birds provides crucial shelter from climatic conditions and concealment for the hen and nest. Many studies have reported greater waterfowl nest success in taller and denser cover (Milonski 1958, Kirsch et al. 1978, Livezey 1981, Kantrud 1993, Gregg et al. 1994). The dependence of breeding birds on concealment also is supported by greater pheasant nesting success as cover grows during the nesting season (Chesness et al. 1968).

Clark and Nudds (1991) found that the importance of cover varied with predator species. Dense cover conceals nests from visually oriented predators such as magpies (*Pica pica*), herring gulls (*Larus argentatus*), and crows (Jones and Hungerford 1972, Brouwer and Spaans 1994). The same visual concealment that protects nests from avian predators may not protect them against predators that rely on olfaction, such as skunks, foxes, or snakes (Crabtree and Wolfe 1988, Fleskes and Klaas 1991, Sargeant et al. 1993, Zimmerman 1984).

A main paradigm in managing breeding grounds for pheasants and waterfowl has been that dense nesting cover improves nesting success (USFWS 1986) by deterring predators and decreasing their feeding efficiency (Duebbert 1969, Schranck 1972, Redmond et al. 1982). Although accepted widely, this hypothesis remains untested. In fact, isolated patches of dense nesting cover may act as ecological traps (Ratti and Reese 1988, Pasitschniak-Arts and Messier 1995) by attracting and concentrating nesting hens (Duebbert and Lokemoen 1980, Fleskes and Klaas 1991) and mammalian predators (Milonski 1958, Schranck 1972, Choromanski-Norris et al. 1989, Greenwood and Sovada 1996), with the result of high rates of nest predation (Labisky 1957, Hines and Mitchell 1983, Clark and Nudds 1991). Pheasant nesting studies along linear patches and rights-of-way (Chesness et al. 1968, Haensly et al. 1987, Mankin and Warner 1992) support the ecological trap hypothesis, which argues that small habitat patches attract nesting birds, but their nests suffer greater predation than nests in larger patches (Ratti and Reese 1988). Instead of being sources for recruitment, small patches of dense nesting cover might serve as sinks for nesting birds (Clark and Diamond 1993). Because concentrations of nesting birds and dense cover attract predators, it may be necessary to increase the area of dense nesting cover to disperse the nests (Duebbert and Lokemoen 1976, Kantrud 1993). However, Joselyn et al. (1968) found that roadside management for pheasant nesting improved pheasant populations in Minnesota.

The effects of habitat loss on breeding birds and their interactions with nest predators and nest parasites in forested systems and grasslands have been reported extensively in Europe (Storch 1991) and North America (Greenwood et al. 1995, Donovan et al. 1997). In Canada, waterfowl nest success was correlated to amount of grassland habitat available and decreased with an increase in amount of cropland (Greenwood et al. 1987, 1995). Similar results were found by Ball (1996) in the Prairie Pothole region. As summarized by Clark and Nudds (1991), the evidence for the relationship between nest success and patch size is inconclusive. There are studies that show positive relationships (Johnson and Temple 1986, Greenwood et al. 1987, Kantrud 1993), no relationships (Duebbert and Lokemoen 1976, Martz 1967 and Storch 1991), or negative relationships (Livezey 1981). Clark and Nudds (1991) suggest that other factors (e.g., effect of concealment and predator species) confound results. Another consideration is the matrix nature of the landscape. The shape and spatial arrangement of cover patches also affect bird recruitment. Local predator abundance and species composition, as well as abundance of alternative prey, may affect predation rates.

The relationship between protective vegetation cover and predation is complex. Betake and Nudds (1995) and Beauchamp et al. (1996) recommend directing efforts toward encouraging extensive management, including the recovery of marginal farmland (Fleskes and Klaas 1991) and alternative farming practices (Warner and Etter 1985). Jimenez and Conover (2001) concluded that there are no panaceas for the problem of reducing predation on ground nesting birds. Managers need to select the best technique(s) based on the predator community, local topography, size of the area, the avian species that needs protection, and other management goals and constraints. The decisions also should be based on cost-benefit (Lokemoen 1984).

Predator-prey relationships are very complex and often misunderstood by the public. Many bird species, especially ground nesting birds such as pheasants, suffer heavy predation. However, the effects of predation on pheasant populations depends on whether predation is offset by reduced mortality from other causes and/or improved reproductive success. Predator densities may not be the primary factor in rates of predation on prey. Predation is responsible only in part for pheasant population declines.

In PA, we have no recent information on wild pheasant predation rates. We believe that predation is the leading cause of mortality, but is not the primary reason for declining pheasant populations in PA. The loss of secure nesting cover, secure winter cover and fragmented remaining habitats have resulted in lower survivorship and nest success of hen pheasants on farm landscapes. Until these habitat factors are corrected over a large landscape, pheasant populations will not recover, regardless of predator population densities (Staback and Klinger 1998). Research to determine predators, predator densities, rates of predation and habitat interactions, and their effects on pheasant nesting success and survival, would provide valuable information for developing habitat management programs.

Parasites and Disease

Studies of parasites and disease have been conducted primarily on pen-reared pheasants. Much less information is available from the study of wild populations. Ectoparasites on pheasants have been examined in North Dakota (Richards, 1966), South Dakota (Parikh, 1972), Iowa (Roslien, 1966) and Nebraska (1990). Blood parasites were studied in wild and pen reared pheasants in Iowa. Tests for the incidence of Plasmodium, Haemoproteus, and Leucocytozoan were negative for these blood parasites (Roslien et al. 1962). Pheasants are susceptible to several viral and bacteria diseases also found in domestic chickens and other gallinaceous birds (Jordan 1966). Allred et al. (1973) studied the susceptibility of wild-trapped pheasants in California to infectious laryngotracheitis virus (ILTV), infectious bronchitis virus (IBV) and Mycoplasma gallisepticum (MG). Both adult and young pheasants were found to be highly susceptible to ILTV. Transmission between pheasants occurred with direct contact. Pheasants were not susceptible to IBV and produced serum responses to MG, but showed no clinical signs.

A highly pathogenic avian influenza virus caused major mortality of chickens in southeastern PA in 1983, which caused speculation by some that the wild pheasant population decline may have been related to this disease. However, Wood et al. (1985) reported that wild pheasant surveillance in the outbreak area failed to find that wild pheasants were involved with the outbreak. Virus replication did occur in experimentally infected pheasants, but the majority of infected pheasants failed to show signs of disease, and no mortalities occurred.

Despite numerous studies, we found no evidence that disease and parasites had any direct effect on pheasant populations in PA. The PDA requires blood tests before any pheasants may be brought into and released in the state. Because of the significant increase in confined poultry operations in the state, transfer of diseases between chickens and pheasants may be possible but still very unlikely. Pen reared pheasants are much more prone to disease because of their close confinement at high densities. PA wild pheasant populations should be periodically examined through blood tests for parasite and disease loads. Based on the evidence we have, we believe that predation and human disturbance effect pheasant populations much more than diseases. At current pheasant densities in PA, it is very unlikely that pheasants are a source for any avian diseases.

Weather and Food Supply

Pheasants are well adapted to survive in cold winters with moderate snowfall and a fair food supply. Several studies have reported mortality of pheasants from severe weather. Nelson and Janson (1949) reported that unusually heavy snows during the winter of 1947-1948 in northcentral South Dakota made food inaccessible and resulted in the starvation of pheasants in some areas. Losses occurred where snow covered the ground from the first part of November to the latter part of March. Standing unpicked corn (practically the only food supply) was exhausted by the first of March and birds began dying from starvation. About 100 dead birds were found in the vicinity of one pheasant area, and 44 dead and dying birds near another. Since these flocks contained an estimated 2,000 and 1,500 birds respectively, the mortality was only about 5%.

Robertson (1958) noted that the occurrence or abundance of pheasant populations in eastcentral Illinois was not related to the presence of woody or herbaceous vegetation in winter. He attributed the low winter mortality of pheasants in Illinois, compared to most Plains states, to abundant scattered waste grain and mild winters. Labisky et al. (1964) also noted that direct losses of pheasants in Illinois to winter weather were rare. Following a severe winter storm in Illinois in January 1977, Warner and David (1978) found 27 frozen pheasants along 64.4 km on 1 study area, 5.6% of the known pre-storm population. Subsequent census data indicated a storm-related decline of 54-67%. These authors necropsied 49 of the birds found frozen and reported that 40 (82%) had food (principally corn and soybeans) in their crops and 39 (80%) had normal reserves of body fat. These findings showed that scattered waste grain has been generally available to wintering pheasant populations in the Midwest from 1958-1978.

Past studies have indicated that over-wintering pheasants are attracted to woody cover (Kabat and Thompson 1963, Hanson and Labisky 1964). Leedy and Hicks (1945) suggested that woody vegetation functions as escape cover and refuge, presumably from predators and man, and that structure of woody cover is important. Warner and David (1982) also found that the extensive daytime use of woody cover by pheasants in winter is a response to seek escape cover and refuge on the barren winter landscape, whereas night roosting in open fields is a means of more readily escaping nocturnal predators. In daytime, pheasants may seek to be out of sight and protected from overhead avian predators; at night they disperse into open areas where they may take flight quickly and easily to avoid ground predators. They suggested that the value of woody cover to the winter range of pheasants in Illinois relates strongly to land use practices near acceptable woody habitat. Because pheasants congregate near woody vegetation during winter, if areas suitable for foraging for waste grains and for roosting exist in close proximity to woody cover, then energy requirements would be minimized for diurnal movement to roosting, feeding, and midday loafing sites.

In more recent studies, Perkins et al. (1997) recorded a population decline of 65% between a mild (1992-1993) winter and a cold (1993-1994) winter in Iowa. A 95% decline in the winter survival rate of pheasants was recorded between two disparate winters in South Dakota (Gabbert et al. 1999). In a North Dakota study in the 1993-1994 winter, the combination of high snowfall and lower-than-average temperatures caused the pheasant survival rate to decline by 88% from the year before. The average winter survival rate was 0.41, with rates ranging from 0.04-0.86 and differing significantly among winters. A 1^{o} C increase in the mean weekly maximum temperature decreased the probability of death by 0.06 and a 2.5 cm increase in new snow raised the probability of death by 0.08 (Homan et al. 2000). Winter survival may therefore be the limiting factor on pheasant populations in the northern Great Plains (Carroll, 1990; Riley et al.1994; Evard 1996). Conversely, when winters are mild, survival of wintering pheasants may be very high. In central Missouri a survival rate of 95% was recorded during a mild winter (Wilson et al 1992).

Hartman and Sheffer (1971) concluded that winter weather was not a significant factor in regulating long-term pheasant populations in PA. They found that pheasants very often roosted in trees in woodlots. They also found that snow very seldom covered the ground for more than 2 weeks. Farmers spreading manure provided a source of food for pheasants in winter even with a snow cover. Hartman (1979) concluded that severe winter weather could reduce pheasant populations in some years, but that secure nesting cover was the critical factor to maintain high pheasant populations. Petersen et al. (1988) suggested that extreme winter weather may make pheasants more vulnerable to predators.

Mortality from exposure to cold and rain in the spring has been documented for pheasant chicks (Riley et al. 1998). During their first few weeks of life, chicks cannot maintain their own body temperature. Arthropod production may be reduced in very cold springs. Pheasant chicks must have 14% protein in their diet to survive (Woodward 1977).

Based on our own data and data from other states, we do not believe that weather is a major factor in regulating pheasant populations in PA. During extremely hard winters with deep snows for prolonged periods, we suspect predation to be higher than during mild winters. However, if sufficient winter cover and food is available, pheasant populations should rebound in a few years. We do not believe that winter cover is the primary limiting factor regulating pheasant populations in PA. Cold spring rains could result in lower brood survival. However, populations can recover in 1 good breeding season. In PA, food is available to adult pheasants in the spring, summer and fall. Chick survival may be limited by arthropod populations in the spring and summer. We have no data on arthropod populations in PA. Most winters in PA are probably mild compared to the northern plains states. Winter food (waste grain), may be a limiting factor to pheasant abundance. We know that farming machinery has become much more efficient at harvesting crops. Krapu et al. (2004) compared the amount of waste corn available to pheasants in Nebraska in 1978 and 1997-1998. Waste corn was reduced by 24% in 1997 and 47% in 1998 compared to 1978. Post harvest waste corn averaged 2.6% and 1.8% of yield in 1997 and 1998. Because of the importance of high energy waste grains to wildlife, they recommended further studies be conducted to determine if lack of waste grains is contributing to declining bird populations. We have no data on amount of waste grain left in fields. Because pheasants are abundant in Midwestern and northern plains states and we have no reason to believe farming practices are any less efficient in these states, we suspect that winter food supplies are not limiting pheasant populations in PA. We recommend that data be collected to determine if arthropod populations and winter food sources are a limiting factor to pheasant abundance in PA.

Mortality from Human Impacts

PA has the highest human population density of any state in primary pheasant range. Indirect effects of this human density are the loss and fragmentation of critical pheasant habitats. The loss of farmland to development has been greatest in primary pheasant range in southeastern PA. Since 1964, over 1,000,000 acres of farmland has been converted to development. Although the rate of loss has slowed, fragmentation of farmland habitat continues. Some farmland has also reverted to mature forest with little or no under-story vegetation. The 2,000,000 acres of farmland that is left is much more fragmented than in 1964. Although we have no population data, we suspect that predator populations and predation rates on pheasants and other ground nesting birds are much higher in this 2006 landscape. Farm equipment is bigger, faster and much more efficient at harvesting crops than in 1964.

Farming Practices and Roads

As early as 1946, Dustman (1950) examined the impacts of mowing alfalfa hay in Ohio on pheasant hen survival and nesting success. In a sample of 784 acres of mowed alfalfa surveyed in 1946, 128 hen pheasants were killed, 5 were crippled, and 85 juveniles were killed. One casualty was represented in each 3.6 acres of alfalfa cut. The greatest mortality in any one field was found in a 23-acre field in close proximity to the Liberty Township State Game Refuge. Here, 55 pheasants were killed as a result of three mowings; 29 hens in the first cutting, 4 hens and 12 juveniles in the second, and 10 juveniles in the third cutting. In 1947, 74 hens were killed and 9 were crippled; 27 juveniles were killed and one was crippled in a sample of 560 acres of mill-cut alfalfa. One pheasant casualty was represented in each 5.5 acres of alfalfa cut. The number of hen casualties decreased from June to July 1946, and increased during this same period in 1947. Early hatching, desertion of nests due to flooding, and no appreciable late nesting during 1946 undoubtedly accounted for much of this difference between the two years. Juvenile casualties did not become apparent until June of both years. In mill-cut alfalfa the first hatched nest was found on June 22, 1946; and on June 20, 1947. A few more juvenile casualties were found in June 1946 than in June 1947. On the basis of the two-year study some idea can be had concerning the overall picture of pheasant casualties resulting from mill mowing. There were approximately 26,259 acres of alfalfa in 1946, and 24,650 acres in 1947 reported cut by six of the seven alfalfa mills located in Wood

County, Ohio. The pheasant casualty rate per acre is greatest during those periods of most intense incubation. The hen casualty rate noticeably declined immediately following a period of heavy rains and flooding (June 11-20, 1946) and gradually built up to a secondary level during the first half of July. This temporary decline was probably due to a large number of hens deserting their nests, and an almost complete absence of nest establishment during and immediately following this period of inclement weather. Data collected in mill-cut hay fields revealed that incubating hens were more prone to be killed then laying hens. They estimated that 4,955 adult hens were killed and 7,169 juveniles were killed in 50,000 acres of alfalfa hay cut three times in May, June and July 1946-1947. Farmer-cut hayfields to feed livestock were cut later and had much lower nest mortality.

Warner and Etter (1989) documented the fates of 1,104 pheasant nests in harvested and unharvested hayfields near Sibley, Illinois, from 1962 to 1972. A mean of 13% and 35% of nests in harvested and unharvested hay, respectively, hatched. Mortality rates of females and embryos were high when hay cutting coincided with the late stages of incubation. Dates when forage crops in the Midwest were harvested gradually advanced, especially in the northern portions of the pheasant range where dairy and livestock production are prevalent. In the 1960s, the mean day of first cutting for alfalfa, the most widely planted hay cultivar in the Midwest, had been 3 June, about 10 days earlier than it was during the 1950s. Mortality rates for pheasant nests found after the first cutting of hay were used with mean dates of the first hay cutting for Illinois to compute indices of female and nest destruction for 1951-58 and 1977-87. Indices of pheasant destruction were lower for 1977-87, suggesting that mortality of embryos and females during haying operations was, on average, easing in the Midwest due to earlier cutting. They concluded that the presence of small tracts of nest cover near hayfields, if carefully managed, could enhance pheasant reproduction.

Randall (1940) studied nest success in PA and found that the dates of first mowings of hayfields greatly influenced the number of clutches that hatched. Fields mowed June 1-5 had 9% of clutches hatch, June 6-10 (10.5%), June 11-15 (10%), June 16-20 (10%), June 21-25 (30%) and June 26-30 (37%). Hartman and Sheffer (1971), 30 years later, found that hay mowing was the cause of the greatest number of pheasant nest failures. About 35% of hens on mowed nests were killed. Hens were most vulnerable in the last week of incubation, when 80% were killed on the nest by mowers.

Hartman et al (1984) studied the impacts of delayed hay mowing on pheasant populations in Cumberland County, PA from 1981-1984. Farmers were paid $35 per acre to delay hay mowing until after June 20 and $50 per acre not to mow hayfields. On the 6,070 hectare study area, there were 95.1 ha delayed hayed in 1981, 148.9 ha in 1982, and 141.2 ha in 1983. Pheasant nesting success in delayed mowed fields ranged from 36%-57%. In control fields, which were mowed on the regular schedule, nest success ranged from 3.4%-20%. One-half fewer hens were killed in delayed mowed hay fields. Delayed hay mowing until after June 20 increased pheasant nest success 3-10 times and doubled hen survival. Later mowing dates would likely protect even more nests and hen pheasants.

Warner et al. (2000) studied the impacts of human disturbance from farming operations, hunting and weather on the movements and survival of 81 hen pheasants in Illinois from 1989-1994. The study area averaged 93% corn and soybean fields. The average number of extended movements was not different for juvenile and adult hens. Survival was higher in hens with more extended movements. Hens with extended movements lived (330 days) compared to those that moved less (115 days). Hens did well at avoiding human disturbances, except during nesting. Nest success was <15%, and many hens were killed on the nest by mowing machines.

Hartman and Sheffer (1971) estimated that 12-20% of the pheasant wintering populations on 2 study areas in PA were killed by vehicles. Most of this mortality occurred between March and May during spring dispersal. They did not provide data on the sex ratio of road-killed pheasants. Because PA has an extensive road system and a large rural population, pheasant mortality on highways is probably higher than other states. The potential for vehicles killing pheasants is also much higher today than in 1970.

We do not know if mortality from hay mowing is additive or compensatory. We suspect that it is additive. Road mortality is also probably additive. Mortality from hay mowing and roads is probably not density dependent. Reducing these types of mortality in PA will be very difficult. We estimate that mortality on highways may reach 20%, but a higher percentage will be males. Mortality in hayfields will likely exceed 80% and will be mostly hens. We believe that the lack of secure nesting cover and high hen mortality in hayfields is a major reason the ring-necked pheasant has declined in PA. Because pheasants prefer to nest in hayfields, we do not know if providing secure nesting cover that is not mowed during the nesting season will be sufficient to offset this high hen mortality.

As Warner and Etter (1989) found in Illinois, hay cutting is much earlier in PA now than it was in 1950 or 1970. The first cutting of alfalfa hay is usually May 13 and the first cutting of grass/legume hay May 22. We compared the cumulative percent of alfalfa hay and other hay harvested by week to the cumulative percent of first pheasant nests and hatching dates by week (Figure 3). We estimated that 90% of the nests in alfalfa hay would be destroyed by mowing before hatching and 60% of the nests in other cool season grass/legume hays would be destroyed before hatching.

In Minnesota, alfalfa hay cutting begins the first week of June. The peak of the pheasant hatch is June 15. Biologists estimate that mowers before hatching destroy 95% of pheasant nests in alfalfa. Modern high-speed hay mowers are estimated to kill more hens, eggs, and chicks than the total pheasant harvest in Minnesota (MDNR 2005). Early in the incubation period, hen pheasants are less likely to be killed on the nest and will renest. The presence of small tracts of secure nesting cover near hayfields, if carefully managed, could enhance pheasant reproduction. The CREP Program is our best chance to provide that cover. We need to increase and target CREP acres. We also need to work closely with USDA on the Farm Bill to insure programs are developed that are biologically sound and will help PA. Direct involvement by the PGC on the USDA State Technical Committee and AFWA Committees will be critical to make this happen. We need to work with our Congressman to develop a flex-fallow program to have a short term (1-2 years) resting of hay land. We also need to work with Cooperative Extension to develop high-protein legume hay that produces 6 tons per acre from 1 cutting in July. This will greatly benefit farmers and pheasants. We need to encourage farmers to include winter wheat in their crop rotations and plant part of their hay acreage to native warm season grasses (NWSG). Winter wheat can provide nesting and brood rearing cover (Rodgers 2002). A winter wheat-fallow program could greatly improve pheasant habitat in PA. We should compensate farmers for the year the wheat field is left fallow. With wheat prices over $12.00 per bushel in 2007, we may have more wheat planted in PA. NWSG can provide fair to good nesting cover. However, it is difficult to establish and requires management, such as prescribed fire or light disking to maintain the cover and prevent it from becoming too dense for pheasant nesting and brood habitat.

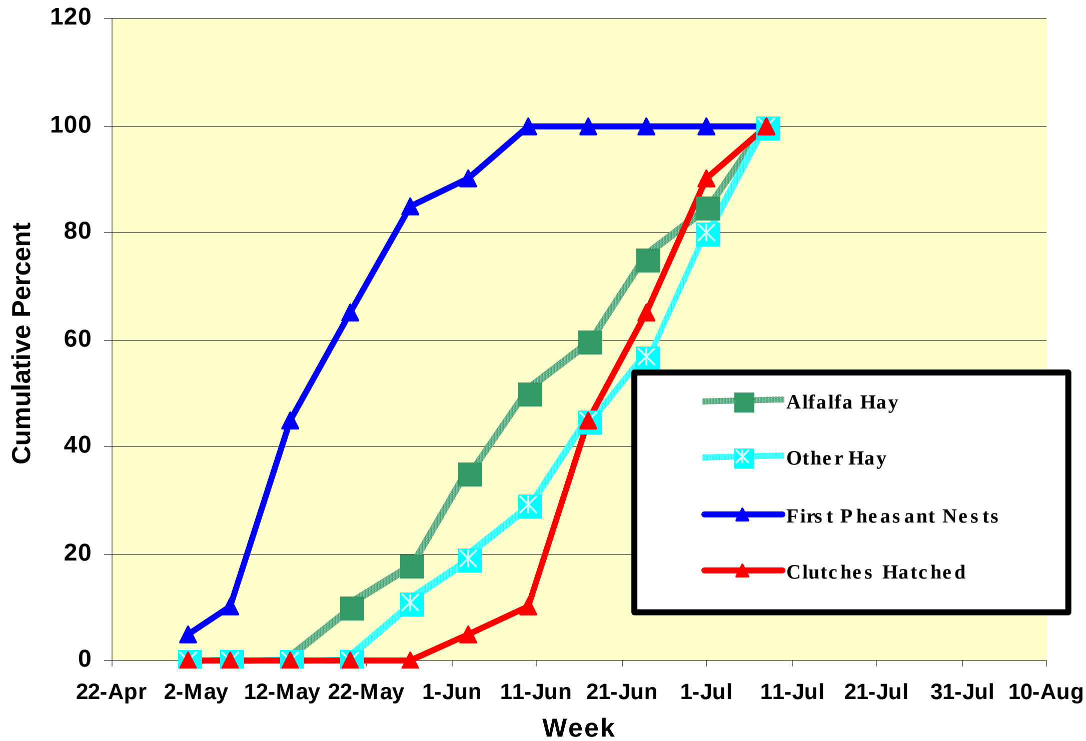


Figure 3. Five-year cumulative average weekly hay harvesting for alfalfa and other hays in PA and cumulative percent of first nesting attempts and hatch dates for pheasants in PA (NASS Crop Progress Report 2007 and Hartman and Sheffer 1971).

Pheasants will nest in the residual cover of NWSG stands, but they prefer to nest in growing green vegetation (Baxter and Wolf 1973). NWSG can be worked into the operations of beef producers, but are too low in digestible protein for dairy cows. Because NWSG should be hayed between July 15 and July 30, they could make very secure nesting cover for pheasants. Technical assistance in planting and maintenance of NWSG stands would be required, since most farmers and landowners are still not aware or have not made the switch to NWSG.

Pesticides

Production of pesticides in the United States increased from 0.2 billion pounds in 1970 to 3.0 billion pounds by 1990 (Hassinger 1991). Pesticides have become a major component of production agriculture. Crop yields and quality of crops have been improved with these pesticides. Although DDT and its associates are no longer legal to use in the U.S., there were still over 300 insecticides, 290 herbicides, and 165 fungicides being produced by 1990 worldwide (Freedman 1995). Extensive declines of pheasants in the Midwest in the 1960s and 1970s and the increased use of pesticides in production agriculture lead to speculation that these pesticides were causing direct or indirect mortality of pheasants. The USFWS studied and ranked the toxicity of 53 pesticides and found that endrin, dieldrin, and aldrin were the most toxic to pheasants. All 3 of these organochlorine pesticides are no longer permitted for use. Malathion was the least toxic and 36 other chemicals had no toxicity to pheasants (USFWS 1972).

There are documented cases of waterfowl being killed by organophosphate insecticides. Duckling survival was 58% on untreated wetlands and 13% on areas exposed to methyl parathion (Grue et al. 1988). There is evidence that some pesticides in treated seeds adversely affected pheasant reproduction (Stromborg 1977, 1979). However, Bennett and Prince (1981) found that pheasants can detect and will avoid pesticide-coated foods. Organochlorines such as DDT are no longer used in the United States. The currently permitted organochlorines are much more biodegradable and less toxic (Blus et al. 1984). Reduction of invertebrate populations can occur from the use of insecticides and fungicides (Brown 1978). This may lead to reductions in arthropod populations below levels that are sufficient to support pheasant broods. It appears that birds with precocial young are more likely to suffer negative impacts from indirect effects of pesticide use than other birds. The evidence indicates that the use of extremely toxic organophosphates and carbamates may cause local population declines in gallinaceous game birds. Less toxic and more targeted pesticides are replacing these pesticides. We could find no studies that demonstrated population declines of pheasants due to agricultural insecticides. More long-term research is needed on impacts of pesticides on game bird populations (Palmer and Bromley 1992).

More herbicides are used on cropland than any other group of pesticides. The trend in herbicide use has increased dramatically as farmers have switched to minimum till and no till planting (Green et al.1987). While herbicides at field application levels are not toxic to birds, some are embryotoxic to bird eggs. Hoffman and Ablers (1984) examined pesticides for embryotoxicity in mallard eggs. Paraquat was found to be toxic and killed chicks in the egg. Paraquat is a contact herbicide and could come in contact with pheasant eggs during field applications. Glysophate is much less toxic and safer for farmers and is now used as a contact herbicide.

Many Biologists believe that the indirect effects of herbicides are more detrimental to wildlife populations than direct effects. The loss of wildlife habitat from extensive use of herbicides has been recognized for over 50 years (Allen 1954). More than 10 years of research was conducted on farmland in England to determine how herbicides affected game bird populations. Intensive herbicide use greatly reduced weeds and arthropod populations resulting in lower survival of pheasant and grey partridge (*Perdix perdix*) chicks. When field borders were left unsprayed, chick survival and game bird populations increased for both species (Rands 1986). Hill (1985) found a very high correlation between total arthropod abundance and pheasant chick survival in England.

We have no data on the impacts of pesticides on pheasant populations in PA. We concur with other pheasant biologists that the loss of annual weeds in crop fields probably reduces arthropod populations and lowers chick survival. We do not know if low brood survival is one of the primary causes for pheasant declines in PA. Northern plains states have much more intensive cropland agriculture and pesticide/herbicide use is probably much higher than in PA. Yet, pheasant populations are currently much higher in the northern plains states than PA. However, these states also have large acreages in CRP, which serves as good to excellent nesting and brood cover.

We need to determine if brood survival and arthropod populations are an issue in PA. We also need to greatly increase the amount of secure nesting and brood rearing grassland, legume and annual weed fields.

Lead Poisoning

Lead is a highly toxic metal to all vertebrates. Absorption of low concentrations result in a wide range of sublethal effects in animals and higher concentrations result in death. Prior to the phasing out of lead shot for waterfowl, wetland avian species were exposed to large amounts of lead through ingestion of spent lead shot (USFWS 1986). Waterfowl have suffered wide spread mortality from lead ingestion (Pain 1996). Lead poisoning has been reported in 31 species of birds other than waterfowl. In 1998, out of 1,600 hunter-killed mourning doves (collected in Arizona, Missouri, PA, South Carolina and Tennessee) only 1% had ingested lead (Franson 1999). However, these studies were not conducted on intensively hunted upland areas.

We found only one study that documented lead ingestion in wild pheasants (Hunter and Rosen 1965). In December 1963, a dead male pheasant found on the Grizzly Waterfowl Management Area in California, contained 43ppm lead in the breast tissue and 168ppm in the liver. These levels are much higher than normal levels in birds. The area received very high hunting pressure. The authors concluded that, on heavily hunted areas, pheasants may suffer from ingesting lead shot, but few carcasses are found because of scavengers and dense habitat.

On heavily hunted uplands, it is possible that pheasants and other birds and mammals could be exposed to lead shot. We do not know the effects at the population level of lead poisoning in pheasants. We recommend that we stay informed on national initiatives that consider banning lead shot for upland hunting.

SECTION IV. HABITAT RELATIONSHIPS

Native Range

Despite their widespread distribution across Asia, little information exists on the native habitats of the common pheasant. What does exist, suggests that, throughout its natural range the common pheasant occurs in a broad variety of temperate habitat types. In China, they prefer overgrown edges of river plains, hilly areas with pine thickets close to large cultivated fields of rice, wheat, or rape (Cheng 1963). In eastern Russia the primary biotype is shrub thickets, cultivated crops, and brush covered river valleys (Dementiev and Gladkov 1967). More recent surveys in China found that they prefer areas of shrubland, forest edge and old fields/cultivated land in close proximity (Zheng 1988). They use woodland edges, but, unlike many other pheasant species, tend to avoid dense forests. Whenever possible, all species of native pheasants will roost in trees. The species occurs at elevations from sea level to 3,000m (Johnsgard 1999).

Introduced Range

Unlike their native range, many studies have been conducted to determine preferred habitats and habitat relationships to population demographics of the common pheasant introduced in Europe and North America. Throughout Europe and America probably no bird species is as closely tied to agriculture as the common pheasant.

In the United States the pheasant is a grassland/farmland-dependent species that thrives in farmlands containing a mixture of cultivated grains, undisturbed grasslands, wetlands, shrublands and woodland edges. Undisturbed grass/forb habitats are required for nesting and brood rearing. Emergent or shrub-scrub wetlands or other dense, woody habitats are needed for winter cover, especially during severe weather. Because most pheasants move <2-3 miles between summer and winter range, both reproductive habitat and at least 1 winter area must be available within a 9-10 square mile landscape to sustain a population over the long term (MDNR 2005).

They are most abundant where cropland (70% or greater) is the most extensive land-use, undisturbed grassland/forbs make up 10-25% and the remainder is secure winter cover (shrublands, woodlots, native warm season grass stands, woodland edges). Interspersion of cover types appears critical to maintaining high pheasant populations. The greater the interspersion of these cover types the higher the carrying capacity for pheasants. Pheasants are absent from heavily forested areas and rare where forests exceed 25% of the landscape (Edminster 1954, Palmer and Hartman 1987).

In PA, Randall (1940) described cover types on a study area with high pheasant densities in Lehigh County. The study area consisted of 1,675 acres of prime farmland. Wheat made up 29%, corn 19%, potatoes 18%, alfalfa and clover 12%, barley 7%, oats 6%, wasteland 3%, pasture 1%, soybeans 0.7%, conifer plantations 0.3% and other 1 %. Thirty years later, Hartman and Sheffer (1971) analyzed the cover types on 2 study areas in Lebanon and York counties that had very high pheasant densities. Each study area contained about 3,500 acres of farmland. Land Use in the York county study area in 1966 included: corn (24.2%), winter grain (22.3%), mixed hay and alfalfa (24%), pasture (15.8%), oats (7.8%), woodland (3.7%) and idle, orchard (1.7%). The Lebanon county area had corn (27%), winter grain (16.9%), mixed Hay and alfalfa (29.6%), pasture (6.5%), oats (6.5%), woodland (3.9%) and orchard, idle, other (9.5%).

Pheasants in England use woodlands more than they do in the United States; however, intensive predator control is practiced. Within arable England landscapes, woods provide pheasants shelter in winter and breeding habitats in the spring. Small woods of less than a hectare are better than large woodlands. However, woodland that lacks a shrubby understory is of little value to pheasants, regardless of size. Pheasants breed along shrubby edges in the spring and the greater the edge the more breeding territories (Hill and Robertson 1988).

Breeding Habitat

When pheasants begin breeding in early March, the males or cocks establish territories they defend throughout the breeding season. Usually the breeding area is a mixture of open field and woody edges. Grass and forbs make up the majority of cover. Woodland cover may be part of a woodlot, patch of brush, and a hedgerow or ditch bank that afford some type of good cover (MDNR 2005).

In England, Lachlan and Bray (1976) found that male pheasant territories were most influenced by amount of shrubby edges next to open fields. Robertson et al. (1993) also found that high territorial male and female densities were associated with abundant woodland edges, in particular those with more than 50% shrubby cover, predominantly arable farmland and the absence of hedgerows.

In contrast to the management of European pheasants, the spatial dynamics and habitat selection of breeding male ring-necked pheasants have received little attention in North America. Leif (2005) radio marked 95 male pheasants from 1997–2001 in eastern South Dakota. He found that males preferred to establish breeding home ranges in association with idled herbaceous and woody cover. The proportional abundance of woody cover decreased the size of male home ranges, whereas higher proportions of cropland resulted in larger pheasant home ranges. Pheasants preferred woody cover to other available habitats. He concluded that complexes of idled herbaceous and woody cover will maximize the capacity of landscapes to support male pheasant territories. Smith et al. (1999) studied pheasants in Maryland and concluded that suitable male territory cover should include shrubs or woody cover at crop borders.

We have no data on breeding habitat of pheasants in PA, but we concur with the findings in South Dakota and Maryland. Woody-shrub cover adjacent to crop fields is a key component of pheasant territories. The greater the amount of woodland-shrub edge to cropland and hayfields the more territories can be supported. We recommend the creation and maintenance of woody-shrub edges that are at least 20 meters wide. Unlike Robertson (1996) that suggested breeding territory habitat was the limiting factor to pheasant abundance in the United States, we conclude that breeding habitat is not a limiting factor in PA. Similar to other pheasant biologists in North America, we propose that secure dense nesting cover is the main limiting factor to recovery of pheasants in PA.

Nesting Habitat

In North America most pheasants select areas of dense herbaceous ground cover with good overhead concealment in which to nest. The best nesting habitat contains a mixture of perennial grasses and broad-leaved forbs. Small grains, hay, and pasture are also used as nesting habitat, but reproductive success is lower than in undisturbed grasslands because of inadequate cover in early spring and untimely harvest. Residual cover that provides overhead concealment is important for early nests with a shift toward hayfields as vegetation becomes taller (Boyd and Richmond 1984, NRCS 1999). Old fields provided the highest nest success in New York (63.3%, Boyd 1981).

In Minnesota, most pheasant nests are found in roadsides and these nests produce 25-50 percent of all pheasant broods annually. Roadsides with thick stands of smooth brome and alfalfa offer good cover early in the nesting season. Grass habitats should provide residual cover or new growth at least 10 inches high by April 15 (when hens begin nesting), and remain undisturbed until at least August 1 (when most renesting is completed) (MDNR 2005).

About 25 percent of pheasant nests in roadsides hatch before being mowed or destroyed by predators. In small grain fields of oats, barley and winter wheat about 50% will hatch, but only 16% of pheasant nests are located there. About 30% of first pheasant nests are in alfalfa. It is very attractive to hens and broods, but it is hostile nesting habitat because the early and repeated mowing for hay destroys nests, nesting hens, and broods. Modern high speed hay mowers are estimated to kill more hens, eggs, and chicks than the total pheasant harvest in Minnesota (MDNR 1986).

Haensly et al. (1987) characterized vegetation at 181 ring-necked pheasant nests as 3-5% woody cover, 32-38% grass cover, 11-16% forb cover, 23-34% litter cover and 19-29% bare ground. Differences between successful and depredated nests were related primarily to differences in habitat pattern rather than vegetative components or vertical cover at nest sites.

Dumke and Pils (1979) found nesting hens in Wisconsin to prefer retired cropland, wetlands, strip cover, or hayfields for nesting cover. Retired cropland was slightly favored over wetlands, strip cover, and hayfields for 72 nests established prior to 16 May. Use of retired cropland by nesting hens was not related to the age of the stand. Nest success was highest in retired cropland where 50% of the clutches hatched. Nest success was poorest in hayfields (14%). Use of retired cropland by nesting hens was not related to the age of the stand. Mammalian predation was the chief cause of nest loss. From 16 May through 15 June retired cropland was most prominent among the cover types selected for nesting, and wetlands diminished in importance. Alfalfa, brome grass, and asters spp. had most nests. Nest success was roughly comparable among upland cover types, averaging about 25%. Among 9 hayfield nests, mowers disrupted 6, 1 was destroyed by predation, and 2 hatched. Hay cutting primarily disrupted clutches of renesting hens. From 16 June to 12 July 9 nests, including 3 that were successful, were distributed among 4 cover types. For all periods combined, retired cropland had the largest complement of nests (33%) and provided the highest nest success (39%). Sixty-nine percent of the hens renested in a cover type that was different from the one selected initially. Most hens that nested initially in wetlands moved to upland sites for renesting.

Randall (1940) examined 245 nests in Lehigh County PA. Nests were located in alfalfa and clover hayfields (65%), wasteland (15%), small grains (12%), roadsides (4%), fencerows (3%), pasture (1%) and potatoes (<1%). Nest success varied by cover type: pasture 33%, small grains 30%, wasteland 27%, hayfields 27%, roadsides 11%, and fencerows 10%. Nest success in hayfields was greatly influenced by hay mowing dates. Fields mowed June 1-5 had 9% of clutches hatch, June 6-10 10.5%, June 11-15 10%, June 16-20 10%, June 21-25 30% and June 26-30 37%.

In Lebanon and York counties, PA, Hartman and Sheffer (1971) found that pheasants nested in herbaceous cover that was at least 8-12 inches tall. The principal nesting cover in order of importance was: cool season hay/legume fields, winter grain, pasture, and odd grass/weed/brush areas. Usually about 33% of hens nested in hay, however, in some years, this was over 50%. During a 6 year period (1963-1968) the following average nest densities were found: alfalfa 1 nest/2.7 acres, mixed hay 1 nest/4.6 acres, weeds/grass/brush 1 nest/4.5 acres, winter grain 1 nest/24.4 acres and pasture 1 nest/11 acres. Nest success was 4.6% in alfalfa hay, 9.5% in mixed hay, 16.7% in grass/weeds/brush, 33.3% in winter grains and 100% in pasture. Hay mowing was the cause of the greatest number of nest failures. About 35% of hens on mowed nests were killed. Hens were most vulnerable in the last week of incubation, when 80% were killed on the nest by mowers.

Casalena and Wallingford (1996) studied nesting in game farm raised ring-necked and Sichuan pheasants released in Centre and Juniata counties, PA, from 1994-1995. Of 31 Sichuan first nesting attempts, 35% were in agricultural habitats and 65% were in nonagricultural areas. Of the 14 successful nests, 50% were in agricultural habitats. Of 37 first nesting attempts for ringnecks, 22% were in agricultural habitats and 78% were in nonagricultural habitats. All seven successful first nests were in nonagricultural habitats. Habitat selection did not differ significantly between subspecies. Based on this two-year telemetry study, it was concluded that game-farm reared Sichuan pheasants are not substantially different from game farm-reared ring-necked pheasants in terms of habitat use.

There is little evidence that overall size of nesting habitat or distance to edge is important for nest placement (Hoffman 1973). As Hartman and Sheffer (1971) found in PA, nests appear to be clustered within the presumed limits of a males territory (Baskett 1947, Seubert 1952). However, Clark and associates (1999) found that areas with 25% of the landscape in block CRP undisturbed grasslands had higher nest success (62.3%) compared to 44.8% in small, linear, or disturbed habitats, regardless of the study landscape. Haensly et al. (1987) studied rates of predation on nests of pen-reared ring-necked pheasants *(Phasianus colchicus),* released in spring and compared strip and non-strip habitats in the Willamette Valley, Oregon, from 1980 to 1983. Nests in strip habitats had rates of predation 4x greater than nests in non-strip habitats. In England, Hill and Robertson (1988) found that females preferred to nest in woodlands early in the breeding season, but shifted to cereal crop cover later. They also noted that pheasants nested in woodlands with good herbaceous or shrubby understories.

Secure nesting cover has declined in PA because of declines in farmland, earlier hay mowing dates, and declines in small grains (Klinger 1996). Based on the evidence we have accumulated, secure dense nesting cover is a major limiting factor in restoring wild pheasant populations in PA. We concur with Clark and Bogenschutz (1999) that about 20-25% of the cropland should be in secure grass/legume cover and be undisturbed from

April 1-July 1 to maintain robust pheasant populations. We believe that idle grassland/legume fields, properly managed native warm season grass fields and winter wheat may be able to provide this habitat in PA. We consider most alfalfa and cool season grass/legume hay fields to be ecological traps and we recommend that farmers be encouraged to mow hayfields as early as possible so they are not selected for pheasant nesting.

Brood Habitat

Pheasant brood cover consists of vegetation that is relatively open near the ground to allow movement of the chicks while providing good overhead concealment from predators and abundant invertebrate populations (Warner 1979). Warner (1984) reported that ring-necked pheasant broods in Illinois used oats, hayfields, and cultivated row crops. Although oats and hayfields constituted only 6.4% of the study area, he found that broods primarily used these cover types.

However, Boyd (1981) in New York reported that old fields, shrubland and hayland were the primary brood habitats. Corn and oats, while available, were used much less. Other common habitat types used by pheasant broods include idle grasslands, pastures, wetlands, and strip cover (Carroll and Sayler 1990). Corn and soybeans were considered of lower value to ring-necked pheasant chicks because of their low insect biomass (Warner et al. 1984). Native grasses of big and little bluestem, sideoats grama, indian grass and switchgrass with native forbs can provide good brood habitat (NRCS 1999). However, monoculture switchgrass becomes too thick for pheasant chicks. Broods from hatch to 9 weeks of age covered an average of 17.8 hectares in oat-hayfield dominated landscapes and 22.3 hectares in row crop dominated landscapes (Warner et al. 1984).

The habitats used by broods in England largely reflected the amounts of arthropods which they contained. Sixty-eight percent of 206 radiolocations of 8 broods during the first 4 weeks of life were in cereal grains. Only 8% were in woodlands. Broods preferred feeding in rough grass, weedy strips and weedy fields (Hill and Robertson 1988). Without food and protein content exceeding 14%, chicks grow slower and die in the wild (Woodward et al. 1977).

Studies in Illinois (Robertson 1958, Labisky 1968; Warner 1979, 1984; Warner et al. 1984) indicated (1) a decline in chick survival was apparent range-wide in Illinois as early as the 1950s, as farming intensified; (2) there has been no change in clutch size or chronology of hatch; (3) survival rates diminished even as metabolites of chlorinated hydrocarbons declined in chicks and the environment; (4) the hay-oat complex, traditionally a mainstay of rotation farming and diverted cropland programs in the Midwest, was integral to both the nesting and brood ecology of pheasants in this region; and (5) the most significant land-use change was the expansion of row crops. Warner (1984) also found that brood movements were much greater and home ranges larger in broods feeding in a monoculture agricultural landscape compared to those feeding in a diverse agricultural landscape. There may have been higher arthropod populations in the more diverse landscape. More recently, Warner et al. (1999) found that in spite of the increase in potential brood habitat on set-aside farmland, chick survival remained low from 1982 to 1996. The number of grassy fields (primarily narrow linear tracts) was positively correlated with chicks per brood, but this relationship explained only 15% of the variation. The lack of improvement in chick survival in recent decades relates to the pervasive clean farming practices in the Illinois pheasant range. Most of the set-aside land in the Illinois has been under annual contract and seeded very late to oats, which is cover of marginal value to foraging pheasant chicks.

We do not know if brood habitat is limiting pheasant populations in PA. We have no information on arthropod populations in different cover types. Considering that most farms in PA practice crop rotations and fields are relatively small, we suspect that brood habitat is not a limiting factor in PA. However, we should collect data on arthropod populations in corn, soybean, CREP and small grain fields to determine if adequate chick foods are available. We do not believe that brood cover and concealment from predators is limiting in PA.

Fall and Winter Habitat

During the fall pheasants avoid disturbed areas with short vegetation and select idle grasslands and strip cover (Gates and Ostrom 1966). Cornfields, retired cropland planted to cool season grasses and forbs and wetlands were important autumn habitats for ring-necked hens in Wisconsin (Gatti et al. 1989).

The primary functions of winter cover are to provide protection from weather and predators. Large blocks of heavy herbaceous or woody vegetation can provide these functions. Weedy fence rows and field borders of upright grasses, cattail marshes, low growing conifers and hardwood shelterbelts and woodlots may all be used for winter cover (NRCS 1999). Pheasants will generally select winter cover that is near winter food. Several researchers considered brushy woodlands and marshes the most important winter cover types for ring-necked pheasants (Gates and Hale 1974, Leptich 1992). Leedy and Hicks (1945) considered woodlots with trees <10m tall and shrubby understories valuable winter cover in Ohio. Shrubby areas with a canopy closure of >30% were considered optimal winter cover for ring-necked pheasants (MDNR 1986).

Hartman and Sheffer (1971) found that south facing conifer plantings and small woodlots were selected for roosting by ring-necked pheasants in PA. Pheasants, in groups of several to several hundred roosted in woodlots and brushy areas over winter. Pheasants fed during the early morning and late evening but returned to the same roosting area at night. They seldom moved more than 1 mile from the roosting area. Woodlands provide the most extensive and important winter cover for pheasants in England (Hill and Robertson 1988). In Wisconsin, Gates and Hale (1974) reported that >80% of marked ring-necked pheasant hens selected wintering areas within 3.2 km of their summer brood rearing range. Hartman and Sheffer (1971) also found that ring-necked pheasants move less than 2 miles from the wintering to breeding grounds in PA.

Winter cover may be a limiting factor in parts of PA. High winter mortality of hens will suppress pheasant populations. Wetlands, shrubby woodlands, and conifers should be maintained and created in areas where winter cover is lacking. Based on data from Hartman and Sheffer (1971), we recommend that at least 5% of each 2 square mile block of pheasant habitat should have good winter cover in several locations.

Habitat Interspersion and Area Requirements

The minimum area requirements to maintain a stable or increasing ring-necked pheasant population are not known. However, Gates and Hale (1974) suggested that year round ring-necked pheasant management units be no smaller than 9-10 sections (6,400 acres) centered on traditionally used winter cover. Riley (1999) recommended that management units be 25,000 acres or larger. Hartman (personal communication) recommended management units be 10,000 acres or larger. The minimum area requirement to maintain a vigorous pheasant population was estimated to be approximately 15,000 acres by USDA (NRCS 1999). Warner and Joselyn (1986) considered 20 contiguous square miles (12,800 acres) the minimum area to demonstrate the effects of roadside management on pheasant populations. Based on the literature and analysis of habitat data, we concluded that 10,000 acres should be the minimum size for WPRAs.

Regardless of the size of the area to maintain or expand pheasant populations, the home range of individual pheasants is about 2 square miles. Good interspersion or mixture of cover types for breeding, nesting, brood rearing, roosting and winter cover must be located in close proximity within this 2 square mile area to maximize ring-necked pheasant populations (NRCS 1999, MDNR 1986).).

SECTION V. POPULATION TRENDS

The first recorded attempts to establish the ring-necked pheasant in PA occurred in 1892. Private individuals purchased several hundred pheasants from England and released them in Lehigh and Northampton counties. Other releases occurred by private individuals in southeast PA. Most likely, these pheasants were not pure strains, but were hybrid crosses between *P.c. colchicus*, *P.c. torquatus*, *P.c. mongolicus* and *P.c. versicolor*.

Growing populations were found across the southern sections of the state by 1930. Gerstell (1935) first described pheasant range in PA. He classified the state into First Class, Second Class and Third Class range. He established criteria for establishing First Class Range for pheasants based on the ability to produce a minimum of a 10:1 ratio of wild to stocked birds in the harvest. First class range was nearly all in southeastern PA and parts of Westmoreland and Bradford counties (3,200,000 acres). Prime farmland made up first class range. Second class range was farmland that, given enough time, should produce pheasants on a sustainable basis (3,585,000 acres). Third class range was isolated patches of farmland that, without intensive management, were too small to produce sustainable populations (240,000 acres). Total estimated pheasant range in PA in 1934 was 7,030,000 acres (Figure 4).

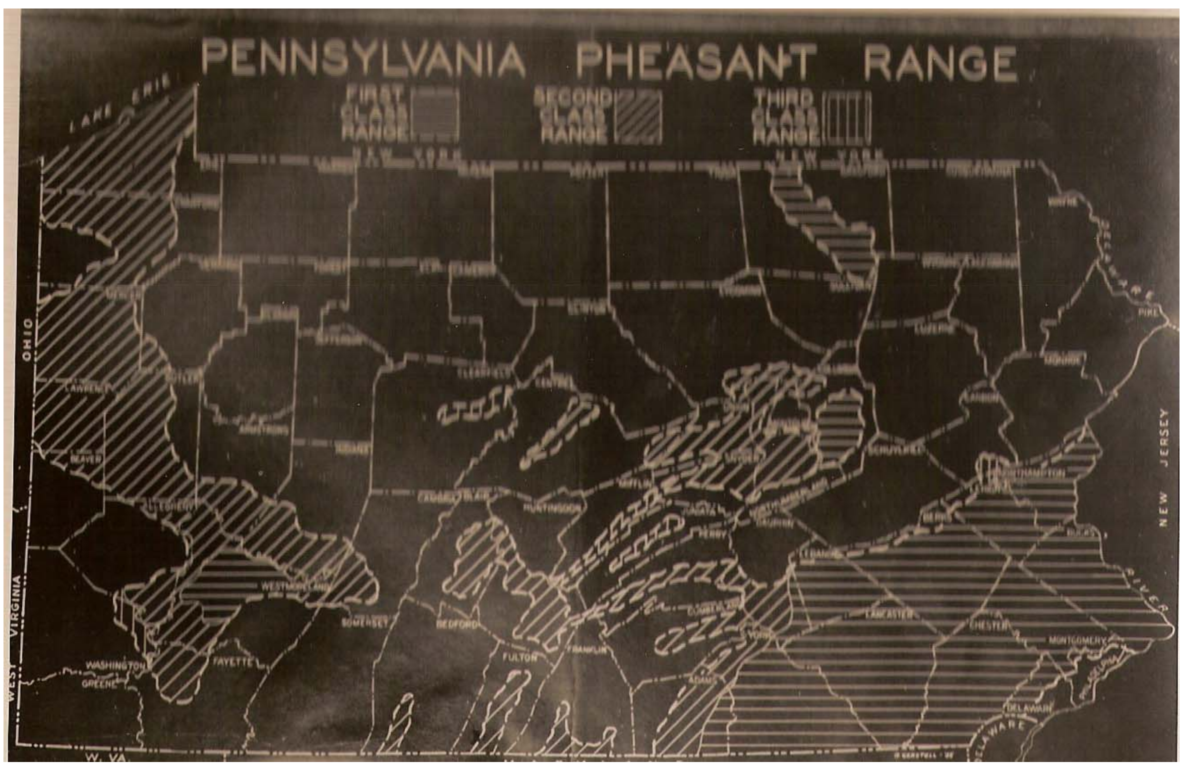


Figure 4. Original pheasant range map, PA 1934 (Gerstell 1935).

Randall (1940) studying PA pheasants “in the good old days” when pheasants were supposedly at their peak, recorded the fall 1939 population in Lehigh County at 1 bird per eight acres.

Hartman and Sheffer (1971) estimated that 15.7 million acres of PA was pheasant range in the late 1960s and early 1970s (Figure 5). Hartman and Sheffer (1971) described pheasant range based upon the patterns of land-use. Primary range was intensively cultivated with a diversity of cropland. Some farming characteristics that had their greatest occurrence in primary range were winter grain, corn, total cropland, harvestable cropland, and total land in farms. Farm habitats in tertiary range had more hayland, idle land, pasture and woodlands (Figure 6).

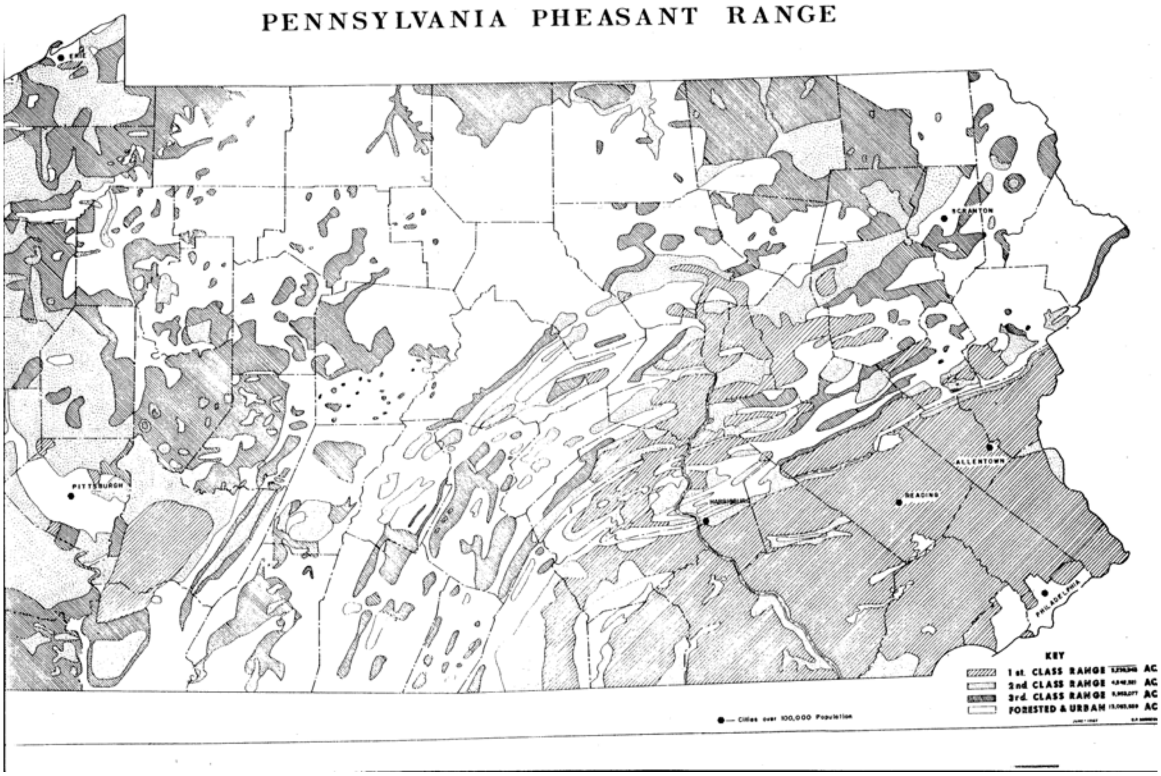
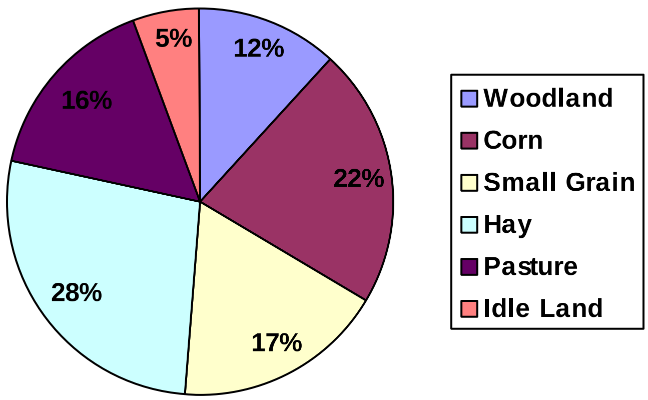


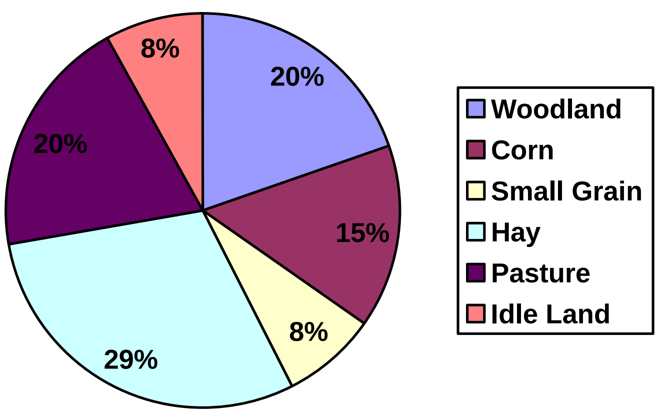
Figure 5. Original pheasant range map, PA 1967 (Hartman and Sheffer 1971).

We do not know the source of data used by Gerstell (1935) and Hartman (1970) to estimate range classes for pheasants in PA. However, because remote sensing imagery was not available, we suspect that they used data from the USDA Census of Agriculture. We analyzed U.S. Census of Agriculture data from 1969 and 1992 and found that total cropland acres in PA declined from 5,597,790 acres to 5,021,773 acres and total land in farms declined from 8,900,767 acres to 7,189,541 acres (U.S. Bureau of the Census1972, 1994). Based on these data, we concluded that pheasant range was overestimated by Hartman and Sheffer (1971). We suspect that they placed each county in primary, secondary, or tertiary range and then counted the counties total land area as pheasant habitat. Total farmland acres in 1935 was 15,855,343 acres with 9,408,560 acres in cropland (U.S. Bureau of the Census1972). Gerstell's estimate of about 3,000,000 acres in First Class Range and 7,000,000 acres in total pheasant range in 1934 seems probable.

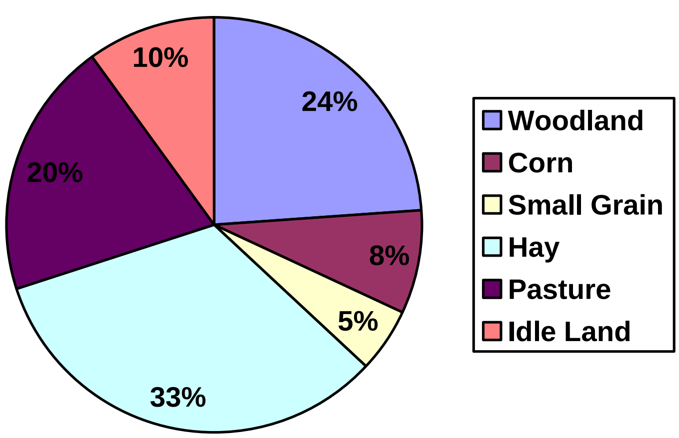
Hartman and Sheffer (1971) estimated the 1970 pre-hunt population to be between 2.5 and 3.0 million pheasants, and that the density of pheasants in primary range averaged 1 bird to 2-7 acres.



PRIMARY RANGE (40-120 hens/mi^2)



SECONDARY RANGE (10-39 hens/mi^2)



TERITARY RANGE (0-9 hens mi^2)

Figure 6. Primary, secondary and tertiary pheasant range land-use characteristics, PA 1970, from Hartman and Sheffer 1971.

Sex ratio in the fall was close to 1:1, slightly in favor of females. During the early 1970s, PA hen pheasant densities in the spring ranged from 40-120 hens/mi^2 in primary pheasant range, to 10-39 in secondary range and 0-9 in tertiary range.

Hartman and Sheffer (1971) suggested that pheasant populations in the early 1970s were likely the highest ever in PA. These pheasant densities may have been among the highest pheasant population densities ever recorded in North America (Dahlgren 1971, Figure 7).

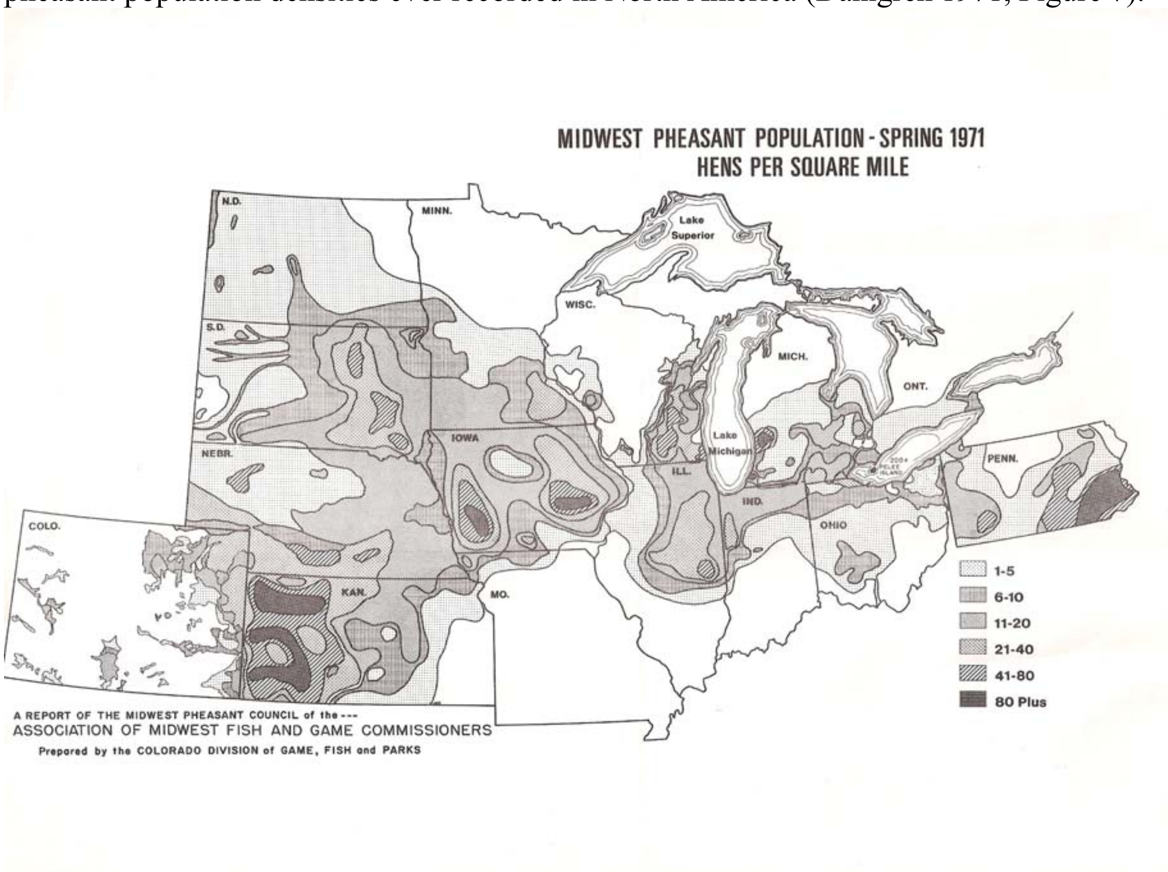


Figure 7. Spring pheasant hen densities in selected states in 1971 (from Dahlgren 1971).

PA pheasant populations on six study areas in the spring of 1993 ranged from 0.0-3.8 birds/mi^2 (Hardisky 1993). Only 3 study areas supported more than 1 bird/mi^2.

Blancher et al. (2007) used BBS data to estimate land bird populations by physiographic region, bird conservation region (BCR), and state. They estimated the statewide population of ring-necked pheasants in Pennsylvania in the spring of 2004 at 30,000 birds..

In 2007, the best pheasant range may support 5-10 birds per square mile and most agricultural lands support less than 0-3 birds per square mile. Populations are much more fragmented and isolated. These densities may also be biased high because of the release of penned-reared pheasants in virtually all counties of the state.

Breeding Bird Surveys (BBS)

Several surveys provide long-term data on the trends in pheasant populations on a regional and statewide basis. The BBS is a long-term, large-scale, international avian monitoring program initiated in 1966 to track the status and trends of North American bird populations. The USGS and the Canadian Wildlife Service coordinate the BBS program. Each year during the height of the avian breeding season, June for most of the U.S. and Canada, participants skilled in avian identification collect bird population data along roadside survey routes. More than 3,700 survey routes are located across the continental U.S. and Canada. Once analyzed, BBS data provide an index of population abundance that can be used to determine population trends and relative abundances at various geographic scales (Sauer et.al. 1997).

We used breeding bird survey data from routes run in primary pheasant range counties in southeastern PA (23-31 routes) to estimate trends and relative abundance of breeding male pheasants from 1966-2005. Pheasant population trend increased 3% per year from 1966 to 1974, was stable from 1974-1980, and declined 11% annually from 1980-1986, 16% annually from 1986-1998 and 21% annually since 1998. The relative abundance of pheasants has declined from an average of 32 birds per route in 1966 to 1 bird per route in 2005 (Figure 8). Based on relative abundance, pheasants have declined by 97% in primary pheasant range since 1966 and are essentially no longer a breeding species on much of PA prime farmland. We do not know how many of these males seen or heard crowing were stocked birds.

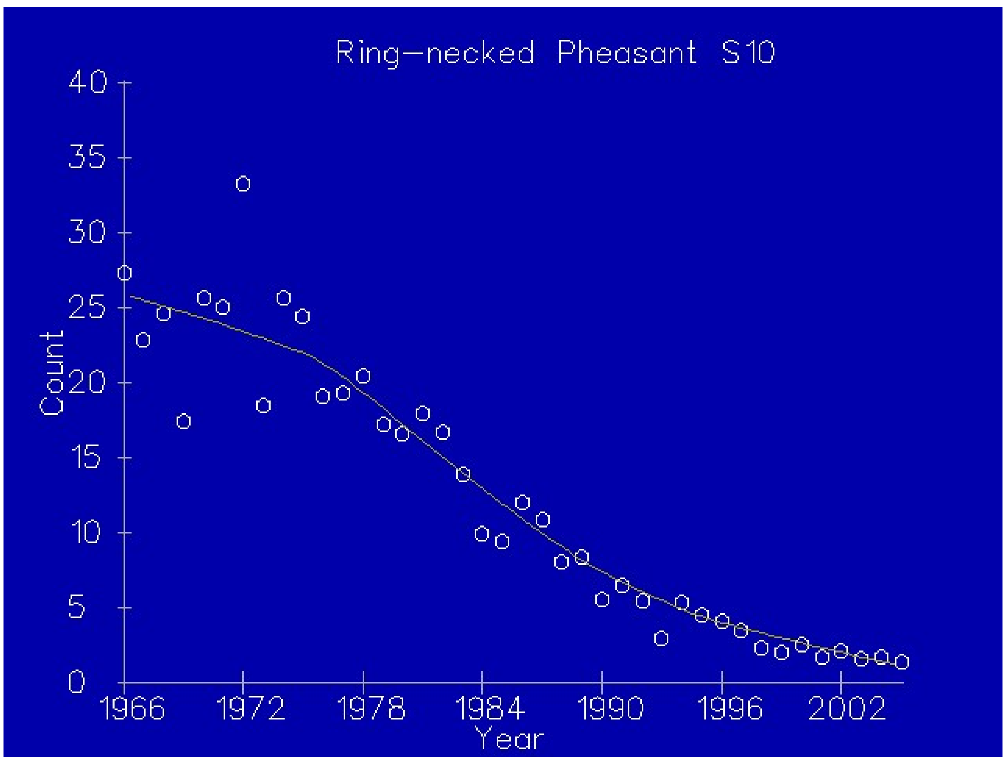


Figure 8. Trend in relative abundance of pheasants in primary pheasant range in southeastern PA, 1966-2005, from BBS (Sauer et al.2007).

We also examined the relative abundance of pheasants in the Ridge and Valley and Ohio Hills physiographic regions of PA. We found similar trends, but much lower relative abundance in central and southwest PA (Figures 9 and 10). Pheasants have declined from 5 birds per route to 1 bird per route in the Ridge and Valley, and from 2 birds per route to <1 bird per route in the Ohio Hills.

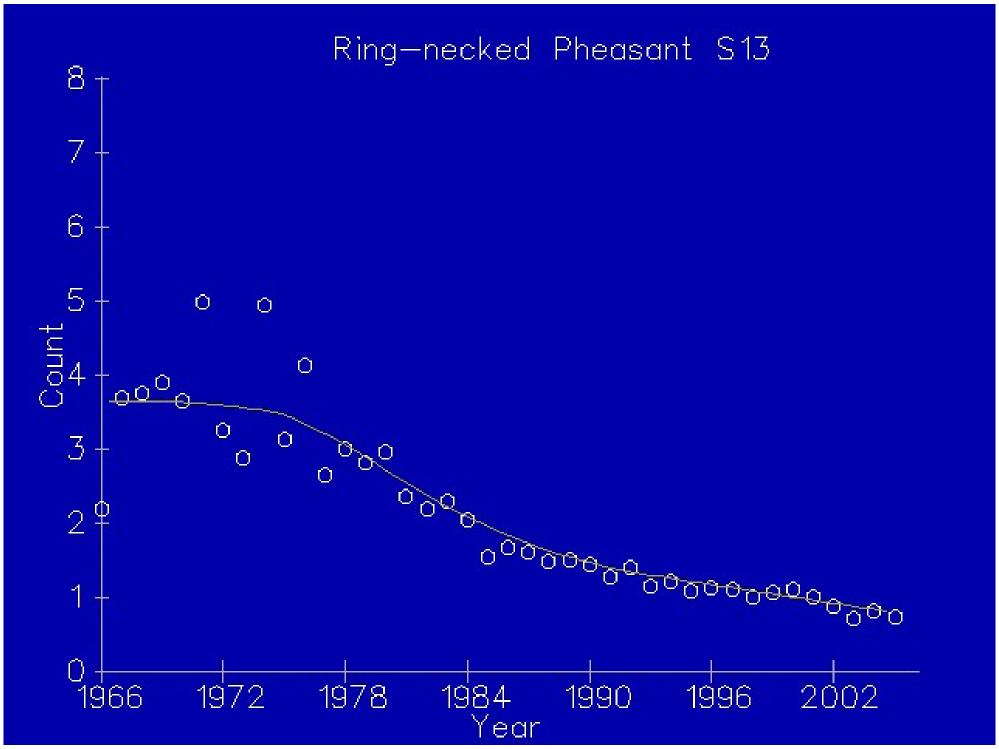


Figure 9. Trend in relative abundance of pheasants in Ridge and Valley physiographic province in central PA, 1966-2005, BBS (Sauer et al. 2007).

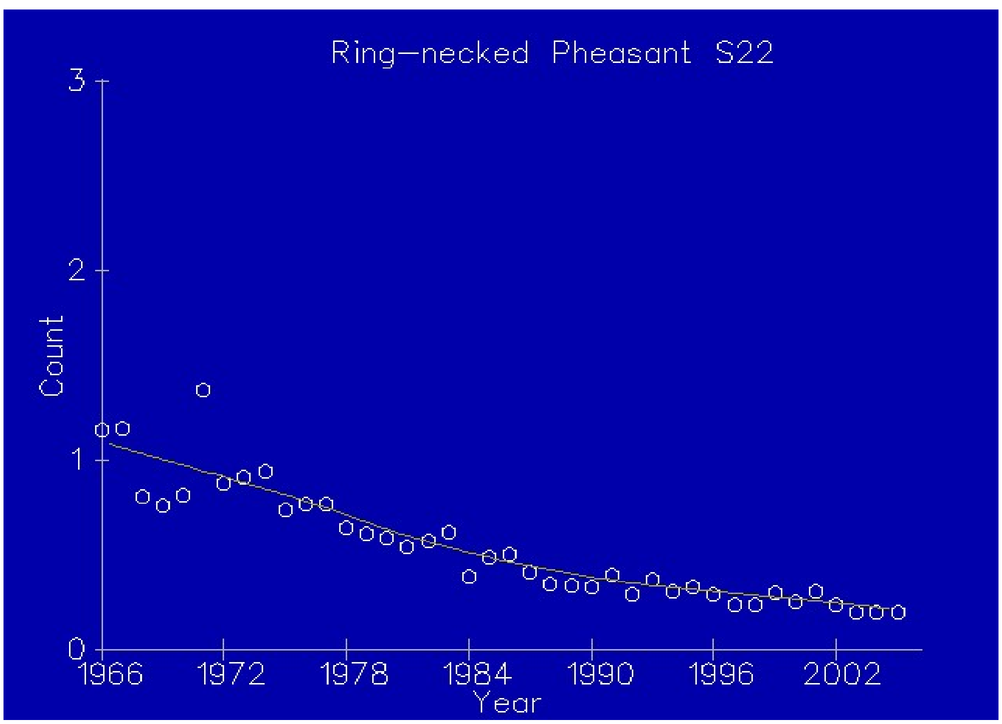


Figure 10. Trend in relative abundance of pheasants in Ohio River Hills physiographic province in southwest PA, 1966-2005, from BBS (Sauer et al. 2007).

Christmas Bird Count (CBC)

The National Audubon Society Christmas Bird Count (CBC) is an early-winter survey of birds. The sample area for a count is a circle that is 15 miles in diameter. Varying numbers of volunteers count all birds they see in the circle during a single day within 2 weeks of 25 December (Butcher 1990). The number of circles and participants has changed dramatically since the early years. The number of birds counted is a function of effort, and analysis of change over time must incorporate some effort adjustment (Butcher and McCulloch 1990).

Bolgiano (1999) was the first to propose that CBC data could be used to evaluate the trends and relative abundance of pheasants in PA. Although the CBC has the disadvantage of being less standardized, he felt it was superior to BBS data because a complete database for PA exists for every year since 1900. He analyzed CBC data from 1919-1997 and corrected the data for effort based on birds/party hour and birds/foot hour. He found that 89% of all pheasants observed between 1919-1997 were from sites southeast of the Ridge and Valley physiographic province, so he restricted his analysis to southeastern PA. He found that pheasants first appeared on CBC surveys in 1919 and nearly doubled in relative abundance by 1945. Populations declined following World War II and stabilized until 1960. Between 1960 and 1970 pheasant numbers would dramatically increase by 4-5 times. He found that pheasants declined by 50% between 1970 and 1974, although they were still very abundant. Pheasants declined rapidly between 1974 and 1981. Another large decline occurred between 1981-1986 and the population continued to decline through the 1990s and by 2005 reached levels below those recorded in 1920.

We examined statewide CBC data from 1945-2005 and adjusted for effort using birds/party hour. Our results are similar to those reported by Bolgiano (1999) (Figure 11). Annual CBC data exhibits a high level of variability, so a line of best fit was incorporated to reflect long-term changes in pheasant abundance. Short-term changes in abundance, as occurred during the mid 1960s, probably reflect the impacts of weather on mortality and recruitment. When pheasants are abundant, they can bounce back from a bad reproductive year within 2 years. However, as habitat is lost and genetic diversity in the population declines, pheasant populations cannot recover.

We also examined the relative abundance at each CBC site from 1965-2003 (Figure 12). These data are consistent with the range maps provided by Gerstell (1935) and Hartman and Sheffer (1971) that southeastern PA has been the heart of PA pheasant range. Today, pheasants persist in PA in small isolated populations and at much lower densities than in 1965.

PA Breeding Bird Atlas (PBBA)

Another source of data on breeding birds is the PA Breeding Bird Atlas (PBBA). Over 4,900 atlas blocks were surveyed for breeding birds from 1983-1989 (Brauning 1992). The second breeding bird atlas is being completed for 2004-2008 (Mulvihill 2008). We compared 1983-1989 and 2004-2008 PBBA data to determine the distribution of breeding pheasants in the state (Figure 13). In 1983-1989 ring-necked pheasants were recorded on 2,196 breeding bird atlas blocks or 44% of all blocks surveyed. They were confirmed as breeding in 697 blocks. Eighty-eight percent of the blocks in the Piedmont

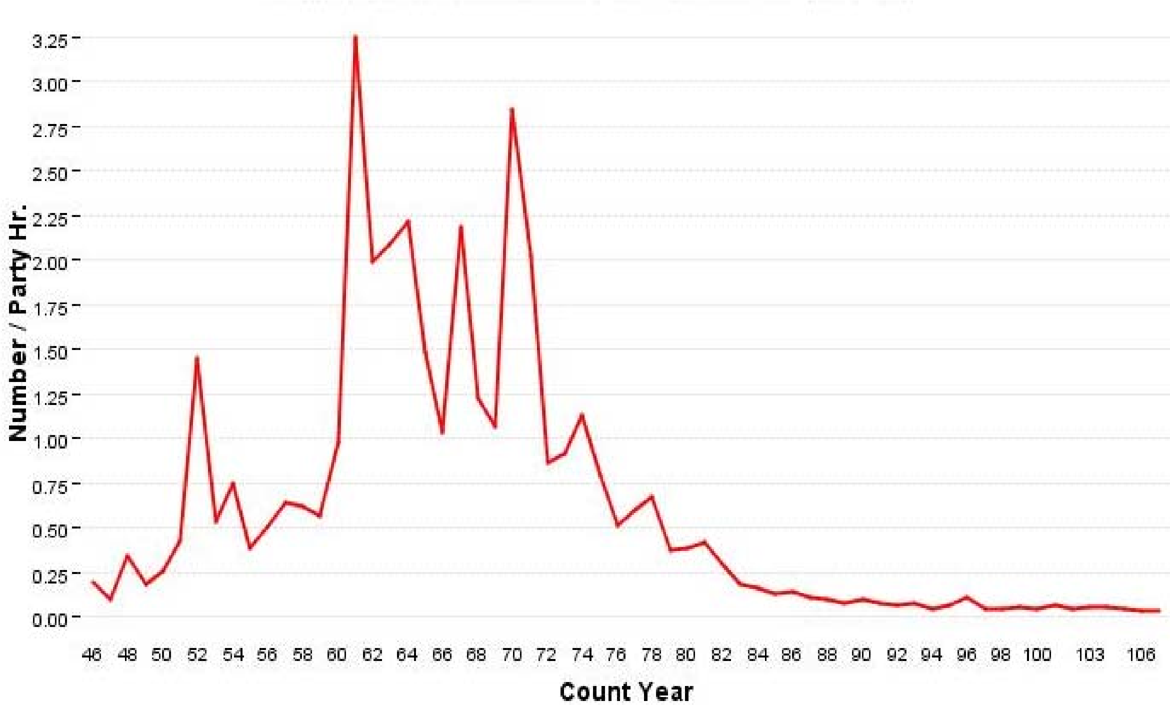


Figure 11. Number of pheasants seen/party hour on CBC in PA from 1945 (count year 46) to 2005 (count year 106), from National Audubon Society 2006.

physiographic province reported pheasants, 60% in the Ridge and Valley, 56% in the Ohio Hills, and 18% in the Allegheny plateau. The distribution and confirmation of breeding pheasants in 2004-2007 showed that pheasant distribution is much more fragmented. Pheasants were recorded on 680 blocks or 12% of all blocks surveyed in 2004-2007. They were confirmed as breeding in 68 blocks; a 90% reduction since 1983-1989. Breeding pheasant populations have been greatly reduced in primary pheasant range in the southeastern part of the state. Populations now appear to be more concentrated in central and southwestern areas, and in western PA along the Ohio border. Even in these areas of the state, populations are much more fragmented and less than in 1983-1989.

Conservation Reserve Enhancement Program Surveys (CREPS)

Another important source of information on pheasant population trends is the CREPS. One requirement of CREP is that the State is responsible for monitoring the effectiveness of habitat improvements on water quality and targeted wildlife populations. In order to evaluate the regional landscape level impacts of CREP on birds and eastern cottontail populations, the PGC established 89 survey routes across the original 20 CREP counties in 2001 (Figure 14). Routes, varying in length from 10-25 miles, were established along randomly selected township roads biased toward agricultural areas. Points along routes are 0.5 miles apart and observers record all birds seen or heard within 250 meters of each point. Each route was run once in May and once in June using Breeding Bird Survey protocols (Sauer et al. 1997). Habitat data was collected on all points in 2001 within 250 meters of each survey point. The plan was to run all routes annually from 2001 thru 2015, but because of budget cuts, no data has been collected after 2005 (Klinger 2002).

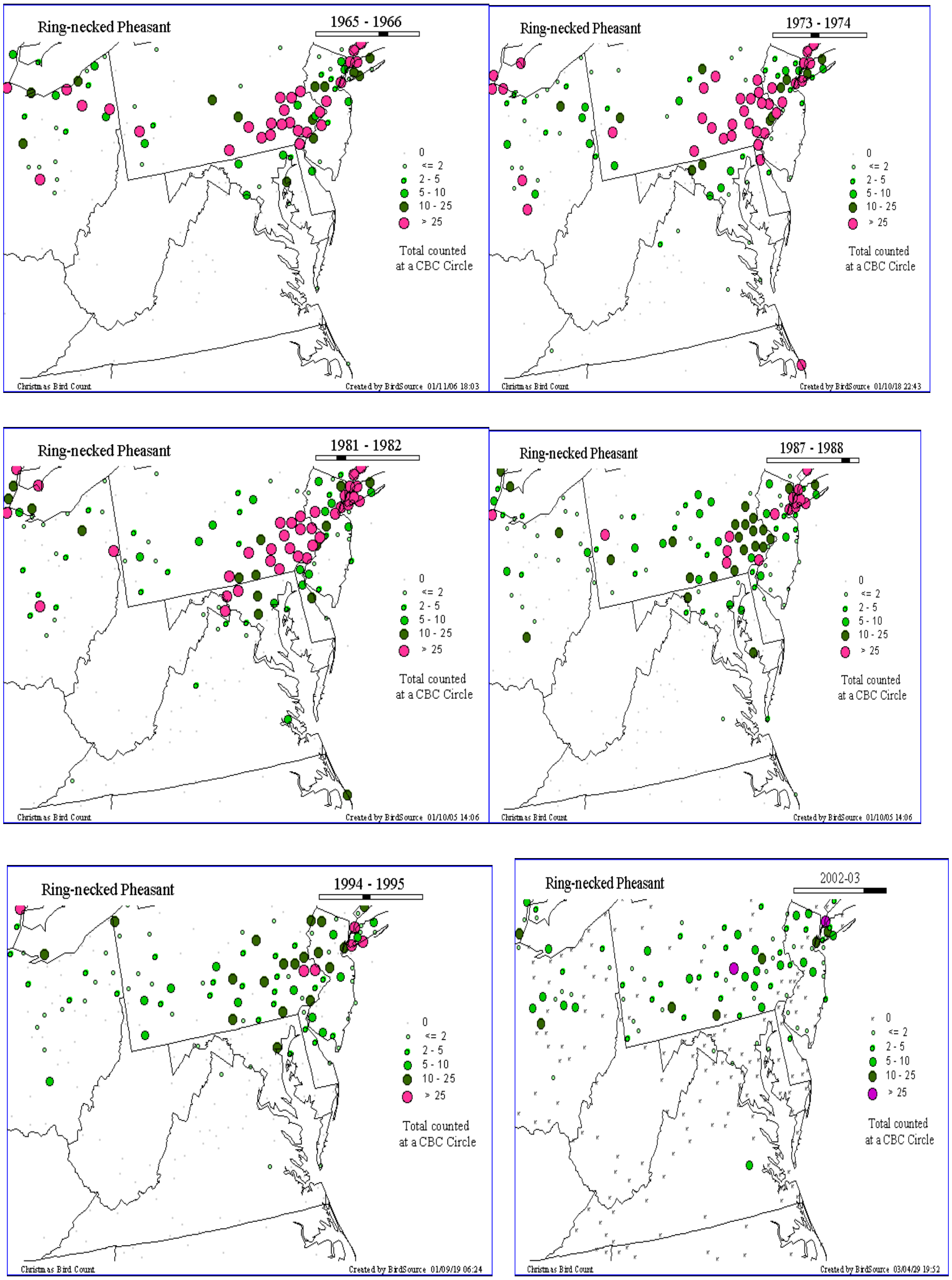
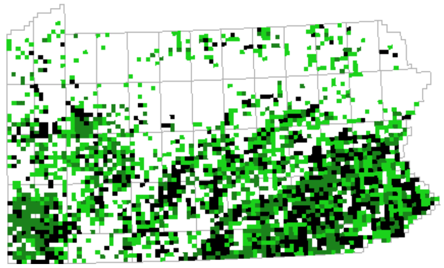


Figure 12. Relative abundance of ring-necked pheasants on CBC sites in PA 1965-2003 (National Audubon Society 2006).

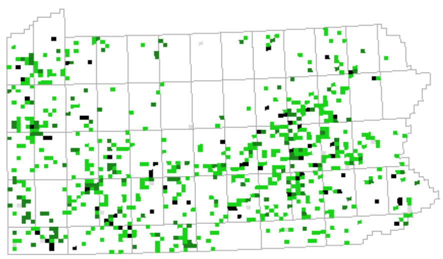
Wilson and Brittingham (2007) analyzed bird data collected from 2001-2005. Of 62 common bird species reported during the monitoring surveys, 12 showed significant population increases while 20 showed significant decreases. The larger number of decreasing species is mainly attributable to the emergence of West Nile Virus, which caused significant, but temporary, declines for at least 10 bird species. Populations of several grassland species fared better in areas where a higher percentage of farmland was enrolled in CREP. The strongest positive effects of CREP on grassland bird populations were noted for American kestrel, eastern kingbird, grasshopper sparrow (*Ammodramus savannarum*), song sparrow (*Melospiza melodia*) and eastern meadowlark (*Sturnella*

Ring-necked Pheasant (blocks) 1983-1989



Recorded	2,196
Possible	860
Probable	639
Confirmed	697

Ring-necked Pheasant (blocks) 2004-2007



Recorded	680
Possible	463
Probable	149
Confirmed	68

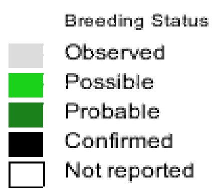


Figure 13. Pheasant breeding status in PBBA blocks, 1983-1989 and 2004-2007 (Brauning 1992 and Mulvihill 2008).

magna). Across a suite of grassland species, there was an average annual population increase of 15% in areas where more than 3% of farmland was enrolled in CREP. This contrasted with average decreases of more than 7% in areas with no CREP. Pheasant populations were not positively correlated to CREP and pheasants declined by 11% during the period. They concluded that these responses were early indicators that CREP has benefited some grassland bird species in southern PA, but they cautioned that the program is still in its infancy and that responses for some species may show a considerable time-lag due to the small and fragmented nature of grassland bird communities in the region. They recommended that monitoring continue through at least 2015 to provide better data on the effects of CREP.

Wentworth and Brittingham (2005) studied the effects of local and landscape features on avian use and productivity on CREP fields. From 2001-2004, they found the most common species were red-winged blackbirds (*Agelaius phoeniceus*), field sparrows (*Spiza pusilla*) and song sparrows. The most common grassland specialists were

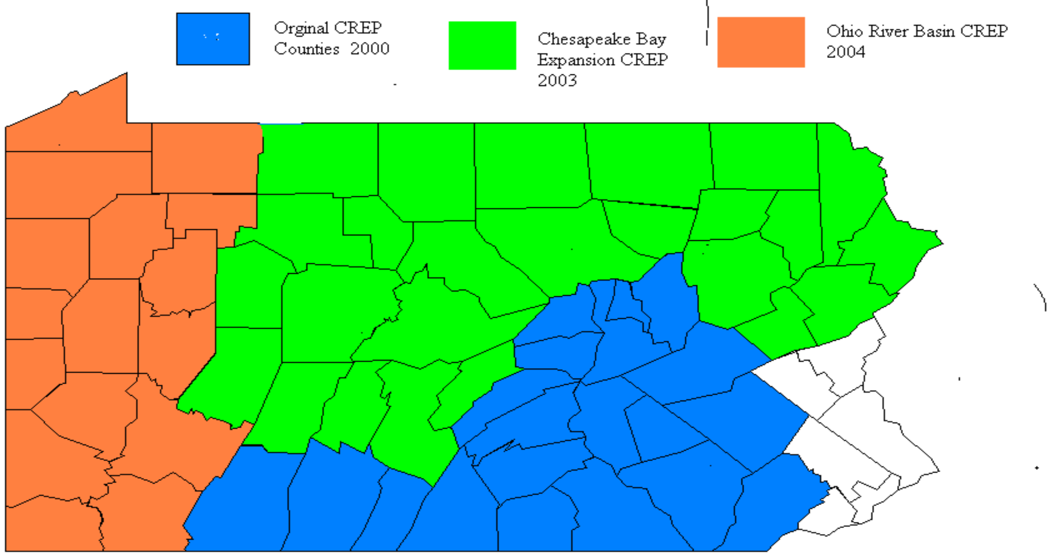


Figure 14. Pennsylvania CREP Counties 2000-2007 (USDA FSA 2007)

grasshopper sparrows and eastern meadowlarks though they were both uncommon. Pheasants, dickcissels (*Spiza americana*), Henslow's sparrows (*Ammodramus henslowii*), savannah sparrows (*Passerculus sandwichensis*), vesper sparrows (*Pooecetes gramineus*) and bobolinks (*Dolichonyx oryzivorus*) were rare. Reproductive success was much higher in CREP fields and had a higher diversity of species than hayfields.

Because CREP fields were just being established in 2001-2005, it is very important that their monitoring be resumed to determine the impacts on pheasants and other bird populations as these grass/legume fields mature. We need to determine the amount of CREP that will be necessary to improve pheasant populations. Five years of data is not sufficient to monitor changes in bird populations. We doubt that this sample size could detect a positive or negative population change of less than 10-15% annually. Still, we have very good baseline data on bird populations and habitats in the original CREP counties. A longer-term database will be needed to determine a 5% annual change in populations.

Analysis of BBS, and CBC data clearly show that ring-necked pheasant populations were very high in PA from 1960-1974. During this period, ring-necked pheasant population densities in primary range probably exceeded any place in North America (Bolgiano 1999). Since then, pheasant populations have fallen throughout PA to their lowest levels since 1920. These results show that wild pheasant populations are essentially gone from much of PA farmland. The PBBA from 1983-1989 and 2004-2007 shows that breeding populations still exist on some farmland, but populations are much more fragmented, far fewer in number, and population densities are very low. As has been discussed earlier in this Management Plan, the loss of secure nesting cover and genetic diversity of smaller populations are the main factors in the decline of pheasants in PA.

We agree with Bolgiano (1999) that without the USDA soil bank and, more importantly, the Feed Grain and Wheat set aside programs from 1956-1974, pheasants would have never reached the densities observed during 1960-1974. Dahlgren (1971) estimated the pre-hunt pheasant population in PA in 1970 at 2,520,000 birds. Based on that estimate and CBC data trends, we estimate that the pre-hunt population in 1956 was 680,000, 1970: 2,520,000, 1974:1,050,000, 1980:450,000, 1985:150,000, 1995:40,000, and 2000:10,000 birds. We realize these estimates lack statistical certainty, but they reflect the trend in pheasant abundance statewide. Loss of idle grasslands/legume fields, along with the large increase in alfalfa hay and earlier mowing of all hay lands greatly reduced hen pheasant survivorship and reproductive success. Increased stocking of game farm pheasants in the early 1980s probably reduced genetic diversity. Significant improvements in habitat over a large landscape and increased genetic diversity will be necessary to restore wild pheasants in PA.

We recommend that BBS and CREP surveys continue to be used to monitor the trends in breeding pheasant populations on a regional and statewide basis. CBC should be used to monitor trends in winter pheasant population trends. These data may be biased because of the release of pen-raised pheasants. However, the survivorship of pen-raised pheasants is low and likely has little influence on long-term population trends. The BBS may be biased because it is not conducted during the peak of pheasant breeding. However, because of the long-term database and the standard methodology, we believe the BBS does provide trend data that can detect small annual changes in pheasant breeding abundance at the regional scale. The CBC data needs to be adjusted for effort and is more likely to be influenced by the release of pen raised pheasants. The CREP surveys are conducted during the peak of pheasant breeding and are stratified to farmland ecosystems. They will probably provide the best data on actual pheasant breeding numbers on a regional scale.

SECTION VI. HABITAT TRENDS

Farmland Habitat Trends

Ring-necked pheasant populations are closely tied to farmland ecosystems. Changes in farming and USDA programs have greatly influenced pheasant populations throughout their range. PA wild ring-necked pheasant populations have been and are dependent on suitable farmland habitats.

Farmland habitat has changed dramatically over the past 40 years in PA. These changes have had negative impacts on pheasant and other grassland bird populations. Loss of farmland to development, conversion to forest and intensification of land use on remaining agricultural lands have been linked to pheasant and other grassland bird declines in the northeast (Staback and Klinger 1998). In 1964 over 4,100,000 acres of farmland was present in 23 primary pheasant range counties (Adams, Berks, Bucks, Chester, Columbia, Cumberland, Dauphin, Delaware, Franklin, Juniata, Lancaster, Lebanon, Lehigh, Montgomery, Montour, Northhampton, Northumberland, Perry, Schuylkill, Snyder, Union, Westmoreland and York Counties) in PA (U.S. Bureau of Census 1967). By 1992 this acreage had been reduced to 2,889,000 acres. The loss of farmland acres was greatest from 1964-1974. Since 1992, the rate of loss has slowed and the number of farmland acres in the heart of historic pheasant range is 3,040,000 (USDA 2004, Figure 15). The Census of Agriculture began using a new method in 1997 to classify farms. The North American Industrial Classification System (NAICS) replaced the Standard Industrial Classification (SIC). As a result, direct comparisons of data from 1997 and 2002 to previous years may be biased. The USDA will be releasing 2007 data in the spring of 2009.

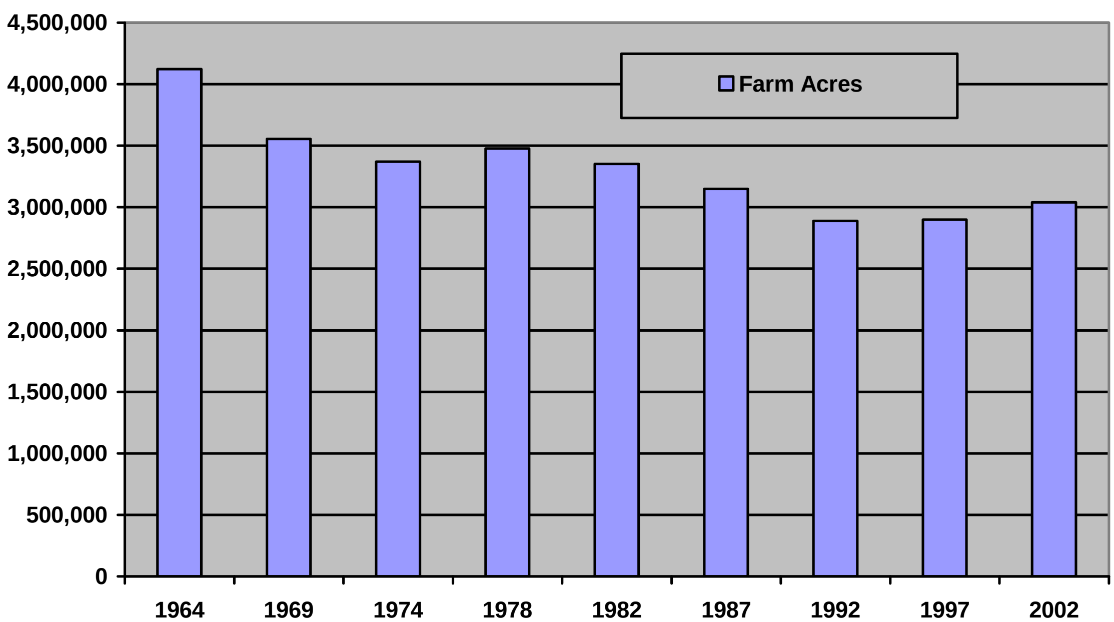


Figure 15. Change in farmland acres in primary pheasant range, 1964-2002, PA (U.S. Bureau of the Census 1967, 1972A, 1977, 1981, 1984, 1989, 1994; USDA 1999, 2004).

In addition, changes in crops planted and the methods and timing of crop harvesting have been devastating to pheasant populations in PA. During the past 25 years alfalfa hay has increased by 45% while other hays have declined by 17% (U.S. Bureau of the Census 1984 and USDA 2004). The goal has been to produce more hay per acre and of higher quality. Bigger and faster mowing machines have replaced the sickle bar mower and hay rake to improve efficiency and cut hay fields much closer to the ground. The peak of hay cutting has shifted to earlier and more frequent cutting of hay fields. In 1950, the mean first cutting date for timothy and clover hay was July 5. By 1970 these same hayfields were being harvested on June 15 and by 1990 the first cutting of timothy and clover was June 5 (USDA 1997). The peak hatching date for pheasants in PA is June 10-15. Although alfalfa hay does provide excellent nesting cover for pheasants, the cutting frequency (early May through October) results in many pheasant hens and nests being destroyed by modern hay mowing machines. Because pheasants prefer to nest in legume hay fields, alfalfa works as an ecological trap drawing many hens to their death.

Winter wheat and barley, although less suitable for nesting, is much more secure than legume hay fields. Unfortunately, since 1969, winter grains and oats have declined by 40-50% (Figure16). Despite the fact that corn acreage has actually increased in primary pheasant range over the past 30 years, these cornfields are much different than 30 years ago. Unlike cornfields in the 1960s, with many weeds and stubble left standing following harvest, today's cornfields are virtually weed free and little stubble is left after harvest. As a result, winter food and cover is reduced. Increased use of pesticides and herbicides have increased corn yields, but at a very high price to farmland wildlife. Prior to 1960, practically no soybeans were planted in PA. Today, nearly 400,000 acres are in soybeans as farmers turn to high value soybeans to supplement farm income (USDA 2004). Soybean fields, after harvest, provide very little winter cover for any wildlife. These changes in agricultural practices have increased per acre crop yields and farm income. Farmers continue to find ways to more intensively squeeze the maximum production from the land leaving little room for pheasants and other farmland wildlife.

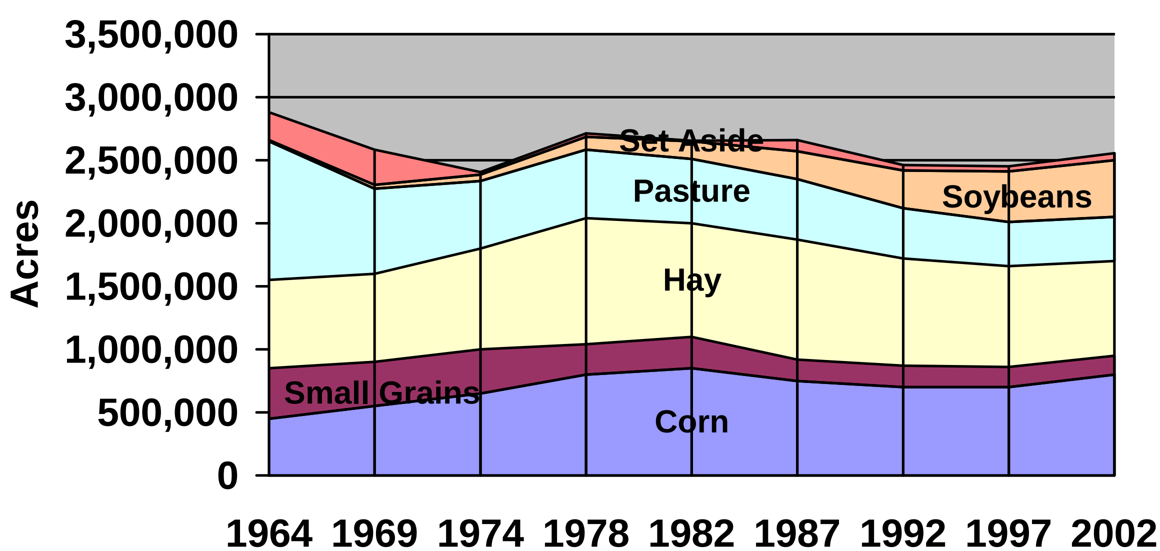


Figure 16. Cropland trends in 23 primary pheasant range counties in PA, 1964-2002 (U.S. Bureau of the Census 1967, 1972A, 1977, 1981, 1984, 1989, 1994; USDA 1999, 2004).

Corn, soybeans and wheat prices are at all time record highs (USA Today 2008). While this is good for grain farmers, it creates higher feed costs for dairy cows, hogs and chickens. Because of these high prices, farmers may put more land in production. Hay may be eliminated in crop rotations. The use of pesticides and herbicides will increase. It is likely that these trends in agriculture will continue and will have a negative impact on farmland wildlife, soil erosion and water quality.

USDA Program Trends

The final blow and probably the most important reason for the rapid decline of pheasants in PA beginning in the late 1970s, was the loss of USDA set aside acres. Between 1961 and 1973, over 295,000 acres of idle hay fields were set aside in the 23 primary pheasant range counties (USDA PA ASCS 1956-1977). This amounted to 7-10% of the cropland in these counties (Figure 17).

The USDA Soil Bank Conservation Reserve (CR) program from 1956-1961, paid farmers an annual rental payment to take cropland out of production and place it in a conservation cover, such as grasses and legumes. In PA, that usually meant timothy and red clover - ideal pheasant nesting cover. The idle acres could not be mowed in the nesting season and land had to be placed in the program for 3, 5 or 10 years. On average, 100,000 acres was idled under the Soil Bank CR program between 1960 and 1969 in primary pheasant range. Approximately 8% of farm landowners participated in the program (USDA PA ASCS 1960-1969).

In addition, the soil bank program had an acreage reserve program (AR) from 1956-1958. The AR was an annual set aside program and paid farmers to reduce production of corn and wheat by placing a percentage of their corn and wheat base acres on the farm into a conservation use. In Pennsylvania, most farmers diverted hay fields. Under the CR and AR, no crop could be harvested from the diverted acres nor could the lands be grazed. AR acres could be plowed and planted the following spring and other hayfields diverted.
AR acres peaked in 1958 at 84,135 acres on 5,327 farms (15% of eligible farms) in primary pheasant range (USDA PA ASCS 1956-1958).

The Food and Agricultural Act of 1965 authorized the Cropland Adjustment Program (CAP). Under this USDA program, farmers were paid to shift cropland into 5 to 10 year conservation, recreation or open space uses. Payment rates were determined based on the crop diverted and the production of that crop on the farm. Additional payments were made to farmers that agreed to open their land to public hunting, trapping, fishing and hiking. Between 1966 and 1976, farmers in primary pheasant range diverted 41,237 acres (1967) to a low of 7,700 acres in 1975. At its peak, CAP enrolled 1,082 farms (4% of eligible farms) in PA primary pheasant range (USDA PA ASCS 1966-1977).

The acreage in the Soil Bank and CAP would be surpassed by another USDA program introduced in 1961 - the Feed Grain and Wheat price support programs. Under these programs, farmers were paid a rental for diverted acres of cropland placed in a conservation cover. They were required to place a certain percentage of their crop acreage in conservation cover in order to be eligible for price supports for corn, wheat, soybeans, and barley. These diverted acres amounted to about 20% of participating farmers total cropland acres. Between 21-54% of eligible farmers participated annually in the Feed Grain and Wheat programs. Acres diverted in primary pheasant range to a conserving use between 1961 and 1973 reached a peak in 1970 at 246,231 acres. The low year was 1973 with 50,366 acres enrolled (USDA PA ASCS 1961-1977). In most cases, farmers diverted existing hayfields annually from production. These diverted acres could not be harvested or mowed during the nesting season, except for weed control. A recent evaluation of the Soil Bank and Feed Grain programs in PA's primary pheasant range clearly showed that secure nesting cover declined by over 86% between 1966 and 1992 (Klinger and Hardisky 1998).

In PA, Feed Grain and Wheat programs diverted, on average, 200,000 acres from production annually in primary pheasant range counties between 1961 and 1973. Most of the acres were hay fields adjacent to corn and small grain fields. Based on nesting data from Hartman and Sheffer (1971), we conservatively estimated that these secure nesting acres annually produced between 800,000 and 1,000,000 pheasants. Between 1962-1997, USDA set-aside program acres declined by 250,000 acres in 23 southern and central PA counties. As a result, undisturbed grassland nesting cover has become an endangered habitat (Figure 17).

The Feed Grain and Wheat Programs of the 1960s and 1970s provided good to excellent pheasant nesting cover in dairy states such as PA, Wisconsin and New York. In the grain states of the Midwest they provided very poor cover because most farmers diverted corn and wheat fields from production and planted oats in the spring as the conservation cover crop. The oats was not tall enough for nesting pheasants and was required to be clipped during the milk stage to prevent any oats production (Brady and Hamilton 1988)). As a result, pheasant biologists in the Midwest have strongly opposed annual set aside programs, and have strongly supported longer-term conservation cover programs such as CRP.

Since 1974, habitat trends on farmland in PA have not been favorable for pheasants. In 1974, the new U.S. Secretary of Agriculture announced the elimination of all set-aside programs (USDA PA ASCS 1974). Instead, farmers would be paid to drain wetlands, pull out hedgerows and bring more acres into production. From 1976-1985 various annual set aside acres programs would be implemented in order to effect total grain production and prices. None of these would require establishment of secure nesting cover on diverted acres. In fact, farmers were required to keep weeds under control by multiple mowings or herbicide treatments (Berner 1988)

The 1985 Farm Bill established the Conservation Reserve Program (CRP), a long term (10-15 years) set aside program required to place cropland in soil conserving use. Over 35 million acres were enrolled nationwide and over 100,000 acres in PA. Very few acres were enrolled in PA's primary pheasant range and, unfortunately, most of that was mowed illegally during the nesting season.

In 1992, 28,000 acres were idled under CRP in primary pheasant range counties, and 50% of this acreage was in just 3 counties (USDA FSA 1993). Although participants were not permitted to mow CRP fields during the nesting season, many landowners did. PA Farm Service Agency County Offices have generally not enforced the mowing requirements under CRP.

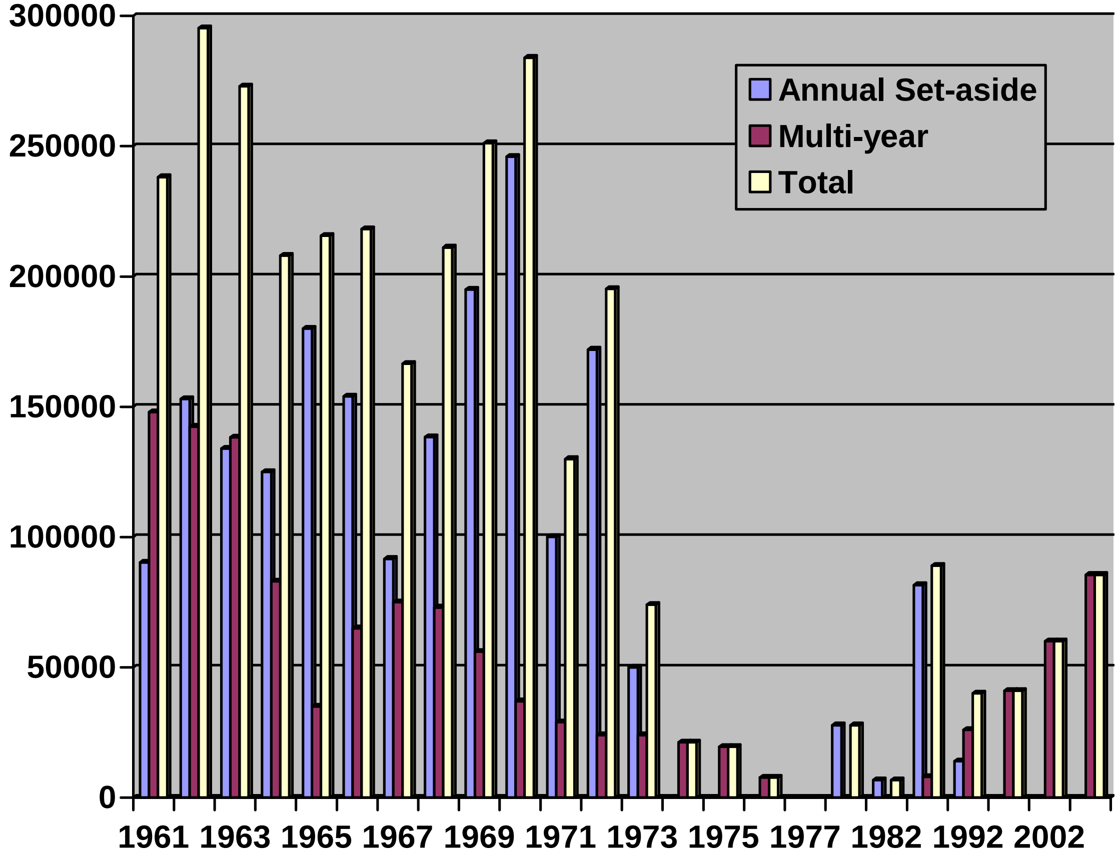


Figure 17. Changes in acres enrolled in conservation cover under the USDA Feed Grain and Wheat programs (Annual Set Asides) and Soil Bank, CAP and CRP (Multi-year Set Aside) in primary pheasant range counties, PA 1961-2008 (USDA PA ASCS 1961-1977; U.S. Bureau of the Census 1981, 1984, 1989, 1994; USDA 1999, 2004; USDA FSA 2008).

The 1997 Farm Bill established wildlife conservation as a coequal objective with soil and water conservation under the CRP. It also authorized the Conservation Reserve Enhancement Program (CREP). Although it kept price support payments for farmers, it required no diversion of cropland to receive those annual payments. Since 1997, no annual set aside of cropland has been required to participate in USDA Programs. The CRP Program was capped at 39.2 million acres nationwide.

In 1998, less than 1% of PA's cropland was in CRP. In Iowa, South Dakota and Montana >10% of cropland was enrolled in CRP. The great benefits of CRP to pheasants in these states have not been realized in PA because most farmers will not participate due to very low rental rates offered. While rental rates in Iowa average $112.00/acre, a dairy farmer can expect to get only $45.00/acre in PA. Soil rental rates offered by USDA simply do not reflect land values in PA.

In March of 1998, the PGC prepared and presented to the USDA State Technical Committee a plan to restore farmland ecosystems. The proposal called for placing 325,000 acres in 41 PA counties in a grass/legume cover for 10-15 years and 25,000 acres in forested riparian buffers for 15 years (Klinger and Hardisky 1998). This program would form the basic foundation for the PA Conservation Reserve Enhancement Program (CREP) approved by Governor Ridge and U.S. Secretary of Agriculture Glickman in April 2000. Funded at $210 million dollars, CREP targeted agricultural lands in 20 southern and central counties in the Chesapeake Bay Watershed. One of the objectives of PA CREP is to restore grassland habitats and declining grassland bird populations. In addition to much higher annual rental payments ($102 per acre) for 10-15 years, the USDA and the Commonwealth of PA provided 100% reimbursement for establishing conservation cover. The goal was to establish 100,000 acres of conservation cover (Klinger et al. 1998). By the spring of 2005, over 100,000 acres were enrolled in the targeted counties and no further enrollment, except for forested riparian buffers, was permitted. Much of this acreage was targeted to primary pheasant range counties.

The PGC and USDA Natural Resources Conservation Service (NRCS) entered into a Cooperative Agreement in June 2000 to establish 10 Wildlife Biologists positions in the 20 PA CREP counties. In addition, the PGC established an outreach coordinator to educate and market the program to interested groups and private landowners. The PGC pheasant and quail research biologist devoted 100% of his time to CREP and USDA Farm Bill Programs. NRCS staff provided technical assistance. All of these positions were critical in providing technical assistance to private landowners interested in CREP. PGC land managers and food and cover employees planted and coordinated planting of native warm season grasses. The PA Department of Environmental Protection (DEP) provided significant Growing Greener State Funding to pay 50% of the costs to establish conservation practices. The USDA Farm Service Agency (FSA) committed over $150 million dollars over 15 years to the program. PA FSA and its county offices administer the program.

In June of 2003 Governor Rendell and FSA signed an amendment to expand CREP by 100,000 acres and to target an additional 21 counties in the Chesapeake Bay Watershed. In October 2004 the Governor and FSA signed a new CREP agreement for the Ohio River Basin for 65,000 acres and 16 counties in western PA (Figure 14). FSA has committed $400 million dollars of new federal funding to PA over 15 years. PA has committed $100 million over 15 years. The State is required to submit annual reports to USDA and to monitor water quality and wildlife habitat and population responses to CREP (PACD 2001).

Based on data from 1970, we know that 10% of cropland was enrolled in set aside programs in 1970. Most of this acreage was in the Feed Grain and Wheat Programs and about 50% of all farmers were in these programs (USDA PA ASCS 1970). Not since the Soil Bank and Feed Grain and Wheat programs of the 1960s and early 1970s have so many cropland acres been placed in set aside conservation cover. By March of 2008, 194,000 acres had been enrolled in PA CREP. In addition, 32,000 acres were enrolled in regular CRP. However, unlike the 1970s, the CREP acres, so far, are not well distributed in primary pheasant range counties (USDA FSA 2008, Figure 18).

Currently, CREP is the only program in PA capable of putting secure nesting cover on cropland. It is very likely that CREP will be extended in the next Farm Bill because it is a very popular program. Unless we can double the current regular CRP rental payments, regular CRP is not an option for PA. As of March 2008, 85,517 acres of CRP were enrolled in 23 primary pheasant range counties on 2,976 farms (13% of eligible farms, USDA FSA 2008). Several counties in primary pheasant range have exceeded 10% of the cropland in CREP. These counties should be prime candidates for the trap and transfer of wild pheasants.

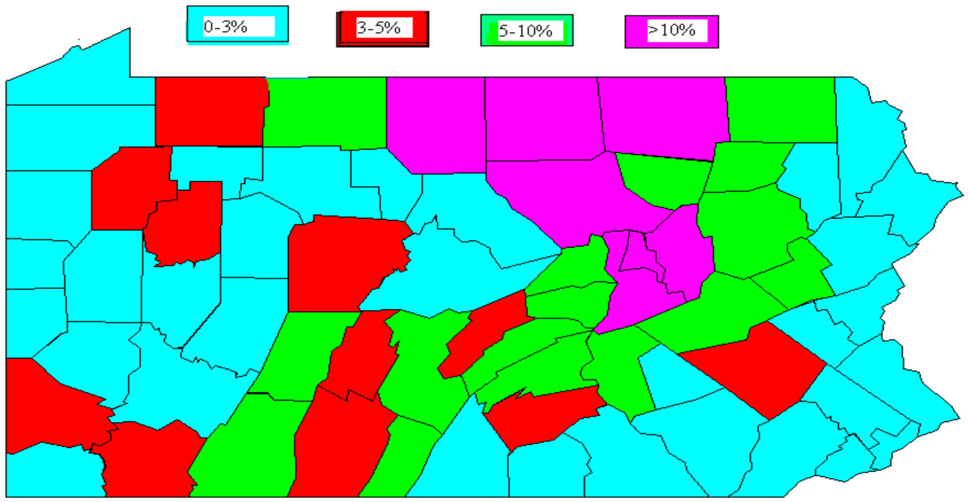


Figure 18. Percent of cropland enrolled in CRP in PA, 2008. (USDA FSA March 2008 CRP Report).

Wildlife managers in the Midwest are strong supporters of CRP, but they oppose annual set-asides. However, annual or 2 year set asides, with the proper regulations, could be very beneficial to pheasants and the recovery of northern bobwhite quail in the Northeast. They could also be very beneficial to farmers by helping to stabilize prices, return organic matter to the soil and sequester carbon.

USDA Programs have had and will continue to have a dramatic impact on farmers, farmland ecosystems and farmland wildlife. The 5-year Farm Bill, approved by the U.S. Congress, provides the federal funding and sets the direction for agricultural policy. Programs may or may not benefit wildlife. Careful monitoring and involvement by the PGC will be critical to insure programs are beneficial to PA wildlife. Keeping CREP in the next farm bill and expanding CREP acres will be critical to restoring Pheasant Populations in PA. Also, working closely with FSA and NRCS on other programs to establish farmland habitat will be necessary.

The PGC needs to provide technical and financial assistance to farmers to help them produce beneficial wildlife and not just more corn and soybeans They also need to provide technical assistance on wildlife damage. The PGC needs to work with the USDA Agricultural Research Service to develop hay crops which are high in digestible protein and produce 6 tons to the acre from 1 cutting in mid to late July. In the future, innovative programs will need to be implemented and farmers and hunters will need to reach common ground in order to restore pheasants and other farmland wildlife. The alternative will be the continuing decline in farmland wildlife, hunters and family farmers in PA.

Habitat Fragmentation

Pheasants have a home range of 1-2 square miles (Johnsgard 1999). Although individual pheasants have a small home range, dispersal is critical to maintaining large pheasant populations. Once pheasant territories become occupied, non-territorial male pheasants disperse to find optimal breeding and nesting habitat. As suitable habitat becomes more concentrated and isolated, pheasants have to expand their range and occupy poorer habitats. Predation rates are much higher when pheasant habitat is highly fragmented (Warner 1988). This habitat fragmentation creates metapopulations of pheasants that are often isolated from each other. As habitat patches get smaller, they can support fewer pheasants. Eventually, populations may be too small and high predation rates or adverse weather may eliminate the metapopulation.

Between 1964 and 1987, farmland habitat was converted to commercial and residential development at an alarming rate (U.S. Bureau of the Census 1967, 1989). Roads have expanded to support this development. Farmland habitats have become smaller and more isolated. Since 1990 the rate of farmland lost to development has been reduced by 80%. PA currently ranks 48th in population growth. Economic and political forces will drive the future loss of farmland.

SECTION VII. PROPAGATION

History and Role of Propagation

Propagation and release has played a significant role throughout the history of pheasants and pheasant hunting in PA. Pheasants have been purchased and released by the PGC, raised and released by the PGC, and raised and released by sportsmen's organizations.

In 1915 the first large-scale stocking of game birds by the PGC occurred with the release of 2,096 purchased pheasants. In 1929, the PGC began the propagation of pheasants on an extensive scale with the establishment of game farms in western and eastern PA. The Western Game Farm, originally called the "Jordan State Game Farm," was started in Lawrence County, and later moved to its present location in Crawford County. Also, the Fisher State Game Farm, located in Montgomery County, was started; and later renamed the Eastern Game Farm.

In 1929 production at the PGC's two game farms using range-reared methods was 30,000. They were released in the fall at about 10-12 weeks of age. In 1933, with mechanical methods of incubation, production rose to 40,000 birds. These birds were released in the summer at 6-8 weeks of age. However, the Commission found that these birds did not survive to the fall hunting season. In 1935, they began to release cocks and hens in the spring. The main thrust of the stockings was establishment of self-sustaining populations (Allen 1956). However, later research would show that game farm pheasants contributed little to wild populations (Hartman and Sheffer 1971).

In 1933 the Loyalsock Game Farm in Lycoming County was established for pheasant production. The Southwest Game Farm was established in Armstrong County in 1953 to augment pheasant production. In 1981, the PGC converted the Northcentral Game Farm in Lycoming County from wild turkey production to pheasants. By the early 1980s the PGC was producing and releasing approximately 400,000 pheasants from five game farms to supplement wild production and provide added hunting opportunity.

Programs also were initiated in 1938 that provided day-old pheasant chicks to sportsmen's organizations who agreed to raise birds to 12 weeks of age before release on areas of public hunting. Also, farmers in the Farm-Game Cooperative Program were paid $1.00 for every bird successfully reared to 12 weeks of age to augment stocking efforts. In 1957 the number of pheasant chicks distributed to cooperators reached 234,356, an all time high. In 1967 a PGC research committee recommended modifications in stocking practices to improve the propagation program, and to phase out the day-old chick program to cooperators due to poor quality birds. A decision was made to discontinue renewing applications for coop programs except sportsmen organizations.

The number of birds provided to clubs dropped to 88,405 in 1970, and continued on a downward trend until 1977 when 41,530 chicks were provided. The winter of 1977-78 proved to be devastating with several heavy snow events, which damaged many sportsmen's and PGC facilities. In 1978 the number of birds provided dropped to 13,758. In 1984 when the PGC cut pheasant production in half, chicks provided to clubs followed suit and dropped to 9,648. From the mid '80s through 1996 when the Eastern Game Farm was closed the number of chicks provided remained relatively stable averaging 8,500 chicks. In 1996 the number of birds provided dropped to 3,640 with a low of 2,720 in 2006.

The PGC attempted to offset declining populations and bolster hunting opportunity in the mid 1970s by mass producing and releasing pheasants. Newly designed environmental brooder houses were constructed at the Eastern Game Farm. Large environmental brooder houses were also constructed at the Western and Loyalsock Game Farms from 1972 to 1975 to replace the old Quonset houses that were built in the 1940s and '50s. These new buildings could house 12,000 to 20,000 pheasants compared to 400-500 in the Quonset houses, and were less labor intensive.

In 1983, 425,217 pheasants were raised and stocked, the highest number ever released by the PGC. We soon learned that mass-producing pheasants only resulted in a bird of reduced quality, with a loss of hardiness and increased tameness. Studies conducted in the early 1980s showed that these traditional pen-reared pheasants did not survive well in the wild and were not very sporting (Krauss et al. 1987).).

Annual production of ring-necked pheasants was cut in half in 1984 to a level of 220,000 pheasants due to a budget crisis. However, this allowed for the game farms to implement new rearing techniques designed to produce a wilder, hardier bird better prepared for survival and much more sporting hunt. Over the years the PGC has propagated a variety of pheasant subspecies to supplement wild populations, and to help establish new game bird populations.

In 1996 the Commission closed the Eastern Game Farm to reduce the operational budget of the Propagation Program and to bring the cost of this program in line with the number of sportsmen who pursued pheasant hunting. During 2005, again due to another budget crisis, the Commission once again cut pheasant production in half to 100,000 birds, which continues to be the production goal. PGC pheasant production history is illustrated in Figure 19.

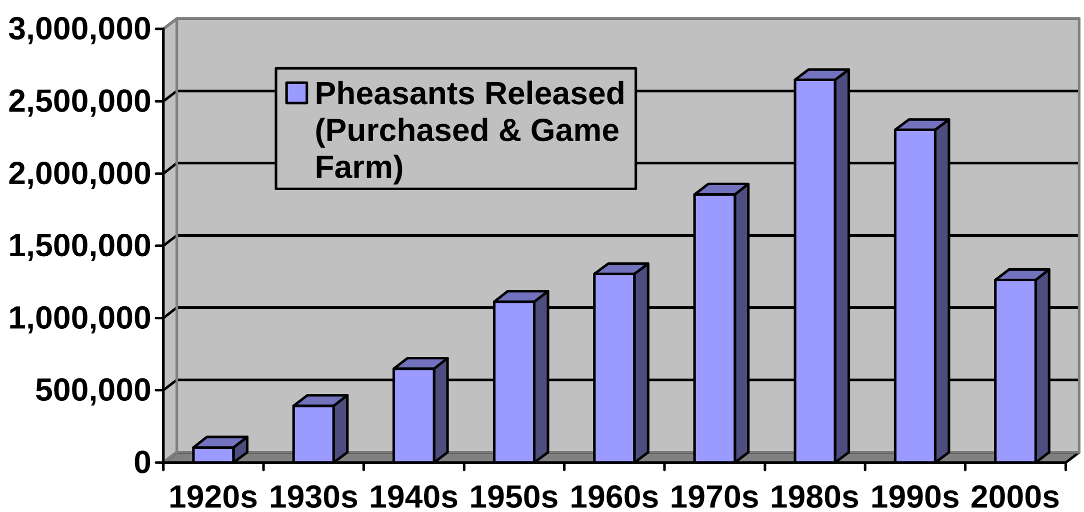


Figure 19. PGC pheasant releases by decade (PGC Propagation Report 2006).

Initially, the purpose of pheasant stocking was to help establish self-sustaining populations. When the pheasant population peaked in 1971, stocking continued as a means of supplementing wild bird production, especially in heavily hunted areas. Today, the primary goal of the PGC's pheasant propagation program is to provide a quality pheasant for regulated hunting opportunities. The PGC's Strategic Plan calls for the annual production and release of a minimum of 200,000 pheasants on state game lands and other managed public lands, and secondarily on lands open to public hunting.

It is clear that hunters prefer naturally produced wild pheasants. However, since habitat conditions yield only low densities of naturally produced birds, stocked pheasants provide thousands of hours of hunting recreation that otherwise would not be available. Stocked birds are a tangible product for hunting license buyers and provide a valued service for many.

In addition to the PGC's Propagation Program the propagation and release of pheasants by private individuals is a popular activity. Pheasants are raised primarily for hunting or dog training and trial purposes. Dunn et al. (2008) conservatively estimated over 376,000 pheasants are released annually in PA for hunting, dog training and trials and other purposes.

Game Farm Pheasant Production

The PGC operates four game farms, which support each other with egg production, incubation and rearing capabilities (Table 1). No one facility has the adequate infrastructure to accommodate all segments of pheasant propagation operations at the past or present production goal. Three of the four game farms maintain a breeder population. Since the Loyalsock and Northcentral Game Farms are in close proximity to each other, as a cost saving measure one breeder flock is maintained at the Loyalsock Game Farm to accommodate both facilities.

Table 1. PGC pheasant propagation facilities, 2007–08

Game Farm	Location	Acres	# Staff	# Breeders	Fall Release
Western Game Farm	Crawford County	400	10	6,750 (500M; 6,250F)	26,500 (14,000M; 12,500F)
Southwest Game Farm	Armstrong County	260	8	4,375 (375M; 4,000F)	25,000 (15,000M; 10,000F)
Loyalsock Game Farm	Lycoming County	397	14[1]	6,600 (350M; 6,250F)	53,000 (34,000M; 19,000F)
Northcentral Game Farm	Lycoming County	185	0	0	0
[1] Includes Northcentral Game Farm staff					

Pheasants are grown out in net covered pens so that birds can be raised free-flying. Rearing densities are maintained between 40-50 square feet per bird, and cover crops of corn, sorghum and oats are planted in these pens to provide a diversified natural habitat. Direct contact with humans is minimized to retain their natural wariness.

Although we have focused on raising and releasing quality birds, our facilities and equipment are aging and infrastructure needs have not been met in recent years. To meet production goals of a minimum of 100,000 birds and a maximum production of 250,000, brooder houses, water, and feed systems need to be upgraded as well as on and off-road equipment. Production increases also will require adding covered pens to maintain rearing densities at 40-50 square feet per bird.

Sportsmen Program and Day-old Chick/Egg Sales

Today, day-old run-of-the-hatch pheasant chicks (generally a 1:1 ratio of males:females) are distributed free-of-charge to sportsmen and conservation organizations that qualify. To be eligible to receive pheasant chicks, all applicants are required to have a minimum of 25 square feet of covered pen space available per chick. In addition, 1/2 square foot (72 sq. inches) of floor space is recommended in the brooder building per chick. All feed and expenses incurred in the work of constructing covered pens and raising pheasants shall be the responsibility of the cooperator. The organization must agree to release all pheasants on lands open to public hunting. Sportsmen organizations raising pheasants help augment stocking pheasants in their local area and promote small game hunting. The number of chicks distributed to sportsmen's clubs has averaged 3,000 in recent years (Figure 20).

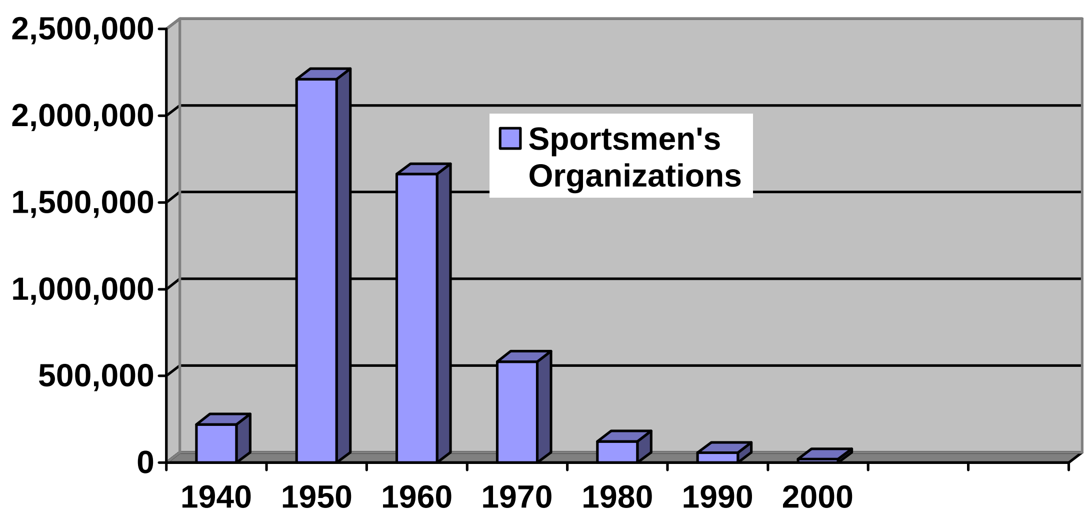


Figure 20. Pheasant production and releases by sportsmen's organizations.

Additionally, surplus day-old hen chicks and surplus eggs are sold to the general public and given to schools for educational projects. Day-old chicks are sold in lots of 100 to anyone, while eggs are sold in lots of 300 and only to licensed propagators. One of the problems we encounter each year is that a greater proportion of males are required for stocking due to WMUs where hen pheasants are protected. During the 1960s and '70s day-old hen chicks were sexed out at hatching and euthanized to increase production of males. Culling these surplus hens from the grow-out population helped to achieve a greater pen-reared male population to offset the need to stock males where only males are legal to harvest. The PGC started offering what were considered surplus day-old hen chicks for sale in 1973, which amounted to 19,800 chicks (Figure 21). The practice of euthanizing chicks was discontinued in the late '70s as chick sales initially helped achieve a greater pen-reared male population.

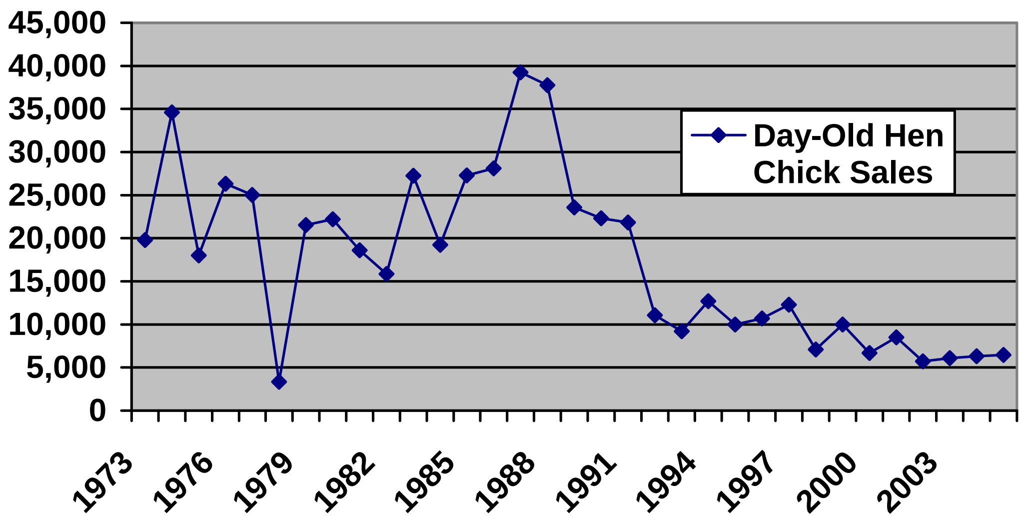


Figure 21. PGC hen chick sales.

There are several anomalies in chick sales over the decades. Snow loads during the winter of 1977-78 caused considerable damage to pens on the game farms and to private propagators, which may have adversely impacted chick sales the spring of 1978 that only amounted to 3,350. Following the cut in pheasant production in 1984 chick sales increased perhaps showing a demand for pheasants. However, during the '90s chick sales declined and following the closing of the Eastern Game Farm in Montgomery County in 1996-97, sales flattened out averaging 6,600. Therefore, the number of hens sold does not offset the need for males throughout the state. Following chick sales and the selective reservation of hens for next year's breeding population, we end up with about a 1.5 M: 1 F ratio.

Flock Health and Disease Prevention

An area of great concern relative to stocking is the potential for the introduction of disease into wild game birds populations. To reduce the potential for disease problems, we maintain rigorous biosecurity and a disease-testing program to control and prevent the accidental release of diseased birds into the wild. We also periodically introduce wild birds into our breeding flocks to enhance genetic viability.

Routine field necropsy work is preformed at each game farm facility. Suspicious birds are submitted to the laboratory for serology tests. Respiratory infections, bacterial diseases, and parasite infestations, which can occur, are diagnosed and treated with appropriate medications to correct the problem. The PGC's veterinarian can write a prescription to add medication to feeds on an as needed basis, and records of medication usage is maintained in accordance to FDA. The breeder population is blood tested each year according to the PDA Bureau of Animal Industry, Avian Health standards. Blood samples are tested for *Mycoplasm synoviae*, *Mycoplasm gallisepticum*, *Pullorum typhoid*, and avian influenza. Eggs are submitted each month during the production cycle and tested for avian influenza. To date no positive reactors have been found.

Fall Stocking

Allocating propagated birds to appropriate areas where they are legal to harvest is essential to increasing the availability of birds currently produced and increasing the cost effectiveness of the program. One of the problems we encounter each year is that a greater proportion of males are required for stocking due to current boundaries protecting hen pheasants. Pheasant chicks hatch at approximately a 1 male (M): 1 female (F) ratio. Therefore it's impossible to produce a greater proportion of males to stock. To offset this ratio we offer what is considered surplus day-old hen chicks for sale to achieve a greater pen-reared male population, however, the number of hens sold does not offset the need for males throughout the state. Following chick sales and the selective removal of hens for next year's breeding population, we end up with about a 1.5 M: 1 F ratio.

In 2005-2007, pheasants were allocated based on total suitable acreage on State Game Lands, private lands signed in the public access program, Federal lands leased to or managed by the PGC, and acreage in the State Park system as well. Additionally, the percentage of time sportsmen spend on a county level pursuing pheasant hunting activity (from the Game Take Survey) is incorporated in the formula. Each region is then pro-rated a share of the available birds. The PGC has established formal standard operating procedures for ring-necked pheasant stocking across the state. Habitat components for the allocation formula are reevaluated on an annual basis.

The first pheasant releases are for the youth pheasant hunting season, which runs concurrent with the junior squirrel hunt starting the Saturday before Columbus Day. The allocation consists of 18,000 birds released at designated sites throughout the Commonwealth, and up to 2,000 birds are provided to organizations that qualify to sponsor mentored youth pheasant hunting events. Pheasants provided by the PGC are distributed at a rate of two legal birds per youth participant up to a maximum of 100 birds per event. Birds are provided at the same sex ratio as the PGC distributes during the regular pheasant-hunting season. In WMUs where male and female pheasants are legal to harvest, the ratio of 1:1.5 (male/female) are provided. In male hunting only wildlife management units, two legal birds (male) per youth are provided and hen pheasants also are included to provide a natural hunting situation. Male and female pheasants are stocked at each release site to promote a natural hunting scenario and aid in training youth to identify their target. The ratio is 1:6 (female/male).

Preseason releases, which comprise 30 percent of the remaining fall allocation, start the week prior to the opening of the general small game season. During the first two weeks of the season, 25 percent of the fall allocation is released each week. The third in-season release consists of the remaining 20 percent, and is stocked where hunting pressure remains high late into the season. Some hens also are released during the late small game season in areas where both sexes are legal to harvest.

The budgetary constraints in 2005 that reduced the pheasant allocation also reduced stocking time frames and locations. The stocking of pheasants on public access properties was reduced and in some cases eliminated. We focused on stocking this limited number of birds on state game lands and corporate lands managed by the PGC where the best habitat conditions exist to provide good pheasant hunting. Pheasants were stocked for a preseason, and two in-season releases, eliminating the third in-season, and late season stocking.

In 2006 the regular season began with the release of preseason birds followed by the first in-season release. In an effort to increase pheasant hunting opportunities, the second in-season release was held off until the 3rd week of the season scheduled in November just prior to Veterans' Day Holiday. Also, an allotment of birds has been reinstated for the late small game season that is scheduled for release as close as possible to the Christmas Holiday season so youth can take advantage of going afield during their school break and some business close down for the holidays.

Propagation Program Costs

The cost to produce ring-necked pheasants has been questioned during the last three decades especially when financial constraints forced budget and program cuts. The PGC at their June 1983 meeting announced budget cuts that included closing down the Southwest Game Farm, in Armstrong County. It quickly became apparent that sportsmen would not stand for closing the game farm; therefore, an alternative solution was developed to reduce overall production at the five game farms from 425,217 pheasant to 220,000.

The PGC, at its October 1995 meeting, voted to close the Eastern Game Farm, in Montgomery County to reduce the operation budget of the Propagation Program and to bring the cost of this program in line with those sportsmen who pursue pheasant hunting. The remaining four farms were tasked with producing 200,000 pheasants for recreational pheasant hunting opportunities.

In 2005, when PGC production levels were cut to 100,000 birds due to budget concerns, operations at the Northcentral Game Farm were curtailed and full-time staff transferred to the Loyalsock Game Farm to assist in raising birds at that facility. Routine maintenance activities such as mowing have continued at the Northcentral Farm. Cost savings were achieved by eliminating 33 temporary, seasonal employees that are required to assist in the production of pheasants and maintenance operations at higher production levels. However, these cost savings were modest. In terms of cost/bird, the modest cost reductions, coupled with significant reductions in the number of birds produced, resulted in higher costs per bird in 2005-06 and 2006-07.

The Legislative Budget & Finance Committee provided program costs from FYs 1982-83 to 1987-88 and FY 1992-93. All other expenditures were taken from Game News Annual Reports. * Includes Sichuan restoration project releases (Table 2).

Table 2. PGC pheasant propagation costs.

Fiscal Year	Expenditures	Pheasants Stocked	Cost/Bird
1982-83	$3,491,125	325,918	$10.71
1983-84	$2,794,298	425,217	$6.57
1984-85	$2,742,576	227,930	$12.03
1985-86	$2,982,869	244,072	$12.22
1986-87	$3,072,704	231,343	$13.28
1987-88	$3,128,946	237,719	$13.16
1988-89	$2,396,756	213,728	$11.21
1989-90	$2,592,497	230,208	$11.26
1990-91	$3,137,392	231,495	$13.55
1991-92	$3,252,272	237,270	$13.71
1992-93	$2,900,000	263,300 *	$11.31
1993-94	$2,707,160	231,456	$11.70
1994-95	$2,757,657	245,985	$11.21
1995-96	$2,612,218	247,018	$10.57
1996-97	$2,677,934	204,990	$13.06
1997-98	$2,294,178	217,913	$10.53
1998-99	$2,322,395	218,401	$10.63
1999-00	$2,382,824	227,974	$10.45
2000-01	$2,427,501	228,980	$10.60
2001-02	$2,536,175	231,880	$10.94
2002-03	$2,194,706	211,141	$10.39
2003-04	$2,774,563	230,358	$12.04
2004-05	$2,701,706	228,524	$11.82
2005-06	$2,189,432	132,830	$16.48
2006-07	$2,373,729	117,104	$20.27

For many years there has been speculation that the PGC could purchase pheasants from commercial vendors and realize considerable savings. The PGC in 2000 conducted a study to look at the feasibility of out-sourcing for pheasants and then close another farm. Specifications were developed to qualify contractors and purchase birds so we would not compromise our program with a lesser quality bird. Prices ranged from a low of $8.65/bird to a high of $15.00/bird, which did not include delivery charges ranging as high as $0.75/mile.

In the final analysis, it became clear that the purchase of pheasants from the private sector would not bring about major cost reductions and, in fact, would result in a net increase in the agency's Propagation Division budget. With factual data now in hand, the decision was made not to purchase commercially produced pheasants, and not to close another game farm.

Harvest Rates of PGC Game-Farm Released Pheasants

A pheasant harvest and reporting rate study conducted by Diefenbach et al. (2000) provided much insight into game farm pheasant stocking procedures, harvest, and program efficiency. They conducted a reward-band study to estimate harvest, reporting, and survival rates of pheasants raised and released by the PGC for the fall 1998 hunting season. They banded 6,770 of 199,613 released pheasants with leg bands worth $0-$400. Rewards >$75 produced 100% reporting rates. Hunters reported 71.0% of harvested pheasants banded with standard bands (no reward). Cocks had an estimated 62.3% harvest rate when released on public land and a 46.8 % harvest rate on private land. Hens had an estimated 50.4 % harvest rate when released on public land and a 31.1% harvest rate on private land. Estimated harvest rate for hen pheasants released in September in the either-sex zone was 15.5%. In the late season, pheasants released on public land had a 33.6% harvest rate and a 23.5% harvest rate on private land. They found that few pheasants (<6%) survived >30 days and birds released on public land had reduced survival rates primarily because of greater harvest rates (Table 3). In FY 1998-99, the net cost to raise and release 199,613 pheasants was $2,813,138 ($14.09 per bird). The average cost per harvested pheasant was $29.10, but ranged from $22.63 to $90.74 depending on the date and location of release. They estimated that 49.9% (82,017 birds) of pheasants stocked immediately prior to and during the regular and late seasons (excluding September releases of hens) were harvested by hunters. They concluded that the percentage of pheasants harvested by hunters could be increased by expanding the either sex zone in Pennsylvania so that more hens could be legally killed by hunters and by allocating releases to seasons and locations with greater harvest rates.

Table 3. Daily, 7-day, and 30-day survival rate estimates for PGC game farm pheasants released during October-November 1998 (Diefenbach et al. 2000).

Sex Land ownership	Survival rate (%) Daily	 7-day	 30-day
Cocks			
Public	84.1	29.5	0.5
Private	90.9	51.3	5.7
Hens			
Public	83.1	27.3	0.4
Private	88.1	41.1	2.2

The methodology for estimating hunter harvest of PGC-released pheasants was developed by Diefenbach et al. (2000) using reward bands. Future attempts to estimate pheasant harvest rates in PA should follow their methods.

SECTION VIII. HUNTING

Seasons, Bag Limits and Hunting Areas

The first hunting season for pheasants in PA was in 1902. There were no daily or seasonal bag limits during a two-month season, and males and females were legal. By 1915 daily, weekly and season bag limits were in place (4, 10 and 20, respectively), and the season was held from October 15 through November 30.

In 1923 the Commission implemented a cocks only season. The daily bag limit was 2, which has remained unchanged to the present day, and the season limit was 6 in a season that ran from November 1-30. From 1927-1934, season bag limits were held steady, but season lengths varied from 2 to 4 weeks, and in some years only certain days of the week were legal for pheasant hunting. From 1935 to 1971, season limits varied from 8 to 12 (always 8 after 1944), and seasons ran from November 1 or the last Saturday in October to the Saturday after Thanksgiving.

In 1972 a possession limit of 4 was established, that has remained unchanged. Also, the state was divided into male-only and male and female hunting areas, using Interstate 80 as the boundary from Ohio to New Jersey, except for a region from Williamsport to Dallas that remained in the male-only area. In 1974 a post-Christmas season was added in the male and female area, which lasted until January 18, 1975. By 1976, an area north of Interstate 80 and West of Interstate 79 in Mercer, Crawford and Erie counties was included in the male-only area.

In 1987 and 1988 Mercer County was closed to pheasant hunting as part of the Sichuan hybrid pheasant restoration investigations, and the area west of Interstate 79 above Mercer County was included in the male and female area. From 1989 to 1992 the portion of Mercer County closed to hunting was north of Interstate 80. In 1993 a male-only season was restored in Mercer County above Interstate 80, but the season was only 1 week long. A regular male-only season length was reinstated in this part of Mercer County from 1994 to 1997.

From 1993 to 1997, 6 areas were closed to pheasant hunting as part of the Sichuan pheasant experimental restoration study. These areas involved portions of Erie, Crawford, Centre, Juniata, Northumberland/Montour/Columbia, and Dauphin/Schuylkill counties. During this time post-Christmas seasons in the male and female area were expanding to include most of January.

In 1998 and 1999, Mercer County north of Interstate 80 was included in the male and female area, and post-Christmas seasons were expanding into February.

Starting in 2000 the male and female hunting area expanded, and was defined by county. Counties, or parts thereof, being added to the male and female area included, Venango, Clarion, Armstrong, Jefferson, Indiana, Clearfield, Cambria, Centre, Blair, Huntingdon, Clinton, Lycoming, Luzerne, Carbon and Monroe, as well as Delaware and Philadelphia. Mercer County was back in the male-only area.

In 2003 a uniform system of 22 WMUs was implemented for all game and furbearing animals, except elk and waterfowl. WMUs with male and female pheasant hunting included 1B, 2D, 2E, 2F, 2G, 3A, 3B, 3C and 3D. WMUs 1A, 4A and 4D were added to the male and female area in 2004, WMU 4B was added in 2005, and WMUs 5C and 5D were added in 2007.

Harvests

The PGC has compiled pheasant harvest statistics since 1915 (Figure 22). Techniques have varied over time, from Game Protector estimates (1915-1936, and 1945-1964), to mandatory reporting (1937-1944), and a survey handed out to a sample of hunters by Game Protectors (1965-1970). The Game Take survey, based on a random sample of license buyers, has been in place since 1971. Even procedures for this survey changed over time. However, consistent procedures have been in place since 1983. Due to changes in techniques for estimating harvests, results may not be directly comparable across years, but considering the major changes that have occurred in pheasant populations over the past century, certainly trends are meaningful.

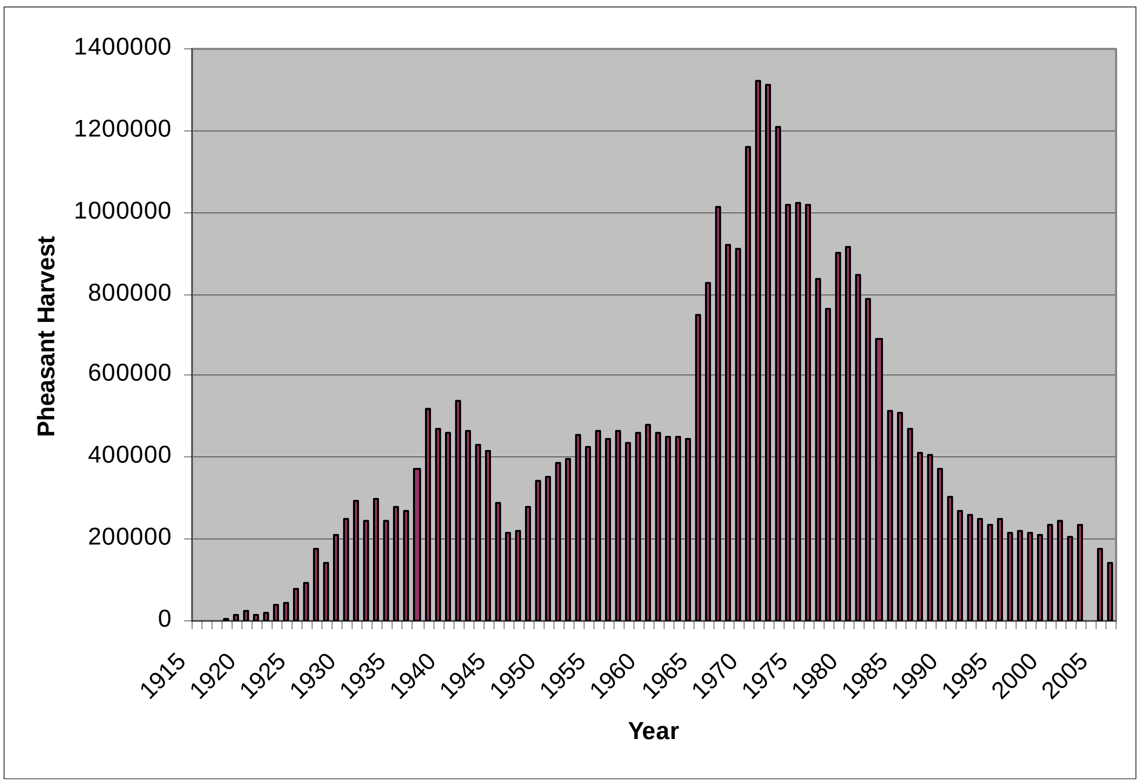


Figure 22. Pheasant harvest in PA 1915-2007 (PGC).

When the pheasant season was established in 1902, the kill was considered to be negligible. In 1915, the kill was still below 1,000, just 796 birds. By 1927 the kill surpassed 100,000 for the first time (177,561 birds), with steady growth until 1941, when 537,990 pheasants were recorded.

Pheasant harvests declined after World War II, to a low of 213,384 in 1946, before increasing steadily again through the late 1940s. Harvests stabilized from the mid 1950s and early 1960s, at a level comparable to the harvest peak in the late 1930s and early 1940s. By 1965 the pheasant harvest started to increase rapidly, and first surpassed 1 million birds in 1967, with 1,015, 000. Peak harvests were recorded in 1971 and 1972, with harvests of 1,322,675 and 1,320,058 birds, respectively. Harvests declined below 1 million birds by 1977 (Shope 1980), below 500,000 birds by 1986 (471,090 birds, Boyd 1990), and steadily since that time, until the mid 1990s, when harvests stabilized at slightly more than 200,000 birds. Harvests dropped to 141,445 pheasants in 2006 (Librandi-Mumma and Boyd 2007).

Hunter Numbers

Pheasant hunter numbers were not estimated prior to 1971, when the Game Take Survey was initiated. Based on survey returns indicating that 97% of hunters hunted small game, and 76% of small game hunters hunted pheasants in the 1971 hunting season (Shope 1972, unpublished report), we can conclude there were 838,394 pheasant hunters (based on 1,137,269 licenses sold, PGC records). Since 1979 annual pheasant hunter numbers have been published in Game Take Survey reports. The number of pheasant hunters stayed above 700,000 until 1983 (677,508), and has dropped steadily to it's current low in 2006 of 96,590 (Librandi-Mumma and Boyd 2007, Figure 23).

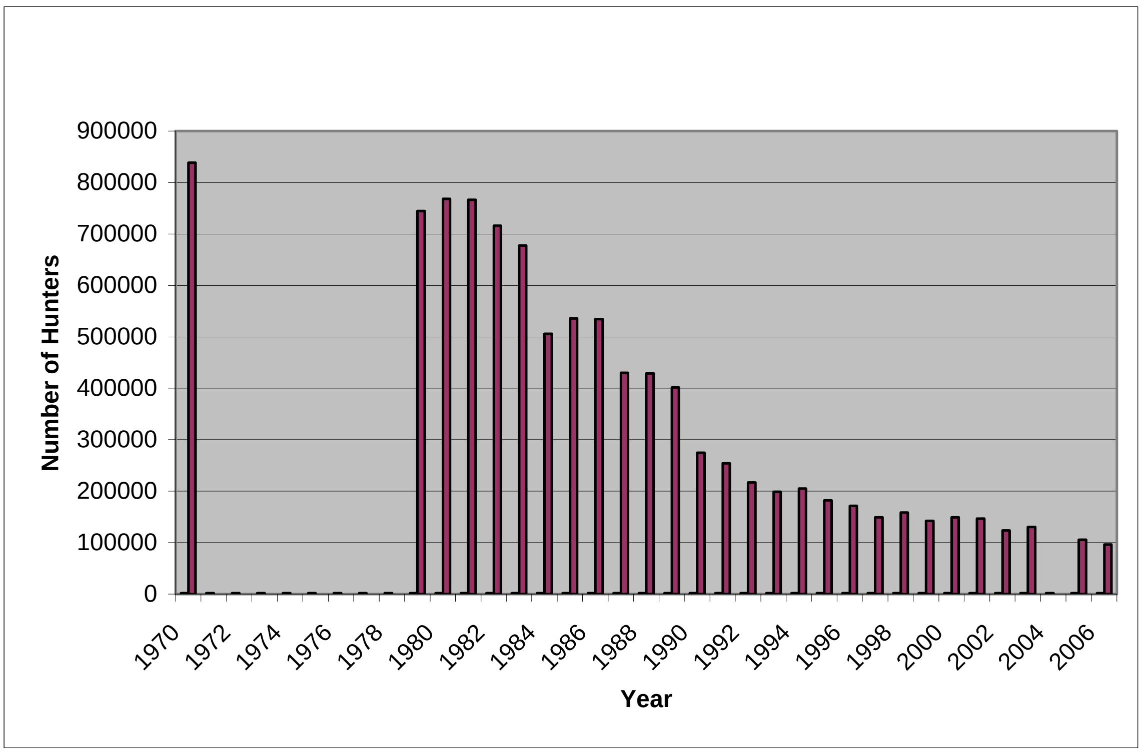


Figure 23. Number of pheasant hunters in PA, 1971-2006 (PGC Game Take Survey data; missing data 1972-78 and 2004).

Contribution of Propagated Pheasants to the Harvest

Hartman and Sheffer (1971) estimated that in primary pheasant range native birds and natural reproduction accounted for at least 98% of the hunter harvest, and that 60-75% of the statewide harvest was from primary range. In secondary range stocked birds accounted for about 50% of the annual harvest, and in tertiary range 90% of the harvest was from stocked birds.

Today, the number of wild birds harvested is not known, but is thought to be a small percentage of the harvest. During 2006, when the pheasant harvest was estimated at 141,445 birds, considering that the PGC released over 100,000 pheasants (Riegner 2007), and private propagators released about 350,000 (Dunn et al. 2008, unpublished report), one could conclude that most of the birds harvested were from propagated stock.

Youth Pheasant Hunt and Mentor Program

In 2002 a youth pheasant hunting season was established to expand opportunities for young hunters. A committee with representatives from the PGC, PA Federation of Sportsmen Clubs and Pheasants Forever developed guidelines for stocking pheasants, and prepared a "Mentored Youth Pheasant Hunt Planning Guide" to enable groups to develop and sponsor a Mentored Youth Pheasant Hunt program.

The first youth pheasant hunt was 2 days long and ran concurrent with the youth squirrel hunt (October 12 and 14, 2002; Columbus Day and the Saturday before). Thirteen thousand five hundred and sixty pheasants were stocked on 71 designated sites on state game lands, and other property managed by the PGC, although pheasants could be hunted by youth statewide. Fourteen organizations participated in the Mentored Youth Pheasant Hunt Program, and received 938 PGC-produced pheasants to host a mentored hunt. Bag limits were the same as the regular season: two pheasants per day, sex of legal target dependent on the area of the state being hunted.

In 2003, to improve and expand this program, the number of pheasants released increased to 18,000 statewide, with 2,000 allocated for the mentored hunting events. Youth pheasant hunt stocking sites included 111 locations on state game lands and other PGC managed lands, and included 56 of the 65 counties where pheasants were stocked during the regular season. Twenty-two sportsmen's clubs sponsored mentored youth hunts and qualified to receive 1,568 birds. In 2004 stocking sites expanded to114, and 31 sportsmen's organizations sponsored mentored hunts receiving 1,993 birds.

In 2005 the youth pheasant-hunting season was expanded to 6 days. Unfortunately, due to budget constraints and a 50% reduction in pheasant production, the youth pheasant hunt allocation was reduced to 15,000. Additionally, birds provided to organizations conducting mentored youth hunts were eliminated. Sportsmen organizations desiring to conduct mentored hunts were required to purchase adult birds from private propagators. In 2006, the PGC again allotted birds, up to 1,500, for organizations conducting mentored youth pheasant hunts.

From the Game Take Survey, an estimated 5,660 junior hunters participated in the 2006 youth pheasant hunt, and harvested 3,200 pheasants (Librandi-Mumma and Boyd, 2007).

Economic Impacts of Pheasant Hunting

It is hard to quantify the value of pheasant hunting. The stocking of fall pheasants is intended to provide hunting recreation and is not intended to result in the establishment of naturally producing populations. We raise pheasants because people like to hunt pheasants. Certainly hunters prefer wild pheasants, however, stocked pheasants provide thousands of hours of quality recreation, a superb alternative that otherwise simply would not be available.

The 2001 National Survey of Fishing, Hunting and Wildlife Associated Recreation (USFWS and U.S. Census Bureau 2003) reported that 370,000 PA hunters hunted small game for 3,135,000 hunting days, and spent $61,259,000 on food, lodging, transportation, equipment and other trip costs. There were 153,000 pheasant hunters (41% of small game hunters) reported, who hunted pheasants 1,102,000 days (35% of small game trips). Pheasant hunter expenditures were not reported, but assuming they were approximately 38% of small game expenditures, we conclude that pheasant hunters spent about $23,278,000. The economic impact would be even greater if we include state and federal tax revenues and jobs that were would be created or supported by this activity, which is normally included in economic impact analyses (e.g., Southwick and Associates hunting economic impact reports).

In a 1995 survey of PA hunters conducted by the PA State University, only 39 percent of respondents were satisfied with the pheasant stocking program, the lowest rating for any PGC program examined in the survey. However, sixty-one percent of the respondents indicated there needed to be an increase in pheasant stocking expenditures, and 72 percent were opposed to closing pheasant propagation facilities to generate more operating capital for agency programs.

That supported the results of a similar survey conducted during 1994, which indicated 20 percent of respondents were satisfied with the pheasant stocking program, 65 percent wanted to increase emphasis on stocking, and only 9 percent were opposed to the Commission continuing the pheasant propagation program. The cost to produce pheasants is expensive, however surveys indicate sportsmen are willing to pay more for the sport they enjoy so much.

Pheasant Hunting License

We recommend that all pheasant hunters be required to obtain a license to hunt pheasants in addition to their regular hunting license. This will help offset the annual Propagation program costs estimated to be $4,000,000 by 2010. We also recommend that hunters be surveyed to determine their support of the Pheasant Management Plan and their expectations and willingness to support its full implementation.

SECTION IX. RESTORATION

Attempts to restore pheasant populations began in the 1960s. A variety of restoration methods were employed including stocking more pheasants, creating better habitat, introducing other types of pheasants, and reintroducing wild pheasants. Many lessons were learned from each attempt to reverse declining pheasant populations across PA.

Increased Stocking

Coincidental with the population decline during the 1970s and early 1980s, annual pheasant stockings by the PGC increased substantially. Initial restoration efforts attempted to increase pheasant populations in secondary and tertiary range. In 1969 and 1970, mass releases of PGC game farm pheasants into second-class range did not increase pheasant populations. Approximately 90% of the released birds died (Hartman and Sheffer. 1971).

Krauss et.al. (1984) compared the survival of wild trapped, PGC game farm, and commercially raised pheasants released in southeastern PA. Seventy-percent of wild birds, 36% of commercially raised, and 14% of PGC game farm pheasants survived longer than 35 days. Despite these findings, the PGC increased game farm pheasant stockings in response to declining pheasant populations.

Decreasing pheasant harvest at a time when pheasant stocking was being increased raised questions about the impact of stocking on wild pheasant populations. Similar questions have been raised in the past regarding quail (Latham and Studholme 1947) and wild turkeys). Wild game bird x pen-reared bird crossings were suspected of causing loss of hardiness and increased tameness in the offspring, leading to depressed game bird populations. Differences in observed behavior and survival between wild and pen-reared game birds led some wildlife biologists to believe that cross breeding caused “genetically polluted” populations (Latham and Studholme 1947).

Pheasant populations continued to decline despite increased stocking. We do not know how the increase in stocking of game farm pheasants effected remaining wild populations. We do know that population declines increased in the early 1980s. Changes in habitat and habitat fragmentation were the major causes for these declines (Klinger 1996). It is also possible that genetic fitness of the populations was declining as populations got smaller and more fragmented. Stocking of large numbers of very homozygous game farm pheasants may have accelerated the pheasant decline. Even though only 5-10% of game farm pheasants survive to reproduce in small declining wild populations, this could be a significant shift in genetic composition over time. No genetic analysis was conducted so no one could establish a clear connection to genetics to explain behavioral and survival differences Based on recent DNA work on wild pheasant populations in Iowa (Giesel et al. 1997) we hypothesized that the stocking of large numbers of very homozygous game farm pheasants in the early 1980s may have reduced the genetic fitness of the remaining populations.

Rearing Method Evaluation

As pheasant populations continued to decline, the PGC continued its evaluation of the birds. In the winter of 1983-1984, the PGC trapped wild pheasants in Bucks and Montgomery Counties. Three groups of pheasants were raised under different habitat and human handling conditions at the Northcentral Game Farm in Lycoming County. One group included 500 pheasants in which wild males mated with wild females. Eggs were collected and hatched in incubators and raised with a minimum of human exposure and in as much cover as possible in their pens. A second group consisted of 500 game farm stock pheasants. These were raised and released under similar conditions. A third group of 500 birds was raised via the usual game farm methods.

The objective of the program was to produce a hardy, wilder bird. However, both the first and second group seemed to produce a better quality bird that was wilder and had much better flight abilities than traditional game farm pheasants (Riegner PGC personal communication 2006). As a result, the PGC changed its methods of game farm pheasant production to produce a "hardy bird. The Commission also reduced pheasant production to about 250,000 birds (down from 450,000) to accommodate these changes.

Subspecies and Hybrid Studies

During 1963-1967, Korean pheasants and Korean-ringneck hybrids were produced at the PGC game farms from eggs obtained from Korea. These pheasants were released in southcentral and northwestern PA, but restoration was not successful (Kriz 1968).

In the late 1980s, Michigan Department of Natural Resources (MIDNR) was evaluating the release of a pheasant obtained from the Sichuan Province of central China. MIDNR, through diplomatic channels, was able to obtain 9 male and 15 female pheasants. In addition, a group of biologists from MIDNR traveled to the Sichuan Province of China and were able to obtain 1,500 eggs from wild pheasant nests. These wild pheasants and eggs became the stock for Michigan's pheasant recovery efforts. Early results seemed promising.

In 1987, the PGC acquired 40 male Sichuan pheasants from the MIDNR. In 1988, the PGC received 100 pure Sichuan eggs from them. According to MIDNR biologists, Sichuan pheasants preferred to nest in brushy fields rather than high grass or agricultural fields in their native China. The logic was that these birds, unlike our "native" ring-necked pheasants, would nest in brushy edges and not in hayfields. Commenting on the Michigan program, Pete Duncan, executive director of the PGC said, "We were impressed with the Michigan program and have every reason to believe we can duplicate it. During the next year, we plan to crossbreed our Sichuan cocks with wild-trapped ringneck hens. After we incubate the eggs and have Sichuan hens, we will concentrate on the production of pure Sichuans. We are cautiously optimistic, but there are no guarantees. At the same time, we will continue our efforts to create better ring-neck habitat at every opportunity." The PGC spent the next 11 years evaluating Sichuan-ringneck hybrids, pure Sichuans, and "hardy" ringnecks produced at the game farms.

In 1987-1992, the large-scale release and temporary protection of Sichuan hybrid pheasants (*P.c. strauchi* x game farm pheasants) had shown some success in establishing populations in selected PA habitats (Palmer and Johnson 1991). Study areas were

Letterkenny Army Depot in Franklin County and a large portion of Mercer County. Although populations initially increased on the study areas, the populations returned to pre-stocking levels by 1996 (Hardisky 1997). The project was terminated.

Ringneck-Sichuan Study

Based on the initial success with the hybrid project and results from Michigan, the PGC conducted a 6-year study (1993-1998) to determine if PGC-propagated Sichuan or hardy ring-necked pheasants could establish wild populations at a density of >36 birds/mi2 in the spring, capable of withstanding fall hunting pressure (Hardisky et al. 2001). Between 1993 and 1995, 20,461 PGC-propagated ring-necked and 20,104 Sichuan pheasants were released in the fall (late September-October) in selected habitats at a density of 45 birds/mi2, with a 1 male:2 female ratio.

Six paired study areas were selected and closed to pheasant hunting (Erie-Crawford, Centre-Juniata, and Dauphin-Northumberland counties). Three study areas were selected for the experimental release of pure Sichuans (Crawford, Juniata, and Northumberland counties) and three for quality ring-necked pheasants (Erie, Centre, and Dauphin counties). Study areas varied in size from 25,550-40,400 ac, with an average size of 31,900 acres. Study areas were similar in composition with cropland comprising 28%, mixed-rangeland 3%, hay/pasture/fallow 27%, forest 30%, residential 8%, and wetland 4% (Palmer and Wallingford 1992). Hartman (1970) considered primary pheasant range to be at least 50% cropland, hay and pasture 25-40%, and forest no more than 10%. These study areas would have been classed as secondary or tertiary range in 1969.

Based on band recovery data, both pheasant subspecies and sexes exhibited very similar dispersal behavior each year. Overall, PGC-raised pheasants survived for an average of 107 days and traveled 3.6 miles from their release sites. Mean ringneck and Sichuan pheasant survival was nearly identical (106-108 days) among leg-banded birds.

Radio-telemetry studies were conducted during the first 2 years of the program to determine which subspecies of pheasant was better adapted to existing farmland habitat in PA. Radio transmitters were placed on 354 Sichuans and 321 ringnecks on the Juniata and Centre County study areas, respectively. Weekly survival of females was significantly lower than that of males for both subspecies and both years. All survival distributions followed a similar pattern of an initial sharp decline, a leveling off once birds acclimated to their new environment, another decline throughout the winter, then another leveling after breeding season had begun.

Habitat selection did not differ significantly between subspecies. Sichuan pheasants maintained home ranges 3 times larger than that of ringnecks. Sichuans averaged 385-ha (952 ac) home ranges, while ringnecks maintained a mean home range of 94 ha (231 ac). Based on the 2-year telemetry phase of this study, Hardisky et al. (2001) concluded that Sichuan pheasants were not substantially different from game farm-reared ring-necked pheasants in terms of survival, reproduction or habitat use. Both subspecies require farmland habitats with winter thermal cover adjacent to food resources. Regardless of subspecies, pheasants survived and bred most successfully in farmland habitats that maintained cover throughout the year for breeding, brood rearing, and winter thermal protection.

Pheasant populations were monitored on all study areas during 1992-1998. A comparison of pheasant crow count results between the 1993 baseline year (before stocking) and 1998 suggested that pheasant populations initially increased on pheasant study areas, but declined to baseline levels after fall stocking was eliminated. Ring-necked and Sichuan pheasant stocking had an immediate post-release effect on the number of crowing male pheasants in the spring. However, it had no long-term effect. Higher crow counts in years following fall stocking may have simply reflected survival of stocked game farm male pheasants and not population increases related to natural recruitment. Based on 1992-1998 crow counts, 1994-1997 flushing survey sex ratio estimates, and mortality studies conducted in 1994 and 1995, hen survivorship was too low for both game farm ring-necked and Sichuan pheasants to substantially increase pheasant populations on any of the study areas. Whether this was due to the inherent low survivorship of captive-raised hens, habitat deficiencies, high predation rates on the study areas or a combination of factors is not known.

Lack of secure nesting, brood rearing, and winter cover were identified as factors limiting pheasant population establishment. Hardisky et al. (2001) suggested future pheasant restoration efforts be directed toward habitat improvement, since many critical life history requirements are severely deficient in PA. They also identified the need to idle farmland on a large scale using federal set-aside programs such as the CREP. This farm program could offer the last real hope for any chance of pheasant habitat restoration on a large enough scale in PA. They concluded that there is no “best pheasant” that will adapt to our current agricultural conditions, and that the PGC discontinue the search for a better-adapted pheasant. Habitat improvements and the trap and transfer of wild pheasants should be the next step in attempting to restore wild pheasant populations (Casalena and Wallingford 1996).

Habitat Improvement

While pheasant populations were sharply declining during 1981-1984, Hartman et al. (1984) studied the impacts of delayed hay mowing on pheasant populations in Cumberland County, PA from 1981-1984. Farmers were paid $35 per acre to delay hay mowing until after June 20 and $50 per acre not to mow hayfields. Pheasant nesting success in unmowed fields ranged from 36-57%. In control fields, where hay mowing was not delayed, nest success ranged from 3-20%. Delaying hay mowing until after June 20 increased pheasant nest success 3-10 fold and doubled hen survival. Later mowing dates were likely to protect even more nests and hen pheasants. However, because the fields where delayed mowing was practiced comprised only 12% of the study area hayfields, impacts to annual pheasant populations may have been minimal. The PGC discontinued the delayed haying program in 1986 due to high costs.

The PGC shifted its emphasis from evaluating pheasants to improving pheasant habitat in 1996. The PGC, USFWS Partners for Fish and Wildlife Program, PF, and California University of PA began the Farmland Habitat Recovery Program (Grabowicz, personnel communication 1996). Funding was obtained primarily from a $750,000 Mellon Foundation grant awarded to California University of PA. The USFWS and PGC, Bureau of Land Management regional staff of land managers, provided labor and technical support. The first area selected for habitat recovery efforts was the Pike Run watershed in Washington County. This area was also in the PGC’s Farm Game Cooperative Program. Landowners were provided technical and financial assistance to establish streamside buffers, stream bank fencing, and the establishment of native warm season grasses, particularly, switch-grass. The area was closed to the stocking of game farm pheasants. A residual pheasant population existed on the area, but at much lower densities than in the 1970s. The Tri-county PF chapter was a key player in starting the Farmland Habitat Recovery Program.

Carroll (1993) developed a southwest PA pheasant management plan in 1993. Over the next 10 years, the partnership would expand to several other "Mellon Farmland Habitat Restoration Areas". No monitoring data are available for pheasant populations on any of these areas. Habitat improvements across 20 counties reported by Partners for Fish and Wildlife were 818 acres of native warm season grasses planted (mostly monoculture switchgrass), 202,000 feet of stream bank fencing, 551 acres of wetlands protected, and 254 acres of wetlands restored by 1999. The Mellon Foundation continued to fund the project through 2007.

In 1999, the Commission requested that the Wildlife Management Institute evaluate the current habitat and pheasant recovery program in PA. Riley (1999) concluded that large-scale habitat improvements in nesting and brood rearing cover would be necessary to restore pheasant populations. He recommended that 25,000-acre core areas of agricultural habitat (no more than 10% forested, 25% idle grass cover) be established. When habitat targets have been met, trap and transfer of wild pheasants may be necessary. At least 200 birds (70% hens) should be transplanted each year for 3-5 years. Populations should be monitored using brood surveys and pheasant crow counts. He also recommended that the PGC establish a private lands wildlife management program to work with private landowners to manage wildlife populations and wildlife habitat. The program should have trained biologists who are very familiar with state and USDA conservation programs.

In 1998, the PGC prepared the first draft of the PA CREP and presented it to the USDA State Technical Committee (Klinger 1998). In 2000, PA Governor Ridge and the USDA Secretary of Agriculture signed the PA CREP. The program committed the state and USDA to establish 100,000 acres of conservation cover on private farmland in PA in 20 PA counties in the Chesapeake Bay watershed to improve water quality and wildlife habitat. It also committed $210 million dollars to fund the program. In 2003, Governor Rendell expanded the program to an additional 21 counties and another 100,000 acres. In 2005, the program was expanded to include the Ohio River basin in western PA (16 counties, 65,000 acres). The total program was funded at $550 million dollars over 15 years. Landowners are paid an annual rent and cost share to establish conservation cover on cropland. The conservation cover may not be disturbed and must be maintained for 10-15 years. By 2008 194,000 acres were enrolled in the program (USDA FSA 2008).

Wild Pheasant Introductions

Past attempts to restore pheasant populations using wild birds was somewhat uncommon. However, during 1964-1966, 1,006 wild-trapped ring-necked pheasants from Montgomery and Union counties were transferred to a Centre County study area. No PGC game farm birds were stocked on the area during this period. The calculated breeding population on the study area was 96 in the spring of 1964, 224 in the spring of 1967, and 492 in the spring of 1969 (Myers 1970). Under those existing habitat conditions, this trap and transfer of wild birds successfully increased the local pheasant population.

More recent attempts to establish wild pheasant populations include two projects currently active in Washington County's Pike Run watershed in southwestern PA and in the central Susquehanna River area of PA centered on Montour County (Figure 24). A third wild pheasant restoration area has been proposed in Somerset County, PA. .

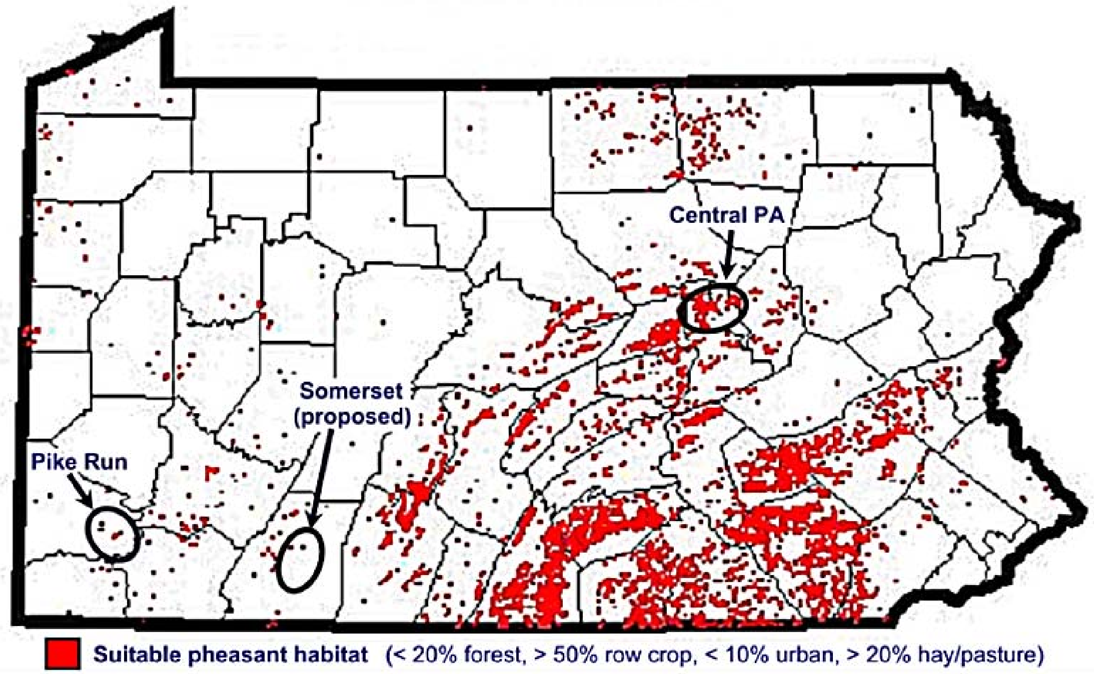


Figure 24. Current and proposed wild pheasant introduction study areas in PA. Red areas indicate 1 km^2 blocks of potential pheasant habitat based on 2000 LANDSAT imagery at 30-meter resolution and on secondary range model characteristics developed by Hartman and Sheffer (1971).

Pike Run

In 2002, the USFWS Partners for Fish and Wildlife organization received funds from the RK Mellon Foundation to begin a wild pheasant restoration project in southwestern PA. The Pike Run watershed was selected as the study area, since farmland habitat improvements were on-going in the area. The study area consisted of 30,965 acres.

During the winters of 2003 and 2004, no wild pheasants were available for transfer and release to the Pike Run study area from the Midwest. Lack of birds and poor trapping weather curtailed introduction efforts. However, 72 wild pheasants from South Dakota were released during both 2005 and 2006 in the Pike Run watershed. In 2007, 247 wild pheasants were trapped and transferred to the Pike Run area. Sex ratios of released birds were 1 M:7 F in 2005, 1 M:3 F in 2006, and 1 M:4.3 F in 2007.

Students and staff of California University of PA and local PF chapter members conducted the research and monitoring on the study area (Argent 2005). Fourteen pheasants were radio-collared and released in 2005. Within 2 weeks of release, 7 radio-marked pheasants died (50%). By the end of the nesting season, mortality was 86%.

Twenty birds were radio-collared during 2006. However, no survival results were reported. No pheasants were radio-marked during the 2007 release of 247 birds.

Population monitoring using standard crowing counts (Anonymous 1974) and fall flushing surveys began in 2007. The average number of crowing males per route was 6.1. Winter flushing surveys were not conducted. However, 3 flushing surveys run during September and December yielded 54 flushed pheasants with a 1 M:3 F ratio. Population monitoring is planned to continue on the study area.

Central PA

In 2006, the PGC approved a permit for PA PF, Inc. to trap and transfer up to 1,000 wild pheasants from the Midwest (South Dakota and Montana) and release them in Columbia, Montour, and Northumberland counties. This central PA study area consisted of contiguous, agriculturally-dominated land in excess of 200,000 acres. The core study area was centered in Montour County and was comprised of 50 mi^2 (32,067 acres) of historic first class pheasant range. Forty-eight percent of Montour County was farmland. Of this agricultural land, 69% was cropland, 12% pasture, 11% idle, and 8% other uses. Nearly 15% of the study area cropland was enrolled in the CREP program.

PF, PGC, and Habitat Forever biologists and a team of cooperating organizations and landowners conducted the pheasant research and monitoring for this project. DeLong and Appelman (2008) headed this effort and summarized the progress of the central PA wild pheasant restoration project in their annual report.

Three hundred twenty-nine pheasants were released on 7 different release sites throughout the study area in February 2007. There were 2 main study sites – one in the Turbotville area (Northumberland and Montour Counties) and one in the Greenwood Valley (Columbia County). The sex ratio of wild pheasants released in the Turbotville area was 1 M:3 F. The sex ratio of wild pheasants released in the Greenwood Valley was 1 M:1.3 F.

Monitoring data were collected on the wild ring-necked pheasants using 4 main methods: radio-telemetry, crowing counts, brood surveys, and flushing surveys. Reports of pheasant sightings in the study area by project staff and landowners were also noted.

Fifty-five hens were radio-collared and tracked February 10, 2007 to January 16, 2008. Radio tracking was used to collect data on survival, causes of mortality, habitat use, and movements of radio-collared hens. Radio-tracking results were limited due to equipment malfunctions. PF and the PGC purchased new transmitters, antennas, and a receiver for the 2008 monitoring season.

There were 24 known mortalities of radio-collared hens during the 2007 monitoring season. Seventy-five percent of these mortalities occurred within the first month of the study between February 8, 2007 and March 13, 2007. The remaining 25% of mortalities occurred from March 14, 2007 - June 9, 2007. The last confirmed mortality was a hen on a nest of 10 eggs. Causes of mortality included stress from the trap and transfer, mammalian predators, avian predators, undetermined predators and one collision with a vehicle.

After the wild pheasant releases, radio-collared hens moved 0.2–0.5 miles from the release sites. Most of the radio-collared hens remained on the same farms where they were released. After hens chose an area after the release, there was very little movement until just prior to the nesting season. At that time, there were again movements of from 0.2–0.5 miles by radio-collared hens.

Three radio-collared hens moved more than 0.5 miles just prior to or during the nesting season. One hen moved 1.5 miles to another release site and nested. One hen moved 2.0 miles, also to another release site, and nested. A third hen moved 3.0 miles to another release site and nested.

Radio-collared hens were released in native-warm-season grasses or stream buffers. During the winter after the releases, radio-collared hens were located in native-warm-season grasses, stream buffers, and hedgerows. In spring and summer radio collared hens were located in native-warm-season grasses, introduced-cool-season grasses, hayfields, wheat fields and cornfields. By autumn, the one hen still wearing a radio-collar, moved back into the same native-warm-season grass field where she was originally released and where she spent the winter of 2007.

Ten radio-collared hens initiated a nesting attempt. Nine of those 10 hens nested in either native-warm-season grass fields or introduced-cool-season grass fields enrolled in CREP. The tenth hen nested in a mixed hay field on a working farm. During the nesting season 8 of these 9 radio collars either broke and dropped to the ground or stopped emitting signals. One hen died on the nest. The tenth hen, nesting in the hayfield, survived and took her brood into a nearby wheat field after hatching. This hen survived because the farmer agreed to mow around the nest site while harvesting the hay.

Crowing counts were conducted on 5 standardized routes located in, and adjacent to, the study area. Three of the routes were in the Turbotville study area, 1 route was within the Greenwood Valley study area, and one route was adjacent to the study area (control route). Crowing counts were performed in 5 time periods between April 20, 2007 and May 15, 2007 (Anonymous 1974). Crowing roosters were counted for 3 minutes at 10 stops at 1-mile intervals along the crowing count route. Crowing counts were also performed in 2006, in the same manner, to collect baseline data.

From 2006 to 2007, the total number of crowing roosters increased on each of the three Turbotville study area routes. There was a slight decrease for the same time period on the Greenwood Valley route. Further comparisons will be made with data from future years.

In August 2007, brood surveys were conducted on the 5 standardized routes. Landowners within the study area also collected data on broods by completing data forms provided by the project. Although no broods were seen during roadside brood surveys on the standardized routes in 2007, landowners in the study area reported seeing broods throughout summer. Landowners reported 38 pheasant brood sightings. In 42% of those brood sightings, landowners reported seeing 8-10 chicks.

Flushing surveys were conducted on 8 sites in the Turbotville area (Montour and Northumberland counties) and on 6 sites in the Greenwood Valley (Columbia County) in January 2008. Sixty-eight volunteers and 35 bird dogs flushed 50 roosters and 57 hens in the Turbotville study area. The sex ratio was 1 M:1.1 F. Forty-four volunteers and 27 dogs flushed 20 roosters and 13 hens in the Greenwood Valley study area. The sex ratio was 1 M:0.65 F.

Wild pheasant acquisition will continue through 2009, until 1,000 wild pheasants have been trapped and transferred to the central PA study area.

Somerset

Modeled after the two previous wild pheasant trap and transfer programs, the Somerset Chapter of PF proposed another pheasant restoration project during February 2008 (Putnam personnel communication). The project area encompasses 11,210 acres in the Stony Creek watershed. The plan follows procedures similar to the Central PA project. This proposal has not been approved by the PGC as of March 2008.

Habitat Evaluation

Based on data from Hartman and Sheffer (1971), we developed several GIS models to predict the potential for areas of the state to support a viable pheasant population. Hartman described first, second, and third class pheasant range based on land-use (Figure 24). Based on these data, we propose that landscapes able to support pheasants must have <20% of the acreage in forest, >50% in row crops, >20% in hay-land/pasture, and <10% developed land. Using LANDSAT Imagery from 2000, we developed rough models based on land-use and analyzed each km^2 of PA (Figure 24). We were not able to separate small grain fields from hay fields.

Our GIS analysis suggests that about 1,500 mi^2 or 960,000 acres would meet our pheasant habitat criteria. We recognize that patches of poor habitat exist on any landscape interspersed with potentially good to fair pheasant habitat. We also recognize that in defining WPRAs, we would want to include buffers around each area of core habitat that may not meet our pheasant habitat criteria. Using data from the USDA 1997 Census of Agriculture and previous estimates of pheasant range in PA (about 20% of current farmland in first class range and 44% of farmland with the potential to produce pheasants), a maximum of 3,000,000 acres would have the potential to support viable wild pheasant populations in 2008. But this is only potential habitat. Whether these acres have enough suitable secure nesting and winter cover has not been determined.

Furthermore, we don't know how well these models predict pheasant densities. Until better habitat models can be developed and tested, we believe these models are a starting point to target any pheasant recovery efforts. Because of habitat fragmentation and the loss of farmland to development in mostly first class range, restoring wild populations that can produce a sustainable pheasant harvest will be very difficult in PA. We propose that a more realistic estimate of potential pheasant range in PA is about 1,000,000 acres, based on our pheasant landscape habitat model.

Restoration Protocol

Standards for selecting potential restoration sites based on existing habitat and landscape features are critical to selecting areas feasible for pheasant restoration attempts. Likewise, the use of standard pheasant population monitoring techniques and procedures is essential for valid comparison of restoration success among study areas.

Habitat Targets

Improving pheasant habitat over a large agricultural landscape will be essential to restoring wild pheasants in Pennsylvania. The positive association between hens with broods and amount of undisturbed grass/forb cover for nesting and brood rearing has been well documented for pheasants.

Pheasant numbers increased in South Dakota from an estimated 3 million to 10 million after nearly 720,000 ha of cropland were converted to grass and legume cover (Erikson and Wiebe 1973). Farris et al. (1977) showed significantly lower pheasant numbers in northern Iowa when undisturbed grass cover was <15% of the landscape. In Iowa, a 6% increase in grass cover statewide coincided with an increase in pheasants seen on August roadside surveys, especially in counties with >70% cropland (Riley 1995).

A landscape with about 25% grass and legume cover resulted in earlier hatch-dates and heavier chicks at hatch than on landscapes with about 10% grass and legume cover in Iowa. Pheasant biologists recommended that areas in the Midwest managed for pheasants should have about 25% undisturbed grass and legume cover interspersed among agricultural crop fields within a landscape approximately 125 km^2 in size (Riley et al. 1998).

We know that pheasants were most abundant in Pennsylvania between 1961 and 1974 (Figure 11). We also know that about 10% of the cropland was in USDA set aside acres during this period of very high pheasant densities (USDA PA ASCS 1956-1977). States with medium to high pheasant populations all have about 10% or more of cropland in CRP. We estimate between 10,000 (Hartman and Sheffer 1971) and 25,000 acres (Riley 1999) is needed to support a viable wild pheasant population because of the dispersal strategies of pheasants. Based on the review of pheasant populations in the United States, at least 15,000 acres of continuous farmland, primarily cropland, is needed to maintain pheasant populations according to NRCS (1999). Based on data from states with moderate to high pheasant populations, it appears that about 15-25% of the cropland acres must be in secure nesting cover from April 1-July 31. We recommend that 25% of the cropland in each 2-mi^2 block of potential habitat within WPRAs be placed in secure nesting and brood rearing cover. WPRAs should be at least 10,000 acres of contiguous farmland.

Although winter cover is not a primary limiting factor to abundance of pheasants, poor winter cover could lead to higher predation rates. We recommend that protection and establishment of winter cover in WPRAs be a high priority for habitat management. About 5% of the farmland in good winter habitat within each 2-mi^2 tract of otherwise suitable habitat should be established or maintained to support substantial wild pheasant populations.

Based on data from other states and our own studies in Pennsylvania, we propose that about 1,000,000 acres of cropland has the potential to support wild pheasant populations on a total landscape of 2,000,000 acres. We recommend that these acres be mapped and be the first target for WPRAs. As better data becomes available, we will need to adjust boundaries and locations of WPRAs. We estimated the amount of secure nesting and winter cover that will be necessary to improve or maintain pheasant habitat in WPRAs by 2015 (Table 4).

Table 4. WPRAs habitat targets in Pennsylvania

	Target acres	% of cropland	Public land acres	Private land Acres
SECURE NESTING COVER				
Grass/legume	150,000	15%	2,000	148,000
Small grains	100,000	10%	500	99,500
WINTER COVER				
Standing corn	10,000	1%	1,000	9,000
Border edges	20,000	2%	2,000	18,000
Shrub cover	19,000	1.9%	2,000	17,000
Wetlands	1,000	0.01%	100	900

We will need to establish 250,000 acres of secure nesting cover and 50,000 acres of winter cover. These targets will be met through CREP, other USDA programs, and PGC private landowner incentives. Some of these habitat targets can be met through small grain plantings. We estimate that 100,000 acres can be accomplished through federal Farm Bill programs. The remaining 150,000 acres will be accomplished by the PGC. We estimate that habitat improvement funds from the Game Fund to implement this plan will be about $2,000,000 annually.

Population Monitoring

The BBS, CREPS and CBC cannot be used to accurately estimate population densities or even trends in populations below the regional landscape level. In WPRAs, we need to estimate annual densities for at least 6 years. To estimate densities, we will need information on spring breeding populations and sex ratios. We propose to obtain information on spring breeding male populations from pheasant crow counts (Luukkonen 1992) and flushing surveys in February-March to determine sex ratios (Klinger and Thoma 2000). In addition, to verify results, we recommend using mark-recapture in January-February to determine densities in years 3 and 4. Radio-telemetry should be conducted to determine survival of live-trapped pheasant hens (on the WPRA) in year 3 and 4. If pheasant densities do not reach 10 hens/mi^2 in 6 years, the WPRA should be stocked with PGC game farm pheasants and opened to either-sex pheasant hunting. We estimate that monitoring and research will cost about $350,000 annually.

Research clearly has shown that game farm pheasants have much lower survivorship and produce much smaller broods. Because wild populations are essentially gone, or have been genetically diluted by the heavy stocking of game farm pheasants over the past 20 years, the trap and transfer of wild pheasants will be necessary. WPRAs should be mapped and identified based on our knowledge of the life requirements of pheasants. Populations need to be monitored and adaptive management used to change WPRAs. At this time, the number of wild pheasant areas and the number of pheasants they can produce is not known. However, through population modeling, we will be able to test many of our assumptions on pheasant populations and make some good estimates.

Many areas of the state will not support wild pheasant populations. These areas should be stocked with game farm pheasants of both sexes. Either-sex hunting with liberal bag limits should be allowed. The birds should be stocked preseason and during the season as close to weekends as possible on game lands or other lands under cooperative agreement with the PGC open to public hunting.

Dog training should be restricted, particularly during winter, nesting and brooding-rearing periods, and the stocking of private-raised and PGC game farm pheasants in WPRAs should be eliminated. Year-round disturbance by dog trainers and private and game farm pheasant stocking within a wild pheasant restoration area could slow or confound wild pheasant establishment. Supplemental stocking of game farm pheasants could increase hunter and dog training activity in the area. This added disturbance might increase hen mortality and reduce nesting success.

SECTION X. PARTNERSHIPS TO IMPROVE HABITAT

Partnerships

Restoring wild pheasant populations and maintaining the PA pheasant-hunting heritage will require cooperation and building partnerships. Several key NGOs have played a major role in trying to restore pheasants in PA. PF is dedicated to the conservation of pheasants, quail and other wildlife through habitat improvements, public awareness, education and land management policies and programs. There are more than 650 PF chapters across the U.S. and Canada, accounting for 115,000 current members. PA has 16 active chapters. Since the first chapter formed in the mid-1980s, PF chapters have spent $2,054,000 towards habitat and public awareness in PA. A total of 54,125 acres of habitat has been enhanced and/or protected since inception, including 29,167 acres of nesting cover, 21,300 acres of food plots, 2,023 acres of wetland restoration, 1,325 acres of woody/shrub cover, and 310 acres of land acquisition

The National Wild Turkey Federation (NWTF) has 75 Chapters in PA and annually through its habitat programs improves thousands of acres of upland habitat. Ducks Unlimited has a biologist that works full time in the state to improve upland and wetland habitats. The PA Federation of Sportsman's Clubs (PFSC) was formed in 1932. Membership is made up of affiliated clubs and individual members. They currently represent approximately 95,000 members. The mission of PFSC is to provide a statewide, united voice for the concerns of all sportsmen and conservationists; to insure their rights and interests are protected, and to protect and enhance the environment and our natural resources. PFSC has over 300 affiliated local sportsman's clubs throughout the state. These clubs improve thousands of acres of habitat every year. Many other conservation and sportsman NGOs are interested in the future of pheasant hunting in PA. Developing and expanding partnerships with those interested in restoring pheasants and farmland ecosystems must be a major emphasis in the future.

Because farmers own the majority of pheasant habitat in the state, we need to work closely with partners such as The PA Farm Bureau, PA Farmers Union, Chesapeake Bay Foundation, The PA Association of Conservation Districts and other less traditional groups. Foundations, such as the Richard King Mellon Foundation, will need to be key funding partners.

Although the PGC is the lead agency in managing the pheasant resource in PA, other federal and state agencies and Universities will be key partners in helping to restore pheasants and farmland ecosystems, including the PDA, DEP, DCNR, Fish and Boat Commission, State Conservation Commission, Center for Rural PA, The PA State University, and California University of PA. County Conservation Districts, county planners and township supervisors will need to be partners. On the federal side, the USDA, FSA and NRCS will need to be major partners. The USFWS Partners for Fish and Wildlife Program has provided technical assistance and funding to improve thousands of acres of wetlands and upland habitats. They will be important partners to insure the success of this management plan.

Private Landowner Assistance

PA is blessed with many conservation partners. However, the future of pheasants in PA will largely rest with the 80,000 private landowners that own over 95% of PA farmland. More and more private farmland landowners in PA are not farmers or are retiring from farming. Many care about wildlife. A strong PGC Private Landowner Assistance Program will be required to make progress in implementing this plan. The PGC may need to enhance it's Private Lands Assistance Program. This program provides technical assistance in wildlife habitat and population management to private landowners. Additional private lands biologist positions may be needed in certain PGC regions. Also, the PGC Farm Bill Biologist would coordinate with USDA FSA and NRCS to restore farmland wildlife populations through PGC, USDA, PDA, DEP and DCNR programs.

Farm Bill programs can put more habitat on private lands than any other programs. However, the limiting factor in PA has been adequate technical assistance. Without adequate technical staff to work with private landowners, restoring farmland ecosystems will not be possible. The PGC should continue its Cooperative Agreement with NRCS to support wildlife biologists statewide in NRCS. These biologists have been critical for delivering CREP and other farm programs to private landowners.

The PGC needs to identify partners, foundations, state and other federal personnel needed to implement the Pheasant Management Plan.

USDA Programs

No programs can improve more farmland habitat than USDA programs administered by FSA and NRCS. However, the details of these programs determine whether they improve wildlife habitat or not. The PGC needs to be represented on the PA USDA State Technical Committee and AFWA Agriculture and Resident Game Bird committees to influence national and state policies. The past three farm bills have shaped more conservation programs for a longer period of time, and put more funding behind those programs, than any other suite of legislation. The more than $5 billion the USDA spends on conservation each year is two-and-a-half times larger than the entire U.S. Fish and Wildlife Service budget. Several key programs can provide pheasant habitat in PA.

Conservation Reserve Program (CRP): CRP offers annual payments for 10-15 year contracts to participants who establish grass, shrub and tree cover on the environmentally sensitive lands. Enrollment offers are ranked for selection using the Environmental Benefits Index (EBI), which weighs six environmental factors and cost.

CRP also includes CREP, Farmable Wetlands Program (FWP) and State Acres For Wildlife Enhancement (SAFE). FWP has not been very valuable in PA. But no program since the days of the soil bank has put more conservation cover on the ground in PA in the past 5 years than the PA CREP. CREP is similar to CRP, but signup is continuous and CREP rental rates are 2-3 times higher than CRP rental rates. So far, over 180,000 acres of CREP are under contract. The cap is 265,000 acres. CREP is our most important tool for getting secure nesting cover on cropland. Under SAFE, state and local agencies, non-profit organizations and other conservation partners determined geographic areas where enrollment of farmland in CRP would benefit threatened, endangered or other high priority species. Project partners then developed conservation proposals that included enrolling land in the designated geographic areas in CRP using existing CRP practices for the benefit of specific species of concern. Last year, USDA accepted SAFE proposals developed by these organizations. FSA evaluated SAFE proposals to determine whether the selected practices would create the desired habitat. To be accepted by FSA, SAFE proposals had to be approved by qualified wildlife professionals and include a wildlife monitoring and evaluation plan. SAFE is a wildlife management tool that helps state and regional agencies, non-profit organizations and others to address local wildlife objectives through habitat restoration. SAFE is limited to 500,000 acres nationwide and is a continuous sign up. Unfortunately for PA, regular CRP rental rates under this program are too low and landowners are not likely to participate.

Wetlands Reserve Program (WRP): WRP allows for the purchase of long-term or perpetual easements and cost-share to producers who agree to restore wetlands on agricultural land.

Wildlife Habitat Incentives Program (WHIP): WHIP provides cost-share for projects developing or enhancing wildlife habitat through 5- and 10-year contracts.

Farmland Protection Program (FPP): FPP provides funds to states, tribal or local governments and nonprofit organizations to help purchase development easements on productive farmland. Eligible lands include cropland, rangeland, grassland, pastureland and forestland.

Conservation Security Program (CSP): The new CSP provides payments to producers for adopting various management, vegetative and structural practices that benefit a "resource of concern" such as soil, water and wildlife habitat. Both cropland and grazing lands are eligible.

Grassland Reserve Program (GRP): GRP assists landowners through long-term contracts or easements in restoring grassland and conserving native prairie.

Environmental Quality Incentives Program (EQIP): EQIP provides technical assistance and cost-share payments to assist crop and livestock producers with environmental and conservation improvements. Wildlife habitat practices are specifically maintained as a purpose of the program.

3rd Party Technical Assistance (TA): TA for program implementation is to come directly from individual program accounts. The Secretary of Agriculture is directed to develop and implement a system for approving third party providers, including nonprofit organizations.

The PGC needs to work with USDA FSA, DEP and the Governors Office to: 1) open the original 20 CREP counties to further CREP enrollment and to increase the CREP acres CAP in PA from 265,000 to 350,000 acres; 2) raise annual rental payments for regular CRP and CREP to insure a minimum of 300,000 acres are enrolled by 2015; 3) work with USDA FSA to insure all CREP contracts can be automatically re-enrolled for another 15 years; 4) enroll 200,000 acres in original CREP counties by 2015 (140,000 acres in cool season grass and legumes, 50,000 acres in native warm season grasses and forbs and 10,000 acres in riparian forest stream buffers); and 5) Establish a Delaware River Basin CREP with a goal of enrolling 20,000 acres in CREP by 2015. The PGC needs to work with USDA, AFWA, PF, NWTF and other Partners and Congressional delegation to develop a short term set aside program to reduce soil erosion, return organic matter to the soil, sequester carbon, reduce fertilizer inputs, improve water quality, improve wildlife habitat and improve net farm income. This program should be established as a USDA Farm Bill Program by 2012. In PA, enroll 35% of farmers and 10% of cropland acres in WPRA by 2017. No mowing or any disturbance should be permitted on annually idled acres that must be planted to a grass-legume cover crop the previous fall. The PGC should evaluate other farm bill programs and determine their value to PA wildlife and changes that are needed to make them more responsive to wildlife.

USFWS Programs

Since 1987, the USFWS has administered the Partners for Fish and Wildlife Program. The Partners Program was established with a core group of biologists and a small budget for on-the-ground wetland restoration projects on private lands. This successful results-oriented program has garnered support through the years and has grown into a larger and more diversified habitat restoration program assisting thousands of private landowners across the Nation. The Partners for Fish and Wildlife Program in PA works with other partners to put thousands of acres of habitat on the ground.

The North American Wetlands Conservation Act established a grants program to improve upland and wetland habitats. It has been annually funded at $65M, and the grants are administered by the USFWS through partnerships called Joint Ventures. PA is currently in the Atlantic Coast Joint Venture. These federal funds could be used to improve grassland habitat in PA. Unfortunately, because of technical staffing limitations, the PGC has received very few of these grants because they have not developed the grant applications.

State Programs

Few state programs exist that provide financial incentives to directly improve wildlife habitat on private lands. Both the PGC and DEP have provided additional funding to the CREP Program to be used for cost share or incentives for placing conservation practices on the land. Growing Greener funding has been used by County Conservation Districts primarily for water quality conservation practices. In some cases, these practices may indirectly improve habitat for wildlife.

The PGC does have a public access program. The Farm-Game Cooperative program was established in 1937. Cooperating farmers opened their land to public hunting and the Commission provided technical assistance in game management and game law enforcement. The Farm Game Program and later the Safety Zone Program would enroll over 30,000 farms and exceed 4,000,000 acres. Although lands remain enrolled in the program, wildlife habitat improvements and public access have varied widely throughout the State. In fact, some sportsmen have called it a stealth program, because, unlike other states, the Commission will not provide the names and exact locations of the farms enrolled. No data is available on the impact of habitat improvements on wildlife on any of the public access farms. No data is available on accessibility or days spent hunting on these farms. In 2005, the Commission received a Grant from the Shooting Sports Foundation to develop Public Access Maps showing the location of the farms and to survey Public Access Cooperators.

The current level of technical and financial assistance on Public Access areas has not been sufficient to prevent rapid declines in pheasants and farmland wildlife on these farms. The current program will not be adequate to restore wild pheasants in PA. An enhanced Private Land Assistance Program to provide technical advice to private landowners and financial incentives may be required to meet the necessary habitat goals to restore farmland wildlife in PA. Landowners should be paid an annual incentive that will improve pheasant habitat and still fit into their farming operations. Farmers and other landowners will need to be surveyed to determine what level of participation and incentives will be necessary for them to participate in a Pheasant Recovery Program. Personal contacts with landowners within WPRAs by staff with biological knowledge of pheasants, agriculture, and Farm Bill programs will be essential for the success of this plan. The PGC will need to seek ways to provide financial incentives to farmers and other landowners to establish and maintain 50,000 acres of secure nesting cover and 50,000 acres of winter habitat in WPRAs by 2015. The remainder of the pheasant habitat targets will be met through USDA CREP and other federal programs.

Improvement of Pheasant Habitat at the Local Level

Detailed management plans to improve pheasant habitat at the local level are beyond the scope of this statewide plan. This plan proposes habitat targets on an extensive scale to improve pheasant populations at the regional level. We know that local implementation of this plan will be the key to success. We recommend the following to improve the quality of habitat improvements at the local level: 1) provide training to land managers, food and cover crews, biologists, WCOs, USDA employees, PF and other partners on pheasant habitat management and habitat improvement programs; 2) prepare a Pheasant Habitat Management Handbook and 3) collaborate with state and federal agencies, legislature, counties, townships, and NGOs on planning, zoning, tax incentives, and easements to improve pheasant habitat.

We also recognize that an informed public will be the key to the success of this management plan. We recommend that the PGC: 1) inform and encourage all public landowners to incorporate pheasant habitat management plans into their management plans where potential pheasant habitat exists; 2) establish Pheasant Habitat Management Demonstration Areas on State Game Lands where potential suitable pheasant habitat exists; 3) inform and encourage private landowners, particularly Public Access and Working Together for Wildlife Cooperators, to enroll in federal and state conservation programs that will benefit pheasants; 4) use all forms of media to educate the public on PGC pheasant management programs; and 5) prepare a color summary of the PA Ring-necked Pheasant Management Plan for wide circulation.

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APPENDIX 1. IMPLEMENTATION SCHEDULE

Goal, Objective and Strategies	By End of Year										
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Responsible Bureau or Region
Goal 1. Restore self-sustaining and huntable ring-necked pheasant populations in suitable habitats throughout Pennsylvania.											
Objective 1.1. Identify all currently suitable and recoverable ring-necked pheasant habitats in Pennsylvania for wild pheasant releases by 2009.											
Strategy:											
1.1.1. Develop models of potential ring-necked pheasant habitat that can be applied to Pennsylvania, including land use elements, juxtaposition of habitats, and minimum area.	●	●	●				●				BWM
1.1.2. Using remote sense data and geographic information system tools, apply the pheasant habitat model to identify areas of the Commonwealth that currently are suitable habitat and areas that are nearly suitable but recoverable (i.e., can cost effectively have habitat elements enhanced to make the habitat 'suitable' prior to releases of wild pheasants).	●	●	●				●				BWM
1.1.3. Prioritize identified habitat areas of at least 10,000 acres as Wild Pheasant Recovery Areas (WPRAs) in Pennsylvania.	●	●	●				●				Regions
Objective 1.2. Maintain or restore 250,000 acres of secure nesting and brood cover and 50,000 acres of winter cover within 2,000,000 acres of farmland in WPRAs by 2015.											
Strategy:											
1.2.1. Within each WPRA establish 25% of cropland in nesting/brood cover and 5% of land in winter cover within each 2 mi^2 block of suitable habitat.		●	●	●	●	●	●	●			Regions
1.2.2. Prepare and distribute via the agency website and through technical workshops a pheasant habitat manual that identifies pheasant habitat needs and requirements for population recovery.	●	●	●	●	●	●	●	●	●	●	BWHM/BWM

APPENDIX 1. Continued.

Goal, Objective and Strategies	By End of Year										
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Responsible Bureau or Region
Strategy:											
1.2.3. Identify public lands within WPRAs, develop habitat management guidelines and implement improvements through partnerships, cooperative agreements, contract and food and cover employees.		●	●	●	●	●	●	●	●	●	BWHM/Regions
1.2.4. Develop and implement a Farmland Habitat Incentive Program to provide financial incentives to farmers and other landowners that fit into farming operations to establish and maintain pheasant habitat.		●	●	●	●	●	●	●	●	●	BWHM/Regions
1.2.5. Work with USDA, Pheasants Forever and other partners to enroll WPRA acres in Farm Bill Programs to provide needed pheasant breeding, brood rearing, and winter cover requirements and meet deficiencies outlined in previous objectives.	●	●	●	●	●	●	●	●	●	●	BWHM/Regions
1.2.6. Reopen the original 20 CREP counties to further CREP enrollment if needed to facilitate habitat enhancements in WPRAs in this area of the state and increase the authorized CREP acres to 350,000 acres state wide.		●	●	●	●	●	●	●			BWHM/BWM
1.2.7. Establish a Delaware River Basin CREP with a goal of enrolling 15,000 acres by 2015.		●	●	●	●	●	●	●			BWHM/BWM
1.2.8. Collaborate with USDA, AFWA, other Partners and Congressional delegation to develop and implement a short term set aside program to reduce soil erosion, return organic matter to the soil, sequester carbon, reduce fertilizer inputs, improve water quality, improve wildlife habitat and improve net farm income. Establish as a USDA Farm Bill Program by 2012.			●	●	●						BWHM/BWM
1.2.9. Collaborate with USDA, The PA State University College of Agriculture and Cooperative Extension to develop forages and biofuel stocks that are harvested after July 15 and before August 15. Promote native warm season grass/forb plantings and rotational grazing.		●	●	●	●	●	●	●			BWM/BWHM

APPENDIX 1. Continued.

	By End of Year										
Goal, Objective and Strategies	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Responsible Bureau or Region**
Objective1.3. Establish criteria and protocols for WPRA wild ring-necked pheasant acquisitions, releases and monitoring by 2008.											
Strategy:											
1.3.1. Identify characteristics, criteria and procedures for wild pheasants that are to be obtained for releases on WPRAs.	●	●									BWM
1.3.2. Identify standards for monitoring the survival and dispersal of wild pheasants released on WPRAs.	●	●									BWM
1.3.3. Identify standards for annually assessing population levels of ring-necked pheasants on WPRAs.	●	●									BWM
Objective 1.4. Establish wild ring-necked pheasant populations of 10 hens per mi^2 in the spring by the third year after trap and transfer is completed in at least 4 WPRAs by 2015.											
Strategy:											
1.4.1. Establish multi-year agreements with organizations and states to obtain wild-trapped ring-necked pheasants for WPRAs.	●	●	●	●	●	●	●				BWM
1.4.2. When the WPRA habitat targets have been met for an area, conduct baseline pheasant surveys of WPRAs using standard protocols to determine pre-release populations using standard protocols.	●	●	●	●	●	●	●				Regions/BWM
1.4.3. Release a minimum of 300 wild pheasants per year for 3 years with a sex ratio of no less than 3 females to 1 male on areas throughout the WPRA. Close pheasant hunting seasons for 6 years, allow no game farm pheasant releases by the PGC or private individuals (excluding permitted shooting preserves), and prohibit dog training within the WPRA during winter, nesting and brood rearing periods after trap and transfer has begun.	●	●	●	●	●	●	●				Regions/BWP

APPENDIX 1. Continued

	By End of Year										
Goal, Objective and Strategies	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Responsible Bureau or Region**
Strategy:											
1.4.4. Annually assess WPRA pheasant populations using standard protocols.	●	●	●	●	●	●	●	●	●	●	Regions/BWM
1.4.5. Annually assess habitat conditions within the WPRAs for suitability and, if needed, implement improvements in cooperation with landowners and partners.	●	●	●	●	●	●	●	●	●	●	Regions/BWM
1.4.6. WPRAs with established populations of 10 hens per square mile in the spring by the third year after trap and transfer is completed will be opened to male pheasant only (cocks only) hunting but remain closed to game farm pheasant stocking.			●	●	●	●	●	●	●	●	BWP/BWM
1.4.7. WPRAs with populations less than 10 hens per square mile in the spring by the third year after trap and transfer is completed will be open to either sex pheasant hunting and stocked with game farm pheasants.			●	●	●	●	●	●	●	●	BWP/BWM
1.4.8. Determine habitat characteristics that result in successful pheasant population restoration on WPRAs, starting in 2010.			●	●	●	●	●	●	●	●	BWM
Goal 2. Annually provide pheasant hunting opportunities across the Commonwealth by releasing game farm raised ring-necked pheasants.											
Objective 2.1. Annually produce and release 250,000 pheasants at 4 Game Commission game farms with an annual harvest rate of 60%.											
Strategy:											
2.1.1. Adequately staff four game farms to produce 225,000 pheasants for fall releases by Regional Staff.			●	●	●	●	●	●	●	●	BWM/Regions
2.1.2. Upgrade all PGC game farms to modern, up-to-date incubation, brood rearing and holding facilities. Upgrade farm and other needed equipment to maintain farm infrastructure and provide proper holding pen habitats.	●	●	●	●	●	●	●	●	●	●	BWM
2.1.3. Monitor game farm pheasants at each game farm for presence of infectious diseases and maintain up-to-date bio-security protocols.	●	●	●	●	●	●	●	●	●	●	BWM

APPENDIX 1. Continued

	By End of Year										
Goal, Objective and Strategies	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Responsible Bureau or Region**
Strategy:											
2.1.4. Review and revise as needed PGC stocking protocols and standards to maximize hunting opportunity for game farm releases and increase game farm pheasant harvest rates to 60% or greater.	●	●	●	●	●	●	●	●	●	●	BWM
2.1.5. Based on pheasant hunter surveys and demand, the number of pheasant hunters may be restricted and bag limits, seasons and other regulations may be modified on public hunting areas and WPRAs to improve pheasant hunter success, hunter participation and to maintain wild pheasant populations.		●	●	●	●	●	●	●	●	●	BWM/BWP
2.1.6. Annually provide a minimum of 20,000 game farm pheasants for youth pheasant hunts statewide.	●	●	●	●	●	●	●	●	●	●	BWM/Regions
2.1.7. Determine harvest rates of game farm pheasants by 2014.					●	●	●				BWM
Goal 3. Inform and educate the public on the status and priority objectives of the Pennsylvania pheasant management program.											
Objective 3.1 Annually provide training to commission personnel and conservation partners on the ecology and management of pheasants in Pennsylvania, as well as recovery and restoration projects.											
Strategy:											
3.1.1. Prepare and disseminate a Pheasant Habitat Handbook.		●	●	●	●	●	●	●	●	●	BWHM/BWM
3.1.2. Prepare and disseminate a Pheasant Propagation Program Handbook.			●					●			BWM
3.1.3. Provide training to PGC field employees, USDA employees, PF and other partners on Farm Bill Programs, State, and NGO habitat programs beneficial to pheasants.		●	●	●	●	●	●	●	●	●	BWHM

APPENDIX 1. Continued

	By End of Year										
Goal, Objective and Strategies	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Responsible Bureau or Region**
Objective 3.2. Annually inform and educate public and private landowners on pheasant management projects, habitat needs and the status of WPRA initiatives.											
Strategy:											
3.2.1. Inform and encourage all public landowners through news releases, bulletins and workshops to incorporate pheasant habitat management plans into their management plans to maintain habitat values in areas of suitable habitat and to enhance potential pheasant habitat areas.	●	●	●	●	●	●	●	●	●	●	BWHM/Regions
3.2.2. Establish Pheasant Habitat Management Demonstration Areas on State Game lands where potential suitable pheasant habitat exists and annually provide at least one public workshop/tour per year for each demonstration area.			●	●	●	●	●	●	●	●	BWHM/Regions
3.2.3. Inform and encourage private landowners, particularly PGC Public Access and Working Together for Wildlife Cooperators to enroll in federal and state conservation programs that will benefit pheasants.	●	●	●	●	●	●	●	●	●	●	BWHM/Regions
3.2.4. Use all forms of media to educate the public on the PGC pheasant management and propagation programs.	●	●	●	●	●	●	●	●	●	●	BWM/BIE
3.2.5. Publish a Summary of the PA Ring-necked Pheasant Management Plan by 2009.		●									BWM/BIE
3.2.6. Annually report research findings and conclusions, pheasant harvest and population trends and propagation program results to the public through various media.	●	●	●	●	●	●	●	●	●	●	BWM

APPENDIX 1. Continued

	By End of Year										
Goal, Objective and Strategies	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Responsible Bureau or Region**
Goal 4. Develop partnerships to restore wild pheasant populations in suitable habitats across Pennsylvania and support the Pennsylvania pheasant hunting tradition.											
Objective 4.1. Establish formal partnerships to facilitate restoring wild pheasant populations in suitable habitat across Pennsylvania.											
Strategy:											
4.1.1. By 2009, establish a formal Cooperative Agreement between PF, USDA, and the USFWS Partners for Fish and Wildlife to restore wild pheasant populations in WPRAs.		●									BWM/BWHM
4.1.2. Coordinate with the PDA, PA Farm Bureau, and other farm organizations to incorporate pheasant habitat management into their Farmland Preservation and other technical and financial assistance farm programs.	●	●	●	●	●	●	●	●	●	●	BWHM/BWM
4.1.3. Coordinate individual, government and NGO efforts to improve pheasant habitat. Integrate pheasant recovery efforts with other habitat enhancement and conservation programs, such as EPA Stream Bank Fencing program, Chesapeake Bay Program, DCNR Riparian Buffer Initiative, and others.	●	●	●	●	●	●	●	●	●	●	BWHM/Regions
4.1.4. Collaborate with state and federal agencies, legislature, counties, townships, and NGOs on planning, zoning, tax incentives, and easements to improve pheasant habitat.		●	●	●	●	●	●	●	●	●	BWHM/Regions
4.1.5. Collaborate with pheasant biologists in other states and countries to obtain wild pheasants and collaborate on research projects.	●	●	●	●	●	●	●	●	●	●	BWM
4.1.6. Serve as a member of AFWA's National Pheasant Plan Team, Resident Game Bird Working Group, and Agricultural Conservation Committee.	●	●	●	●	●	●	●	●	●	●	BWM/BWHM
4.1.7. Serve as a member of the Northeast Upland Game Bird Technical Committee and the Northeast Habitat Technical Committee.	●	●	●	●	●	●	●	●	●	●	BWM/BWHM

APPENDIX 1. Continued

	By End of Year										
Goal, Objective and Strategies	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Responsible Bureau or Region**
Objective 4.2. Establish partnerships to support Pennsylvania pheasant hunting.											
Strategy:											
4.2.1. Coordinate with PF and sportsmen clubs for at least 7 days of youth pheasant hunting each year and at least 20 mentored youth hunts.	●	●	●	●	●	●	●	●	●	●	Regions/BWM
4.2.2. Coordinate with sportsmen clubs and others by providing technical assistance to Cooperators in raising and releasing pheasants. Provide Day Old chicks to Cooperators for a nominal fee.	●	●	●	●	●	●	●	●	●	●	BWM/Regions
Goal 5. Conduct monitoring and research to ensure the best management of pheasant populations and maximize hunting opportunities.											
Objective 5.1. Determine hunter and landowner interest and support of the PGC's pheasant management program.											
Strategy:											
5.1.1. Conduct pheasant hunter surveys every 5 years, beginning in 2009, to obtain information and feedback on what they know about and expect from the pheasant management program.		●					●				BWM
5.1.2. Survey PGC Public Access Cooperators, Working Together for Wildlife Partners, and other owners of farmland every 5 years, beginning in 2010 to determine their knowledge of and interest in Pennsylvania pheasant recovery efforts and the incentives required for participation in a wildlife habitat improvement program.			●					●			BWM
Objective 5.2. Determine the annual pheasant harvest and number of pheasant hunters by WMU and WPRAs.											
Strategy:											
5.2.1. Continue the annual Game Take Survey to estimate the annual pheasant harvest and number of pheasant hunters by WMU.	●	●	●	●	●	●	●	●	●	●	BWM
5.2.2. Conduct annual surveys in WPRAs to estimate the pheasant harvest and number of pheasant hunters.		●	●	●	●	●	●	●	●	●	Regions/BWM

APPENDIX 1. Continued

Goal, Objective and Strategies	By End of Year										
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Responsible Bureau or Region
Objective 5.3. Conduct research in pheasant ecology and propagation to improve the cost effective management of the pheasant resource.											
Strategy:											
5.3.1. Determine the genetic variability in wild trapped (WPRAs) and game farm pheasants by 2010.		•	•								BWM
5.3.2. Resume the CREP research project with The PA State University, by running routes from 2009-2017, and evaluating the effects of land use at multiple spatial scales on pheasants by 2017.		•	•	•	•	•	•	•	•	•	BWM
5.3.3. Determine the adequacy of winter food supplies and arthropod populations to support a sustainable wild pheasant population by 2012.			•	•	•						BWM
5.3.4. Determine the best habitat model to predict pheasant abundance by 2014.		•	•	•	•	•	•				BWM
Goal 6. Provide sustainable funding and resources for plan implementation.											
Objective 6.1. Determine and provide the financial and personnel resources to implement the pheasant management plan.											
Strategy:											
6.1.1. Develop and approve an annual budget to implement each Goal, Objective and Strategy of the pheasant management plan from July 1, 2008 - June 30, 2017.	•	•	•	•	•	•	•	•	•	•	BWM
6.1.2. Ensure sufficient personnel are available to implement the various parts of the plan.		•	•	•	•	•	•	•	•	•	BWM/Regions

APPENDIX 1. Continued

	By End of Year										
Goal, Objective and Strategies	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Responsible Bureau or Region**
Strategy:											
6.1.3. Continue the Cooperative Agreement with NRCS, as needed, to support Wildlife Services Biologists statewide in NRCS Offices.	•	•	•	•	•	•	•	•	•	•	BWHM/BWM Regions
Objective 6.2. Establish and provide sources of funding to implement the pheasant management plan.											
Strategy:											
6.2.1. Seek legislation to establish an annual Pheasant Hunting License required for all pheasant hunters to support pheasant propagation; exempt youth hunters 12-15 years of age.	•	•	•	•	•	•	•	•	•	•	Executive Office
6.2.2. Use Game funds, other State funds and Federal funds to support technical assistance and financial assistance to farmers and other private landowners to improve pheasant habitat and implement the Pheasant Plan.	•	•	•	•	•	•	•	•	•	•	Executive Office

APPENDIX 2. PUBLIC COMMENTS ON THE PLAN

The draft of the Ring-necked Pheasant Management Plan for PA: 2008-2017 was made available for public comment from June 12 to July 12, 2008 (30-day comment period). A news release and posting on the PGC's web page announced the public comment period. The document was available electronically through the PGC's web page, or in printed format by request. The news release was widely published throughout the Commonwealth. Comments could be submitted via the web page, through e-mail, or in writing to the agency's Harrisburg Office.

We received 312 correspondences from individuals, 19 from PF, and 1 each from The Pennsylvania Federation of Sportsman's Clubs, and USDA. Duplicate correspondences were excluded. Most correspondences contained more than one comment. For example, "This Plan is the best yet to get youth back into hunting. I strongly support a Pheasant Stamp to hunt Pheasants in PA. Support the implementation of the PA Pheasant Mgt Plan" This comment was divided into 3 comments: Get youth back into hunting, Support a Pheasant Stamp and Support the Pheasant Plan.

Nine hundred and forty-six comments were received. We identified 268 unique comments. These comments were grouped by the following categories: Support the Pheasant Plan, Do not support the Pheasant Plan, Support a Pheasant Stamp/License, Do not Support a Pheasant Stamp/License, Other Funding, Support Stocking Game Farm Pheasants, Do Not Support Game Farm Stocking Program, Wild Pheasant Restoration, Pheasant Hunting, Predators, Habitat and Information/General Comments.

We received 219 comments in support of implementing the Pheasant Management Plan and 29 opposed. Funding was a major issue and we received 233 comments. There was strong support for a pheasant stamp/license (200) compared to opposing a pheasant stamp/license (5).

The Propagation program had 115 comments. Many comments (81) were related to increased stocking and timing of stocking. Hunters wanted stocking increased to 250,000-500,000 birds annually. Thirty-four comments called for the elimination of the PGC Propagation Program.

We received 134 comments on the Wild Pheasant Restoration Program. Most of these comments were very supportive of establishing WPRAs. However, there was some opposition (18 comments) regarding the closing of WPRAs for 6 years to pheasant hunting. Eighty-five comments were received on habitat. Most of these comments recognized the importance of CREP and other large-scale habitat programs for restoring wild pheasants in Pennsylvania. There was also a recognition that landowners will have to be compensated to provide pheasant habitat.

Predators were an issue identified in 55 comments. Most comments focused on the need for some type of predator control program in WPRAs. We received 56 comments related to pheasant hunting, and 20 comments of an informational/general nature.

We summarized the 268 comments in a table and selected the objectives from the Pheasant Plan that were most related to that comment. If we could not relate the comment to an objective in the Plan, we left it blank.

The public response to the PA Pheasant Plan clearly shows support for the Plan and restoring pheasant hunting. We are grateful to everyone that took the time to review and comment on this Plan.

PUBLIC COMMENTS ON THE PA PHEASANT MANAGEMENT PLAN		
COMMENTS	**No.**	**Plan Objectives**
SUPPORT THE PHEASANT PLAN	**219**	
1. Completely support full implementation of the PA Pheasant Mgt Plan.	136	All
2. This PA Pheasant Plan is the only hope for restoring pheasants.	1	
3. Looks like a rational balance between wild populations and stocking.	1	
4. This Plan cannot be accomplished overnight. It will take patience and dedication over the long run to be successful. It is a very good Plan.	1	
5. This Plan is the best yet to get youth back into hunting. We must implement this plan for our young hunters and bird dogs.	8	
6. The Plan is outstanding and very comprehensive and scientifically sound.	13	
7. The PA Pheasant Plan is a full-press, coordinated effort to restore huntable populations of pheasant, instead of the patchwork, band aid-on-a-mortal-wound approach that the PGC has tried in the past. It is a very comprehensive plan.	1	
8. This plan looks at all aspects-from problems to possible solutions.	1	
9. I am very impressed with the quality effort that has gone into the creation of the plan.	1	
10. I like your Mgmt Plan, I will back you plan 100%.	5	
11. Lets get this program up and running ASAP!!!!	1	
12. If it weren't for pheasants, I would NOT purchase a PA hunting license! I read the entire management plan...and it's overwhelming!	1	
13. I am a member of Pheasants Forever and I would like to commend you on a job well done with the new management plan. It is very well thought out.	1	
14. You should think about giving the people who put this together an award. It is outstanding.	2	
15. I am currently a member of Pheasants Forever and with the implementation of this plan will become much more active and vocal in this organization.	1	
16. I would love to see this great plan come together.	1	

COMMENTS	No.	Plan Objectives
17. I back the PGC on this Plan and will be watching to see it get implemented.	3	
18. I am very excited about this program! I agree with just about every facet of it.	1	
19. I know that Ohio hunters hope this program works. Strongly support the Plan.	1	
20. I welcome the new Plan with open arms and a huge smile on my face!	4	
21. I think this looks like a solid plan. It meets the immediate and long-term needs of hunters and parents. Through the increase in pheasant releases the plan provides an increased chance for hunter success thus maintaining hunting interest. The trap and transfer of wild birds, along with habitat improve should provide a long-term improvement in pheasant populations.	1	
22. I have a daughter 11, she got a Lab puppy last Christmas, we were hoping to hunt pheasants and ducks. Strongly support the Plan.	1	
23. As a conservationist, Pennsylvanian, and game bird enthusiast, I don't think that you could have made me happier by writing and proposing this well thought management plan.	1	
24. PGC-Just looked over you're new ring-neck management plan and I think it looks great. I can't wait to see it implemented.	2	
25. My thanks to the PGC for finally developing a comprehensive plan to restore wild Pheasants to this State. I love the pheasant management plan. I would love to see a major commitment for ruffed grouse as well.	2	
26. I am still going over the plan, but let me tell you, it is outstanding, the PGC should be proud of this! Outstanding, Awesome, worth the wait. Great job.	3	
27. What do we need to do to make this happen? Great plan.	2	
28. This is the best news to come from the game commission that I have read in my lifetime. I really hope it is implemented.	1	
29. All I can say is it's about time you thought of more than just deer. This program is long over due. The PA Game Commission is headed in the right direction as far as their pheasant management plan is concerned.	6	
30. This is a sound plan that I believe will improve pheasant populations dramatically. Although this will require a lot of cooperation from many groups and agencies.	1	
31. Your plan is very comprehensive, forward thinking and the type of plan that could have an extremely positive effect on the entire pheasant population statewide given an appropriate length of time. I think it’s an excellent plan to improve a very difficult situation.	1	

COMMENTS	No.	Plan Objectives
32. Although there are some sacrifices that will have to be made in the early stages of the plan, this will benefit all hunters past, present, and future. Please lets get this done.	1	
33. I like the exacting detail in the pheasant recovery program. I toughed it out and read all of the 118 pages and it covers all factors in my opinion, very thorough.	1	
34. The pheasant management plan is a great proposal. I can only pray that it is fully implemented. PA residents do not know how lucky they are.	1	
35. This Plan is the only hope left for restoring pheasants in PA.	1	
36. I believe the PGC is right on track to re-establish a viable pheasant population.	1	
37. An outstanding plan that is long overdue. I am glad to see the efforts by many of the past and present Pheasants Forever members are not in vain!	6	
38. As one who has been critical of PGC pheasant management in the past I have to congratulate you on the excellent work. It filled in many holes in my knowledge of the pheasant in Pennsylvania.	1	
39. You have done an excellent job on the Plan and have generated a lot of excitement in the segment of the sporting community that is aware of the plan. This has the opportunity to be one of the more successful PGC programs of the new century.	1	
40. I began to think the P.G.C. didn't give a damn about the future of pheasant hunting in this state. Glad I was wrong. Implement Now.	1	
DO NOT SUPPORT THE PHEASANT PLAN	**29**	
41. Do not spend hunter dollars on pork barrel projects; just stock more pheasants.	1	2.1, 6.1, 6.2
42. Do not implement this plan.	2	
43. The PGC will not implement this Plan.	2	
44. Funds designated for pheasant restoration should instead go to acquiring State Game Lands and youth hunting programs.	2	6.1
45. Pheasant restoration is an ideal, but unrealistic objective.	2	
46. Pheasants are not native to PA. Concentrate on native species.	2	1.4, 2.1
47. The PGC should spend money on other projects. They have tried to restore pheasants for 20 years and it has not worked.	2	6.1
48. This Plan is a license increase in disguise and I do not support it.	1	6.2
49. The PGC should not be in the business of raising and releasing animals for people to go out and kill. Spend the money on habitat and management for the PA state bird.	1	2.1
50. I wish you would forget pheasants altogether. Waste of time and money.	1	6.1, 6.2

COMMENTS	No.	Plan Objectives
51. It appears that this plan is based upon two unsound premises. First, in today's financially unsure times, it appears to be unwise and possibly unsustainable to increase expenditures in the area of stocking pheasants. 2,000,000 for "farmer incentives" and at, 2007 costs, 20.67 per bird which equals another 5.2 M.	1	6.1, 6.2
52. Spending this time and effort for the introduction/reintroduction of an exotic species is absurd.	1	
53. I don't think that the goal of the Game Commission should be to have a self-sustaining population of a non-native species. I feel that we should focus more on restoring our own native species.	3	1.4
54. One thing about Pa hunters though. If administrative costs are excessive, there will be a lot of resistance to any type of license increase or additional fees.	1	6.2
55. Rather than waste money on pheasants, I suggest you start cutting timber and opening up our gamelands for rabbits and grouse.	1	6.1, 6.2
56. Restoring wild pheasants in PA at a time of very high commodity prices will be nearly impossible.	2	1.2, 1.3, 1.4, 6.1, 6.2
57. Work on habitat. And restore Northern Bobwhite Quail, not pheasants.	3	1.2, 1.3, 1.4
58. I don't think that a self-sustaining and huntable population of wild pheasants is economically feasible in the current economic times.	1	6.1, 6.2, 1.2
SUPPORT A PHEASANT STAMP/LICENSE	**200**	
59. Support a Pheasant Stamp to hunt Pheasants in PA.	99	6.2
60. A pheasant stamp should be between $10-15.	13	6.2
60. A pheasant stamp should be between $10-15.	13	6.2
61. Support a $50 Pheasant Stamp. Stamp needs to be high enough to fund Plan.	14	6.2
62. Support a $25 Pheasant Stamp.	2	6.2
63. Support the pheasant stamp if used to raise more pheasants for stocking.	16	2.1, 6.2
64. Support the pheasant stamp if used to support research and habitat in WPRAs.	21	1.2, 5.3, 6.2
65. New Jersey has stamps for every species, why not us.	1	6.2
66. Any increase in fees to hunt pheasant would be welcomed. It would also save money not to go to Iowa or South Dakota yearly.	1	6.2
67. The fees you charge your in-state hunters appears to be on the order of giving it away for almost free (with respect to only pheasants).	1	
68. The funds generated by the pheasant license be used solely for the pheasant management plan, and that these funds not be diverted to any other program, or be used for any other purpose.	3	6.2

COMMENTS	No.	Plan Objectives
69. This plan must be well funded or it will fail. The Pheasant Stamp needs to be substantial. All funds going to wild pheasant establishment, because the stocking program is already funded.	2	1.1, 1.2, 1.3, 1.4, 6.2
70. You will get some resistance to the pheasant stamp, but stick to your guns.	1	6.2
71. Support the Plan only if funded with a pheasant stamp.	1	6.2
72. Get us a pheasant license and lets get to work.	2	6.2
73. Strongly support a "pheasant stamp" for ALL hunters (including juniors).	2	6.2
74. The cost of a pheasant license is an extremely small price to pay for the availability of excellent State Game Lands.	1	6.2
75. Add species-specific licenses/stamps and allocate the associated funds to support those specific species.	1	6.2
76. The idea of a pheasant license/stamp is a very good idea and I feel much like the trout stamp it is needed.	2	6.2
77. I love to hunt pheasants with my dad and grandpa, and would like to have more pheasants to hunt. I know that it would cost us more money, but it would be worth it.	1	6.1, 6.2
78. Hopefully a pheasant stamp or a license increase could happen and the money could be used to acquire land.	1	6.2
79. The pheasant stamp or license is a good way to determine if PA hunters are serious about recovering a sustainable population of pheasants in this state.	1	6.2
80. Seek legislation to establish an annual Pheasant Hunting License required for all pheasant hunters to support pheasant propagation and pheasant habitat, research and monitoring; exempt youth hunters 12-15 years of age.	1	1.2, 2.1, 5.1, 5.2, 6.1, 6.2
DO NOT SUPPORT A PHEASANT STAMP/LICENSE	**5**	
81. Oppose a Pheasant Hunting Stamp.	4	6.2
82. This Plan is a license increase in disguise.	1	6.2
OTHER FUNDING	**28**	
83. Ask local Sportsman Clubs for help in implementing the Pheasant Plan.	2	4.1, 4.2
84. Have hunters help with implementation of the plan.	3	4.1, 4.2
85. Charge a nominal fee, $3-$4 per day when hunting on a shooting preserve; the revenue to be earmarked for pheasant habitat improvement.	1	6.1, 6.2
86. The PA Pheasant Plan needs to be funded.	3	
87. Seek funding from the Richard King Mellon Foundation.	2	6.2
88. Sportsman need to step up and provide the necessary funding.	2	6.2
89. A portion of the state sales tax should be used to support this Plan.	1	6.2
90. Due to feed costs, PGC will have to raise revenues to pay for pheasants.	1	6.1, 6.2

COMMENTS	No.	Plan Objectives
91. Eliminate 200 jobs not needed in the PGC to pay for the Management Plan.	1	6.1, 6.2
92. General fund revenues will make PGC dependent on legislature.	1	
93. If South Dakota can raise $103 per bird in the economy of that state, Pa. needs to step up and see what can be done.	1	
94. To fund habitat work, landowners should be paid for habitat. Hunters would be charged for a trespass permit.	1	1.2, 6.1, 6.2
95. My suggestion is ask for 4-5 million and do it, and do it right, and you will get more money than you could imagine. Is it reasonable to assume there are 500,000 bird hunters?? If the stamp was 50, that is 25 million dollars.	1	6.1, 6.2
96. A general "Day Use" or access fee for State supported outdoor facilities/land would certainly be justified.	1	6.2
97. The hunting license needs to be raised to support PGC programs.	3	6.2
98. The economic value of the pheasant program will only go up as you move forward.	1	
99. Recommend that State Wildlife Grant Funds be used to supplement CREP.	3	1.2, 4.1, 6.1, 6.2
SUPPORT STOCKING GAME FARM PHEASANTS	**81**	
100. Increase stocking to at least 250,000 birds.	18	2.1
101. Do not publish pheasant stocking dates.	3	
102. Release Game Farm birds in April-July (1 year old birds).	4	
103. PGC should experiment with natural or surrogate raising of pheasants.	5	
104. I also wonder if a blended plan could work wherein some of the birds were purchased from outside sources.	2	2.1, 6.1, 6.2
105. Increase pheasant stocking to 500,000.	2	2.1
106. The way and times birds are stocked needs to be looked at.	4	
107. Support late Friday stocking. Stock more birds on SGL.	4	
108. Stocked birds will keep the interest, while wild birds expand.	2	2.1, 1.4
109. Expand Day old chick program.	2	2.1, 4.2
110. I would like to see birds released ideally on a weekly basis.	1	
111. Distribute stocked birds equally to state game lands. Lets make it fair, not 1/4 of the birds in one county but equally distributed to all counties.	2	
112. In my point of view the game commission needs to put funds toward pheasants by not stocking all of them on game lands. The Game Commission needs to put some on private back road lands.	1	
113. The plan needs to include stocking on the many cooperative landowners and Sportsmen Club grounds that have committed their land for public hunting.	2	
114. GREAT job PGC for stocking birds that fly like wild birds!	1	2.1

COMMENTS	No.	Plan Objectives
115. This plan would increase opportunities for hunters to spread out over larger hunting areas and not be jammed into just the current stocking locations.	2	2.1
116. DO NOT use Chinese ring-necks. These birds are just plain DUMB! Blueback ring-necks and Mongolian strain birds are the best bet for release.	1	2.1
117. Have you examined the Japanese pheasants? They are steel blue and unlike the type you are now propagating, the Japanese pheasants are more woodland birds. I hunted them for several years with a dog and they seem to do well in forested areas.	1	2.1
118. The pheasant is not native. Add some genetics to the Game Farm birds.	1	2.1
119. I think that increased stocking of game farm pheasants is where investments will provide the most gain for a quality ring-necked pheasant hunting experience in Pennsylvania.	1	2.1, 4.2, 6.1, 6.2
120. What would it hurt to allow hunters to put and take their own birds?	1	2.1, 6.1, 6.2
121. Change the stocking practices on SGL.	1	
122. Why not sell pheasants. I would buy some.	1	2.1, 6.2
123. Do not release game farm pheasants in WPRAs.	13	1.3, 2.1
124. Does the progeny of game farm pheasants survive in the wild?	1	
125. Spread stocked birds over more than one release area in a county to divide the hunters.	1	
126. Pheasants Stocking should avoid prime cover for American woodcock and grouse during the fall season.	3	
127. It may cause problems if PGC is providing day old chicks and we do not want game farm birds released in WPRA's.	1	1.3, 2.1
DO NOT SUPPORT GAME FARM STOCKING PROGRAM	**34**	
128. Oppose PGC raising/and allowing hunting of stocked Pheasants.	1	2.1
129. PGC should eliminate propagation program and stocking game farm pheasants.	6	2.1, 6.2
130. Stock Bobwhite Quail instead of pheasants.	1	2.1
131. Close down Game Farms and use funding for stocking to purchase/ lease land for pheasant habitat.	2	1.2, 6.2
132. Releasing game farm pheasants improves nothing in the long run, and is deleterious to the gene pool.	2	1.3, 2.1
133. Privatize the Game Farms. $20 to produce pheasants is fleecing hunters.	3	2.1, 6.2
134. If it costs $20 for the PGC to raise a pheasant then you should all resign.	1	2.1, 6.2
135. The Rockport pheasant farm in NJ told me it cost them $10 to raise a pheasant.	1	

COMMENTS	No.	Plan Objectives
136. You need to forget about all these pheasants. We need more deer. Stock deer instead.	1	2.1
137. I feel that the pheasant-raising program is ridiculous. Pennsylvania cannot afford to be a game farm. Eliminate the game farms.	1	2.1, 6.2
138. This is a no brainer. Farm out the raising of pheasants to farms who can raise a chicken for just a few dollars; in this way we get 4 or 5 birds for the price of one raised by the game comm.	1	2.1, 6.2
139. I think we should scrap the whole stocking program from top to bottom, or at least tear it down and start over with some different ideas because we're wasting millions on a dead end program.	1	2.1, 6.2
140. I just can't get excited about shooting stocked birds.	1	2.1
141. Stocking pheasants is a joke, its even worse than the fish commission stocking trout in streams that produce wild trout. Spend that money you waste on stocked birds and go get more wild ones and create more habitat. Lets bring back pheasants the right way.	3	1.1, 1.2, 1.3, 1.4, 2.1, 6.1, 6.2
142. I feel the "put and take " concept a waste of money and many resources within the Game Commission. My feelings are that research into how to perpetuate a "wild, native " population of whatever species is in question, is by far the best approach.	1	2.1, 5.3
143. You cannot expect them to come back by releasing pen-raised birds on public land. Stocking game farm pheasants will not work.	1	2.1
144. As far as the put & take pheasants; more birds could be raised by independent breeders at a much lower cost per bird, the preservers & dog training clubs buy there birds at $10 a bird or less.	2	2.1, 6.2
145. Number one- close propagation farms (what happened to turkeys when we did this? Pen reared birds will not have a high percent nesting success--- These hens can not teach there young on how to find food- cover -avoid predation etc. Bring in wild birds from out west and place them in a strong habitat base. This would be less expensive than the cost for each bird in the game bag --educate sportsman that they will have some lean years.	1	1.2, 1.4, 2.1, 6.1, 6.2
146. The PGC should spend the available resources developing a huntable population of wild birds by improving habitat. Close the game farms.	2	1.2, 1.4, 6.2
147. The guy in charge of the North Central Region does not believe in stocking pheasants.	1	
148. Have the local sportsman clubs raise the pheasants and have the township stock them-like we did in the 1950s.	1	2.1

COMMENTS	No.	Plan Objectives
WILD PHEASANT RESTORATION	**134**	
149. Oppose closing all pheasant hunting on WPRAs for 6 years.	5	1.3, 1.4
150. Oppose closing all pheasant hunting on WPRAs on public land.	6	1.3, 1.4
151. Trap and transfer wild pheasants to old strip mines.	1	1.1, 1.3, 1.4
152. Evaluate areas, such as Federal and State Parks not open to hunting, for WPRAs.	1	1.1
153. Establish wild pheasant trap/transfer research areas (separate from WPRAs) that have different habitats to see if your Pheasant Model is accurate.	7	1.1, 1.3, 5.3
154. Don't forget the western half of the State in your pheasant restoration (WPRAS).	4	1.1
155. Pheasant habitat is only in the eastern part of the state, because that is where lawmakers live.	1	1.1
156. There may not be large enough tracts of habitat to support Pheasants in PA.	1	1.1
157. Support Wild Pheasant Trap and Transfer to WPRAs.	7	1.4
158. Support Wild Birds. Why is it taking so long to get this program going?	3	1.4
159. The management goals need to look to the future, not 1950. Get moving on this program (WPRAS).	1	1.4
160. You should try re-introducing native species, like quail or something that can survive diverse habitats, not Chinese chickens.	1	
161. While the goals and objects seemed reasonable, I saw little in the plan on how to reach these goals in WPRAs.	1	1.2, 1.3, 1.4
162. I believe that the trap & transfer of wild pheasants is the only reliable way to establish breeding birds back into the wild.	3	1.4
163. I would like to see the timeline for most of the objectives moved up.	3	All
164. Looks like a good plan, but you need to look at Bucks County also!	1	1.1
165. Somerset County restoration area is to forested and fragmented to support a huntable wild pheasant population.	1	1.1
166. Closing extensive areas for 6 years in WPRAs will reduce support for pheasant hunting.	7	1.3, 1.4
167. WPRAs, if successful, will probably lead to areas being closed to hunting or leased for hunting.	1	1.4
168. The time frame for closing WPRAs should be reduced to three to five years as a general rule with annual evaluations determining the length of the closure to hunting.	5	1.3, 1.4
169. Keep the WPRA's away from commercial shooting preserves.	2	1.1, 1.3, 1.4
170. Once in-state pheasant populations grow to the point where we can move them, there are resources within the PGC that we can work with to drastically reduce the cost of moving birds.	1	1.3, 6.1

COMMENTS	No.	Plan Objectives
171. Limit the counties where WPRAs are located to release and harvest of males only and keeping a buffer of 5 miles between release points and the stocking points and initially closing the townships where the releases are occurring to all pheasant hunting.	5	
172. An adaptive policy that makes annual adjustments as the program grows will allow the maximum use of stocked birds to keep the pheasant hunting tradition going and not cause adverse impacts to the new wild populations.	1	5.1, 5.2, 5.3
173. Recommend that simple monitoring protocols be used to measure the progress of each site. Telemetry should be used to answer specific questions and is far too expensive to use on every site.	5	1.3
174. Recommend that the original 13-farmland habitat restoration areas be included in WPRAs.	5	1.1, 5.3
175. We do not know everything. Your pheasant model is a start, but it may be wrong. We recommend that wild pheasants be trapped and transferred to areas that do not meet the model—or where habitat targets have not been met—to test the validity of the pheasant model. These could be established as Model Pheasant Research Areas (MPRAs) and would answer specific questions about pheasant establishment and test the pheasant landscape model. Turkeys are thriving today in areas where we never would have put them in the past based on our views of the landscapes they required.	5	1.1, 5.3
176. To help coordinate WPRA project area activities with local input, PA PF would like to see a Project Management Team established for each WPRA. Members of this team should include at the least; the PGC Regional Biologist, PGC Land Management Group Supervisor & leaders of the local PF Chapter.	6	1.3, 1.4
177. Need to have a WPRA in Franklin County.	2	1.1
178. Do not forget western PA when implementing the Pheasant Plan.	3	1.1
179. No one has done wild pheasant restorations on today's PA landscape. We need to remain flexible and evaluate what we learn step-by-step to do a good job. A management plan for any species needs to have the ability to be amended as we gain new knowledge.	1	1.1,1.3, 5.1, 5.2, 5.3
180. The focus on habitat improvements for the restoration of wild pheasants in potential WPRAs, as opposed to the constant large-scale stocking of game farm birds, is absolutely the correct approach to restore wild birds.	1	1.2
181. If a site passes the initial habitat evaluation, but the area is being highly pressured by land development, it should not be used for a WPRA.	1	1.1

COMMENTS	No.	Plan Objectives
182. Need to add shrub-land and wetlands to the Pheasant Habitat Model. Need to evaluate Pheasant Habitat in 2 square mile blocks. Need to remove large forest blocks and urban areas from habitat model calculations.	3	1.1
183. WPRAs should be 9-12,000 acres- based on data from Illinois.	3	1.1
184. Restore a minimum 250,000 acres of secure nesting and brood cover and a minimum of 50,000 acres of winter cover within 2,000,000 acres of farmland in *all* WPRAs combined by 2015.	3	1.2
185. Implement a short term (1-3 years*)* set aside habitat program.	3	1.2
186. Establish wild ring-necked pheasant populations of at least10 hens per mi^2 in the spring by the third year after stocking ends in at least 4 WPRAs by 2015.	3	1.4
187. Prohibit dog training During the nesting and brood rearing April 1-August 1 *s*eason within the WPRA after trap and transfer has begun.	3	1.3, 1.4
188. WPRAs with established populations of at least 10 hens per square mile in the spring by the third year after stocking ends - will be opened to male pheasant only (cocks only) hunting but remain closed to game farm pheasant stocking.	3	1.4
189. WPRAs with populations less than 10 hens per square mile in the spring for 3 consecutive years after stocking will be open to either sex pheasant hunting and stocked with game farm pheasants.	3	1.4
190. By 2010. Identify all currently suitable and recoverable ring-necked pheasant habitats in PA for wild pheasant releases.	3	1.1
191. Determine habitat characteristics that result in successful pheasant population restoration on MPRAs, starting in 2010.	3	1.3, 1.4, 5.3
192. Determine harvest rates of wild and game farm pheasants by 2014.	3	2.1, 4.2, 5.3
193. Renew Cooperative Agreement with NRCS to June 30, 2017. Through a cost share agreement, continue to support 10 Wildlife Services Biologists statewide in NRCS Offices. Continue and expand the CREP and other NRCS programs.	3	1.2, 6.1
PHEASANT HUNTING	**56**	
194. Support either sex pheasant hunting statewide.	5	1.4, 2.1
195. Oppose shooting of hen pheasants.	3	1.4, 2.1
196. Close pheasant season statewide until populations recovers.	3	
197. No pheasant hunting immediately after stocking.	5	
198. Close pheasant season for 2 years.	3	
199. Increase pheasant season length by 2-3 weeks.	4	
200. Do not restrict the number of pheasant hunters.	3	1.4, 5.1, 5.2

COMMENTS	No.	Plan Objectives
201. Do not support incentive payments for pheasant habitat unless land is open to public hunting.	1	1.2, 6.1
202. Members of hunting clubs should be exempt from pheasant stamp when hunting on club property where the hunting club has released pheasants.	1	6.2
203. Permit Sunday hunting after 12:00 for pheasants.	2	
204. Increase daily bag limit to 3 on stocked areas.	1	2.1
205. Eliminate youth pheasant hunt program.	1	2.1, 4.2
206. There is no reason to shoot hens in WMU 2-A.	1	
207. Stop pheasant hunting and concentrate on habitat management until the birds can sustain themselves.	1	1.2, 1.4, 2.1
208. Need more hunting opportunities near the cities. How do you plan to create hunting opportunities near the cities?	5	
209. It is about time!!!! Increase the quality of habitat and the hunting experience, and focus on recruiting new hunters.	2	1.2, 4.1, 4.2
210. Hunting preserves are getting to expensive. I travel great distances to find birds, So I think that a Plan such as you are proposing is an excellent approach to improving bird hunting.	1	
211. It makes me happy to see an agency that cares enough to make a progressive effort to make Pennsylvania even more of a hunter's paradise.	1	
212. Close pheasant season for the next 3-5 years.	1	1.4, 2.1
213. To reduce mis-identification and accidental shooting of hen pheasants during early morning and evening hours; legal shooting hours for pheasant within the WPRA's & any rooster only areas (after reintroduction and monitoring period is complete) should be set for 8am (at the earliest) and Sunset.	6	1.4
214. Hunting cocks only should be permitted in WPRAs with a reduced bag limit of 1 daily.	6	1.4
PREDATORS	**55**	
215. Provide an incentive for trappers on WPRAs to control predators.	2	1.3, 1.4
216. Need to focus on habitat and predator reduction; not lead and pesticides.	1	
217. Seek approval, on an experimental basis, to reduce avian raptor populations on WPRAs.	1	1.3, 1.4
218. Predators are the main reason we have no pheasants. Need predator control.	22	
219. Open a season on hawks.	2	
220. Reduce the fox and coyote population and you will have pheasants.	2	
221. Pheasant decline followed protection of avian raptors and until you get federal permission to hunt hawks and owls you will not bring back pheasants.	2	

COMMENTS	No.	Plan Objectives
222. Institute unlimited, year round hunting and trapping of furbearers in WPRAs.	1	1.3, 1.4
223. Open fox hunting year round. Require only a general hunting license for furbearers in WPRAs.	1	1.3, 1.4
224. Do not spend any money on this project, unless you implement a major predator reduction program.	2	6.1
225. Work with the PA Trappers Association to develop a Plan to reduce predators in WPRAs.	2	1.3, 1.4
226. Place a bounty on pheasant predators.	3	
227. Do not stock Fishers which will prey on pheasants.	2	
228. Do not require Jr. Hunters to obtain a trapping permit.	1	
229. Must have cooperation of federal and state government for predator control.	1	
230. Give hunters some incentives to go kill some predators.	1	6.1, 6.2
231. The main problem is avian predators.	7	
232. Get rid of the coyotes and all wildlife will come back.	1	
233. Get rid of the Asian lady bugs and fire the person that brought them in.	1	
HABITAT	**85**	
234. Provide incentives to farmers to change or modify their practices to benefit pheasants.	5	1.2, 6.1, 6.2
235. Develop a crop where pheasants can successfully nest and farmers benefit.	2	5.3, 6.1, 6.2
236. Improve habitat and stock wild birds.	15	1.2, 1.4
237. Habitat is the key. Large scale set aside habitat programs, such as CREP, are essential. The maintenance and expansion of CREP is critical.	5	
238. Establish habitat on public and cooperative landowners property only.	2	1.2
239. Send biologists to other states to learn about pheasant restoration and habitat.	3	3.1, 4.1
240. Use controlled burns to enhance habitat.	2	1.2
241. Work with PF and DU on habitat projects.	6	1.2, 4.1
242. Support continued farming and pheasant restoration on the Erie NWR.	5	1.2, 1.4
243. The SGL need to be managed for habitat-not for the benefit of farmers that leave no cover.	7	1.2
244. SGL should be managed like the Soil Bank lands.	3	1.2
245. KS and SD have pheasants because they have CRP. We need more CRP.	3	1.2, 6.1
246. The PGC needs to establish a full time Farm Bill Coordinator position to work on USDA programs for pheasants and farmland wildlife.	2	1.2, 4.1, 6.1
247. The PGC Pheasant/Quail biologist needs to be involved at the state/NE/ national/level with the National Pheasant and Bobwhite Quail Plan and Farm Bill Programs. An assistant is needed to implement the Pheasant Plan.	7	1.2, 3.1, 4.1, 6.1

COMMENTS	No.	Plan Objectives
248. Why not start a volunteer program to help improve habitat.	1	1.2, 4.1, 4.2
249. Improving pheasant habitat will also improve small game hunting- rabbits.	2	1.2
250. Good cover is the key. Enhance or reward the farmers to leave a few strips of fencerows and plant several different grains so pheasants can breed and lay eggs safely.	1	1.2, 6.1, 6.2
251. By following Pheasants Forever's habitat guidelines and the PGC Plan, I hope that we can successfully restore Pennsylvania's pheasant populations.	1	1.2, 1.4
252. I am an avid conservationist/sportsman who spends many hours a-field in PA. In my opinion, CREP habitat enhancement will not only help our wild pheasant population, but also many other species.	1	1.2, 6.1, 6.2
253. The PGC needs to have a full time employee to work on Federal government conservation programs. Only with large-scale conservation set aside programs do we have a chance of a wild pheasant population in PA.	7	1.2, 4.1, 6.1
254. We need to have delayed hay mowing in the WPRAs.	2	1.2, 6.1, 6.2
255. More CRP and CREP is the answer to more pheasants in PA.	1	1.2, 6.1, 6.2
256. Farming practices must be modified to have any pheasants in PA.	2	1.2
INFORMATION/GENERAL COMMENTS	**20**	
257. CBC data is more reflective of actual pheasant populations than BBS	1	
258. People should be able to view every ones comments on the PA Pheasant Plan.	1	
259. Educate and inform people of this Plan	5	3.2
260. Those who blame the PGC for the demise of the pheasant are not knowledgeable of the biology of ring-necks or are just plain stupid	1	
261. Need to include a history of pheasants in PA in the Plan. Maybe an appendix	5	
262. There needs to be a robust media campaign to solicit support from both hunters and non-hunters. A focus on the economic benefits is needed.	1	3.2, 6.1, 6.2
263. Need to tell the politicians to butt out and let the educated personnel of the PGC take over this program.	1	
264. What are the PGC Plans to implement this Plan? A Plan is no good if it is not implemented.	1	
265. The PGC does a great job compared to WV, OH, IA, and MI; states where I also purchase hunting licenses annually.	1	
266. Inquire of the people who live on the land. Ask them to help and provide technical information.	1	1.2, 1.4, 6.1
267. Lead has not been shown to affect upland game birds.	1	

COMMENTS	No.	Plan Objectives
268. With all that is known about the dangers of lead in any environment, to wildlife and to people, we need to stop using lead shot. I agree that PA needs to be on board with any national initiatives to ban lead shot for upland hunting.	1	