GAME REPORT

Survival and Productivity of Wild and Pen-reared Ring-necked Pheasants in South Dakota, 1990-92

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by

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Pittman-Robertson Project W-75-R-32

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Abstract

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Radio telemetry was used to monitor survival, nesting, and brood-rearing of wild (n = 61) and pen-reared (n = 188) ring-necked pheasant (Phasianus colchicus) hens on 2 study areas in eastern South Dakota, 1990-92. Survival of pen-reared hens (0.5%) was lower ($P < 0.001$) than that of wild pheasants (48%) during the 181-day reproductive period due to a higher ($P < 0.001$) predation rate. Fifty-six percent of pen-reared hens were killed within 14 days of their release. As a result of lower survival rates, proportionally fewer ($P < 0.001$) pen-reared hens (18%) initiated incubation of nests than wild pheasants (68%). Pen-reared hens also had lower rates of hen nest success (38%, P = 0.032) and brood rearing success (45%, P = 0.021) than wild hens (63% and 83%, respectively). Wild hens recruited 169 8-week-old young/100 hens while pen-reared hens recruited 11 8-week-old young/100 hens released. Because of low survival and reproductive rates and potential negative impacts on wild pheasants, release of pen-reared hens to augment wild pheasant populations in South Dakota is not recommended.

Preface

This report summarizes results of data collected by South Dakota Department of Game, Fish and Parks personnel from December, 1989 through October, 1992, on Productivity of Wild and Pen-reared Hen Ring-necked Pheasants in South Dakota, under Pittman-Robertson Project W-75-R-32.

This study was initiated to evaluate the management potential of releasing pen-reared ring-necked pheasant hens in spring. Management potential was based on survival and reproductive success comparisons between pen-reared and wild hens.

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Survival and Productivity of Wild and Pen-reared Ring-necked Pheasants in South Dakota, 1990-92

INTRODUCTION

Most counties in South Dakota have within them at least one private pheasant management organization. Although most were organized to release juvenile, game-farm pheasants, many groups are realizing the futility of this practice and are now emphasizing habitat development and/or stocking of adult, hen pheasants. Stocking of pen-reared hen pheasants in the spring is advocated by at least 9 groups in eastern South Dakota in an attempt to supplement the production of wild pheasants. However, the extent of nesting and brood-rearing success of released pen-reared hens in South Dakota has not been documented.

Productivity of pen-reared pheasants has been studied in Illinois (Ellis and Anderson 1963, Anderson 1964), Oregon (Jarvis and Engbring 1976, Haensly et al. 1985), the United Kingdom (Hill and Robertson 1988), and Sweden (Brittas et al. 1992). Studies have used visual markings (patagial streamers, Jarvis and Engbring 1976; backtags, Anderson 1964) and radio telemetry (Haensly et al. 1985, Hill and Robertson 1988, Brittas et al. 1992) to monitor hens. While Illinois studies reported results of winter stockings, Hill and Robertson (1988) monitored hens released in fall. Jarvis and Engbring (1976) and Haensly et al. (1985) monitored spring-released hens but lacked control (wild) hens and Brittas et al. (1992) studied wild and pen-reared hens on a 3,100 km^2 island.

Comparative studies of wild and pen-reared pheasants in Europe have found that although pen-reared hen survival was lower than wild hens, nest initiation and success were similar (Hill and Robertson 1988, Brittas et al. 1992). Research in the United States comparing productivity of wild and pen-reared hens is lacking although release of game farm hens is a common management practice in South Dakota and other states of the main pheasant range.

OBJECTIVES

The objectives of this study were to evaluate nesting and brood-rearing success of wild and pen-reared, hen ring-necked pheasants in eastern South Dakota, 1990-92.

STUDY AREA

Field Work was conducted on or near two state-owned study sites; the Norwegian-Borden Game Production area (NBGPA) in Beadle County and the Horrigan Game Production Area (HGPA) in Sanborn County,

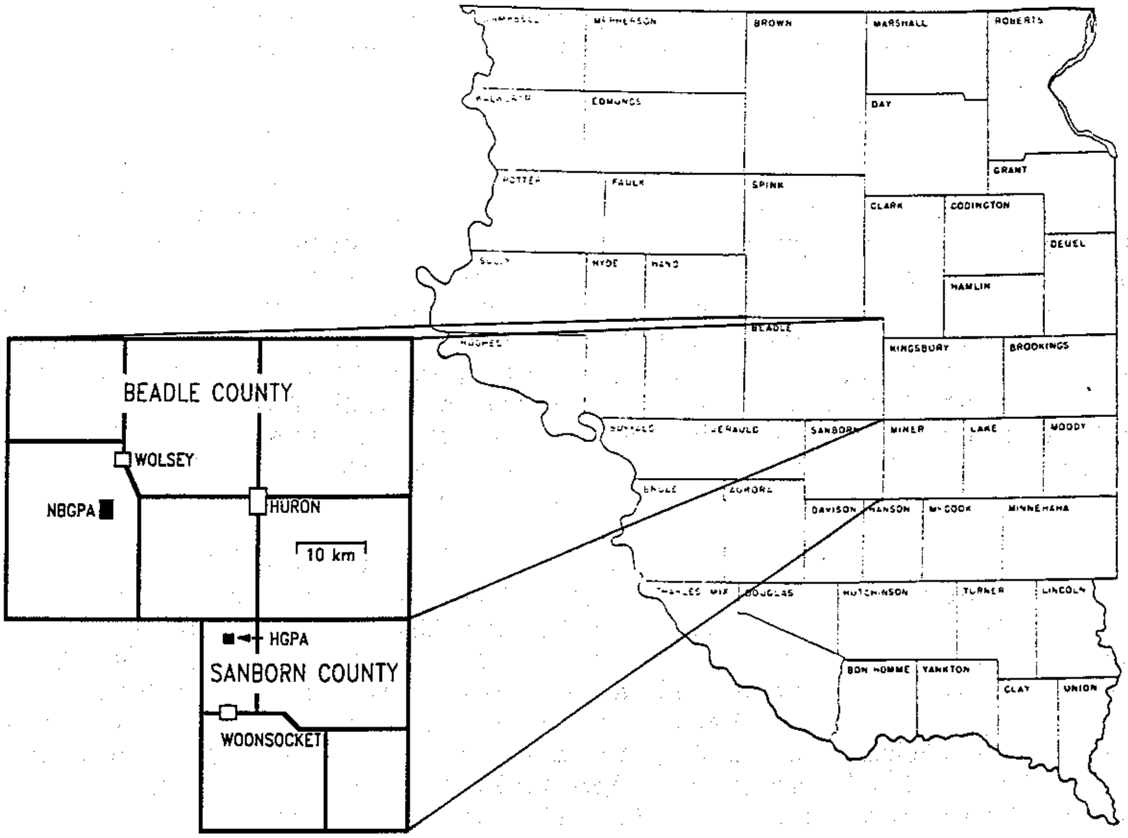


Figure 1. Location of Norwegian-Borden (NBGPA) and Horrigan (HGPA) Game Production areas in eastern South Dakota.

South Dakota (Figure 1). Average daily maximum temperatures at a weather station located within 21 km of both study sites peak in July (30.6 C), while average daily minimum temperatures are lowest in January (-17.2 C). Precipitation averages 48.4 cm per year, with highest monthly totals being recorded in May (10.7 cm) and June (12.1 cm) (Heil 1979).

NBGPA is a 390-ha management area located 20 km (12 miles) west of Huron, SD. Dominant soil-type of the study area is Carthage fine sandy loam. Other soils on the study area include Hand-Bonilla loams, Durrsten silt loams, Shue loamy fine sands, Forestburg-Doger loamy fine sands, and Enet loams. Site topography is flat to slightly rolling (0-9% slopes) (Heil 1979). The study area is comprised of 75 ha (19%) of cropland that is annually share-cropped for agricultural production and food plots, 60 ha (15%) of semipermanent marsh, 25 ha (6%) of shelterbelts and

230 ha (59%) of upland nesting cover. The area surrounding NBGPA is privately owned and used primarily for corn and small grain production and pasture.

HGPA is a 65-ha management area located 21 km (13 miles) south of Huron. Dominant soil type of the study site is Durrestein silt loam, with secondary dominance by Enet-Delmont loams and Alwilda fine sandy loams (Driessen 1980). Land-use on HGPA is 22 ha (34%) of share-cropped cropland, 9 ha (14%) of creek bottomland, a 3 ha (5%) shelterbelt, and 31 ha (48%) of upland nesting cover. Adjacent to the management area is 220 ha of private land enrolled in the Conservation Reserve Program; all of which is seeded to a mixture of alfalfa, sweet clover, and intermediate wheatgrass with the exception of 8 ha of annually planted wildlife food plots. The remaining private land around HGPA is either annually cropped or utilized as pasture.

METHODS

Wild hen pheasants were captured near Huron, SD or on the Lake Andes National Wildlife Refuge in January and February using walk-in traps baited with corn. Twenty-gram solar powered radio transmitters were affixed to captured hens using herculite (vinyl-like) ponchos prior to their release on study areas. Pen-reared hens were raised on a game farm under artificial heat sources from hatching through 3 weeks of age, during which human contact was kept to a minimum. Heat was gradually reduced during the second 3-week period at the end of which chicks were transferred to conditioning pens that allowed voluntary movement outdoors. At 7-8 weeks of age, chicks were transferred to 23x46 m flight pens until their release the following spring. Chicks were fed 28% protein mash from hatching to 8-weeks, 24% protein pellets until 16-weeks, 15% protein until 22-weeks of age, and 13% protein maintenance diets until their release. Pen-reared hens were instrumented with similar radio transmitters as wild hens and were approximately one year old when released. Transmitters constituted less than 3% of hen body weights and had a maximum signal range of 1.5 km on the ground and 5 km by air.

Hens were monitored via radio signal throughout the 181-day reproductive period which was defined as the day of initial pen-reared hen releases (10 Apr 1990, 9 Apr 1991, 4 Apr 1992) through the date the youngest pheasant brood (in any year) reached 8-weeks of age. As recovered radios became available in the 3 weeks following initial releases, addition pen-reared hens were released. Survival was estimated for each treatment (wild or pen-reared) using program MICROMORT (Heisey and Fuller 1985) and compared using Z-tests. Missing radios were interpreted as deaths unless radios transmitted indications (sporadic signals) of forthcoming failure.

From April through August, hens with radio signals indicating no movement were approached and surrounded with surveyor's flags. On occasions where hens were flushed during attempts to mark their location or if previously marked hens were not in their marked area, the locations were searched for nests. If a nest was found intact, the number of eggs and stage of incubation (Fant 1957) were recorded. The number of eggs for nests that were not active when first approached (due to completion or predation) were estimated from egg shells present. Nests were considered to be successful if at least one egg hatched. Because hens could not be identified with a nest until incubation began, initiation of incubation was used as the measurable onset of nesting activity. Not all nests were marked as some of the solar-powered radios failed to produce signals when hens began incubating. When these hens completed incubation, nest success was determined by hen behavior and visual observations of young. Distances from release locations to first nests and radio recoveries were determined by measuring marked locations on aerial photographs.

Successfully nesting hens were considered to be successful in brood-rearing if they survived the 8 weeks following nest completion. Recruitment was calculated as a ratio of young produced (using a mean 8-week brood size of 5 young [SD Game, Fish and Parks, unpub. data]) to the number of hens alive at the beginning of the reproductive period. Potential differences in rates of reproductive activity were tested using 2 X 2 chi-square tests.

RESULTS

Forty-four wild and 184 pen-reared hens were monitored during the 3-year study. Eleven wild and 4 pen-reared hens contributed exposure days (an exposure day is counted for each day that each hen survives) in 2 reproductive periods while 3 wild hens contributed exposure days in all 3 years. Six radios on pen-reared hens and 2 on wild hens were censored from analyses due to radio failure. Three pen-reared hens that were recovered intact within 2 days of release exhibited no evidence of predation and were not included in analyses as deaths.

Survival

Survival of wild and pen-reared hens during the 181-day reproductive period differed ($\underline{P} < 0.05$) on both study areas in all years (Figure 2, Table 1). No differences ($\underline{P} > 0.05$) were found within either treatment between years and study areas so data were combined to calculate overall survival rates. Years and study areas combined, wild hen survival exceeded ($\underline{Z} = 7.23$, $\underline{P} < 0.001$) that of pen-reared hens (Table 1). Nine (5 in 1990, 4 in 1991, and 0 in 1992) pen-reared and 30 (7 in 1990, 13 in 1991, and 10 in 1992) wild hens survived reproductive periods. Deaths to

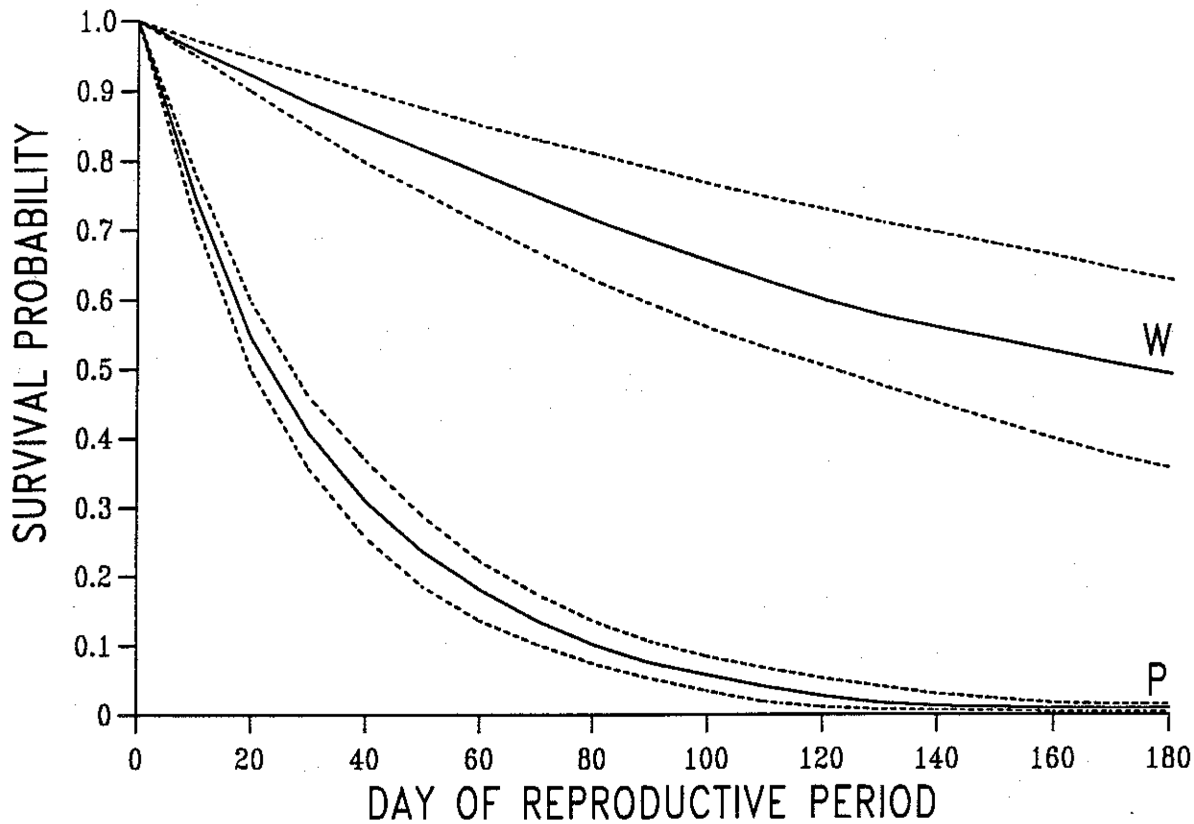


Figure 2. Survival probabilities and 95% confidence intervals for Wild (W) and Pen-reared (P) ring-necked pheasant hens from early April through early October (181-day reproductive period) in eastern South Dakota, 1990-92.

predation were identified as the primary cause for losses of both wild and pen-reared hens. Combined predation rates were higher ($Z = 5.63$, $P < 0.001$) for pen-reared hens than wild pheasants (Table 1). Twenty-five (8 in 1990, 7 in 1991, and 10 in 1992) wild and 144 (39 in 1990, 55 in 1991, and 50 in 1992) pen-reared hens were killed by predators. Fifty-six percent of pen-reared hens were killed within 14 days of their release (Figure 3). While no wild hens died as a result of accidents, 8 pen-reared hens were recovered following collisions with vehicles (7) or farm machinery (1) and 3 pen-reared hens drowned in wetlands.

Although attempts were made to identify hen predators, most radio recoveries had little information as to predator identification. Generally, only a few feathers and the radio transmitter were found at recovery sites. In a few recoveries, marks on hens and radios, predator tracks, and recovery locations indicated losses

Table 1. Survival and cause-specific mortality rates of pen-reared (PR) and wild (WD) ring-necked pheasant hens from early April through early October (181-day reproductive period) in eastern South Dakota, 1990-92.

								Mortality					
		n		Total hen-days		Survival		Predation		Accidents		Lost Hens	
Year	Study area	PR	WD	PR	WD	PR	WD	PR	WD	PR	WD	PR	WD
1990	Borden	56	18	2179	1759	0.0163	0.3952	0.7829	0.5376	0.0402	0	0.1606	0.0672
1991	Horrigan	34	10	1004	1193	0.0041	0.5445	0.9295	0.3416	0	0	0.0664	0.1139
	Borden	37	12	1027	1590	0.0023	0.5655	0.8217	0.3476	0.0880	0	0.0880	0.0869
1992	Horrigan	33	11	619	1600	0.0001	0.6357	0.9687	0.3643	0.0312	0	0	0
	Borden	28	10	1000	995	0.0102	0.2786	0.7522	0.6183	0.1979	0	0.0394	0.1031
All	Both	188	61	5829	7137	0.0047	0.4786	0.8489	0.4495	0.0644	0	0.0820	0.0719

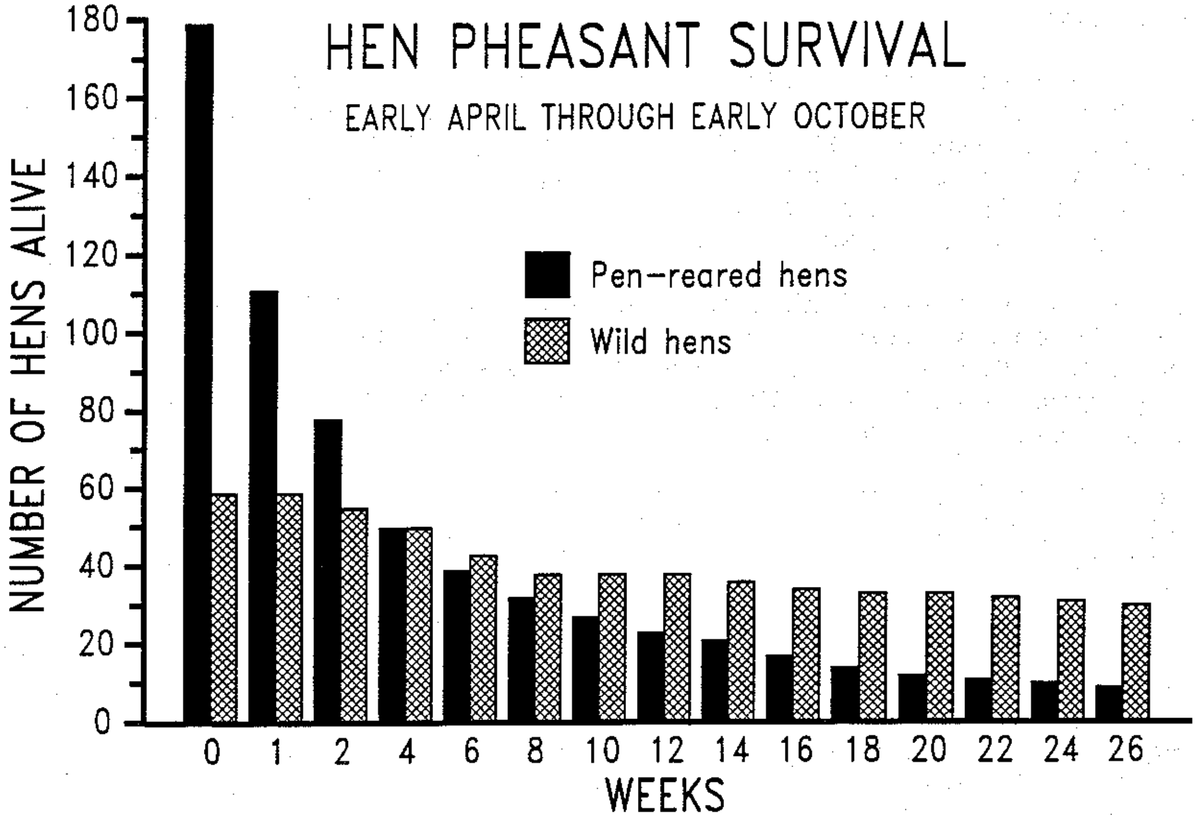


Figure 3. Survival of wild and pen-reared hens by week of the 181-day reproductive period in eastern South Dakota, 1990-92.

to red foxes (Vulpes fulva), coyotes (Canis latrans), mink (Mustela vison), badgers (Taxidea taxus), raccoon (Procyon lotor), and aerial predators.

Recovered radios (deaths) of wild hens were found 1.9 ± 0.3 (SE) km from release sites. Only 20 of 155 pen-reared hen transmitters were recovered more than 1 km from release sites with a mean recovery distance of 0.6 ± 0.1 km. In 14 of the 20 recoveries more than 1 km from release sites, recovery distances were likely the result of being carried off by a mobile predator rather than dispersal since hens were never previously located alive in the recovery location.

Pen-reared hens that survived reproductive periods also dispersed only short distances from release sites. All 9 pen-reared hens that survived reproductive periods were located within 1 km of release sites.

Productivity

Years and study areas combined, 32 pen-reared hens initiated incubation of 54 nests while 40 wild hens initiated incubation of 67 nests. A higher ($\underline{X}^2$ = 52.41, 1 df, $\underline{P}$ < 0.001) proportion of wild hens initiated incubation of eggs than pen-reared hens (Table 2). Median initiation dates of first nests was 29 April for wild hens and 2 May for pen-reared hens.

Similar to recovery distances, pen-reared hens moved relatively short distances from release sites to initiate nests. These hens moved 0.5 ± 0.1 km to initiate first nests with only one hen moving more than 1 km. Wild hens initiated first nests 1.3 ± 0.2 km from release locations.

Of hens that initiated nests, a higher ($\underline{X}^2$ = 4.58, 1 df, $\underline{P}$ = 0.032) proportion of wild hens had a successful nest than pen-reared hens (Table 2). Although individual nest success approached significant levels, no differences ($\underline{X}^2$ = 3.05, 1 df, $\underline{P}$ = 0.081) were detected between wild and pen-reared hens. Forty-two ($\underline{n}$ = 57) percent of nests initiated by wild hens and 26% ($\underline{n}$ = 50) of pen-reared hen nests were successful. Nest predation accounted for 44% of nest fates for wild hens and 46% of pen-reared hens' nests. Nest predators identified by predated nest characteristics included striped skunks (*Mephitis mephitis*), raccoon, and red foxes. Remaining unsuccessful nests were the result of hen predation (wild, 4%; pen-reared, 14%), abandonment (wild, 4%; pen-reared, 6%), flooding (wild, 4%; pen-reared, 2%), and unknown causes (wild, 2%; pen-reared, 6%). Wild (58%, $\underline{n}$ = 26) and pen-reared (54%, $\underline{n}$ = 26) hens that were unsuccessful in initial nesting attempts had similar ($\underline{X}^2$ = 0.08, 1 df, $\underline{P}$ = 0.78) rates of renesting. A maximum of 4 nests was attempted by 2 pen-reared and 3 wild hens.

Wild hens with successful nests had a higher rate ($\underline{X}^2$ = 5.30, 1 df, $\underline{P}$ = 0.021) of brood rearing success than successfully nesting pen-reared hens (Table 2). Wild hens recruited 1.69 8-week-old young/hen while pen-reared hens recruited 0.11 8-week-old young/hen.

DISCUSSION

Pen-reared hen pheasants exhibited lower survival and higher predation rates than wild hens because they did not fully utilize available cover. As indicated by radio signals, wild hens tended to avoid approaching researchers by running or hiding in herbaceous cover. Pen-reared hens exhibited these behaviors to a lesser extent and tended to crouch or stand upright in habitat openings. It is reasonable to assume that these hens were equally detectable when approached by predators. Studies of rock ptarmigan (*Lagopus mutus helveticus*), rock partridge (*Alectoris*

Table 2. Productivity of pen-reared and wild ring-necked pheasant hens in eastern South Dakota, 1990-92.

		Pen-reared hens				Wild hens			
Year	Study area	n	Number initiating incubation	Number hatching clutches[a]	Number rearing young[b]	n	Number initiating incubation	Number hatching clutches	Number rearing young
1990	Borden	54	6	3	2	16	7	4	4
1991	Horrigan	32	5	3	2	10	7	5	5
	Borden	36	7	2	1	12	9	5	3
1992	Horrigan	32	4	0	0	11	10	5	5
	Borden	25	10	4	0	10	7	5	3
All	Both	179	32	12	5	59	40	24	20

[a]Hens that had nests that at least one egg hatched.

[b]Hens that survived at least 8 weeks after hatching a clutch of eggs.

graeca), and hazel grouse (Bonasa bonasia) chicks that were raised in captivity without parental presence support this conclusion as they exhibited no antipredatory behavior as early as 3 weeks of age (Thaler 1986). Predation rates of pen-reared hens in this study were similar to that (80%) reported by Hill and Robertson (1988) on 15 pen-reared hen pheasants released in the United Kingdom.

On 2 occasions, hens equipped with radios that were not transmitting signals were observed on study areas. Because it was not possible to identify to which treatment these hens belonged, these and possibly 16 other missing hens were incorrectly classified in analyses as dead hens. Heisey and Fuller (1985) point out the potential relationship in transmitter losses and mortality and recommend interpreting lost transmitters as animal deaths. Hen transmitters could be lost not only when radios were damaged during predation or collisions, but also when transmitters that no longer held storage capacity were cached or simply ended up with solar panels facing away from the sun following hen deaths. Twelve radios that had not transmitted signals for more than 7 days were recovered the day they resumed signal transmission, indicating that hen deaths resulted in the lack of a radio signal until subsequent movement of the radio by the hen predator or another animal positioned the radio where a signal could be transmitted and received. Even frequent violations of this assumption would result in minor, negative biases in survival estimates. Analyses where all lost hens were assumed to be the result of radio failure (censored) would adjust survival estimates of wild hens up 5.1% to 0.5299 and pen-reared hens up 0.3% to 0.0129.

Higher predation rates of pen-reared hens than wild hens accounted for lower rates of incubation initiation, hen nesting success, and brood-rearing success of pen-reared hens. Most pen-reared hens simply did not survive long enough to initiate nests. However, similar rates of renesting and nest predation between treatments indicated that pen-reared hens possessed the impetus to reproduce and the ability to seclude nests from predators similar to wild hens. Slightly higher rates of predation on pen-reared hens with active nests explained differences in hen nest success between treatments. Continued lack of antipredatory behavior resulted in lower success of pen-reared hens in rearing young.

Pen-reared hens in the United Kingdom (0.22, Hill and Robertson 1988) and Oregon (0.18-0.28, Haensly et al. 1985) recruited twice as many young/hen as pen-reared hens in this study while machine-reared hens on an island in Sweden recruited 9-15 times (1.0-1.7) as many young/hen (Brittas et al. 1992). However, recruitment of young by pen-reared hens was within ranges of that for machine-reared hens (0-0.4) on the mainland of Sweden (Brittas et al. 1992) and exceeded that of an earlier study in Oregon

(0.05, Jarvis and Engbring 1976). While reproductive potential of pen-reared hens in these studies was probably similar to pen-reared hens in South Dakota, differences in recruitment were likely reflective of predation pressure. This variable was not measured in this or previous studies but was described by Brittas et. al. (1992) as being lower on the island (higher recruitment) than the Swedish mainland (lower recruitment). Intensive control of predators may have increased recruitment of young by pen-reared hens in South Dakota but without fur related incentives, this practice is expensive and impractical (Trautman 1982:103).

MANAGEMENT IMPLICATIONS

Releasing pen-reared hens to augment wild pheasant populations is not a practical management option. While pen-reared hens have reproductive capabilities similar to wild hen pheasants, recruitment of young is 15 times lower than wild hens because pen-reared hens are more susceptible to predation. These results are from hens released on state-owned areas managed for wildlife production and therefore should be considered to be maximum reproductive levels. Because 7 wild hens will recruit more young than 100 pen-reared hens, pheasant managers should emphasize management options that increase production of wild pheasants in their management schemes.

Results of this and previous studies of pen-reared hen productivity should be viewed with one caution: although this study and those conducted in the United Kingdom (Hill and Robertson 1988) and Sweden (Brittas et al. 1992) included use of control (wild) hens, none measured impacts of pen-reared hen introductions on wild hen survival and productivity. Distances to radio recoveries and nests demonstrate that 96% of pen-reared hens disperse less than 1 km from release sites. Sudden increases in pheasant densities through introduction of more environmentally susceptible pen-reared pheasants could concentrate pheasant predators and lower survival of wild pheasants. Furthermore, introductions of pen-reared hens in limited habitat areas may reduce wild pheasant survival and productivity by forcing wild hens to seek solitary nesting and brood-rearing sites in marginal habitat. Because net effects of pen-reared hen pheasant introductions may in fact be negative, pen-reared pheasants should not be released until further study evaluates comprehensive impacts of this management practice.

LITERATURE CITED

Anderson, W. L. 1964. Survival and reproduction of pheasants released in southern Illinois. J. Wildl. Manage. 27:254-264.

Brittas, R., V. Marcstrom, R. E. Kenward and M. Karlbom. 1992. Survival and breeding success of reared and wild ring-necked pheasants in Sweden. J. Wildl. Manage. 56:368-376.

Driessen, J. L. 1980. Soil Survey of Sanborn County, SD. US Dept. Ag. Soil Cons. Ser. 191pp.

Ellis, J. A. and W. L. Anderson. 1963. Attempts to establish pheasants in southern Illinois. J. Wildl. Manage. 27:255-239.

Fant, R.J. 1957. Criteria for Aging Pheasant Embryos. J. Wildl. Manage. 21:324-328.

Haensly, T. F., S. M. Meyers, J. A. Crawford and W. J. Castillo. 1985. Treatments affecting post-release survival and productivity of pen-reared ring-necked pheasants. Wildl. Soc. Bull. 13:521-527.

Heil, D.M. 1979. Soil Survey of Beadle County, SD. US Dept. Ag. Soil Cons. Ser. 169pp.

Heisey, D. M., and T. K. Fuller. 1985. Evaluation of survival and cause-specific mortality rates using telemetry data. J. Wildl. Manage. 49:668-674.

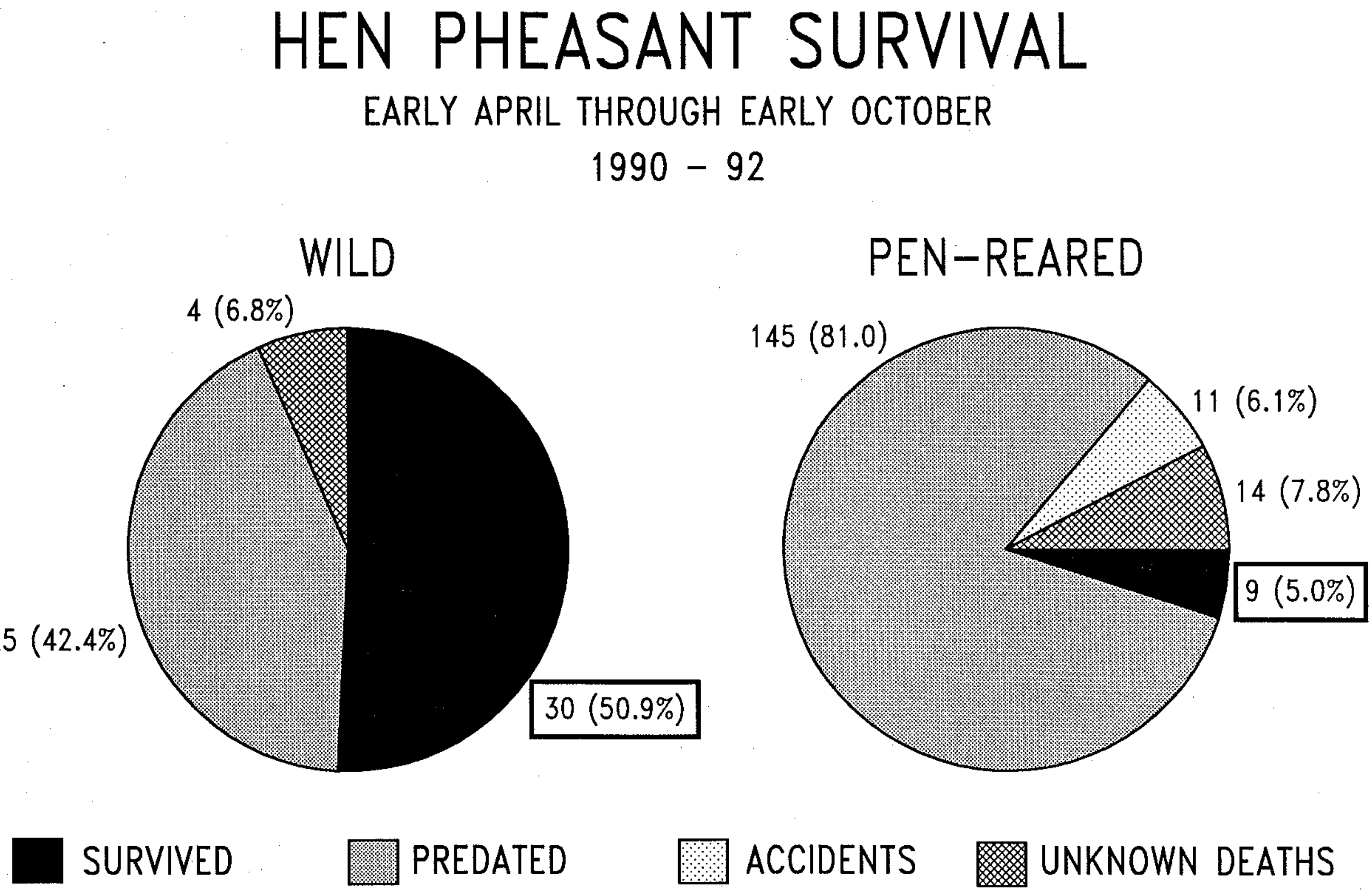
Hill, D., and P. Robertson. 1988. Breeding success of wild and hand-reared ring-necked pheasants. J. Wildl. Manage. 52:446-450.

Jarvis, R. L., and Engbring. 1976. Survival and reproduction of wild game farm pheasants in western Oregon. Northwest. Sci. 50:222-230.

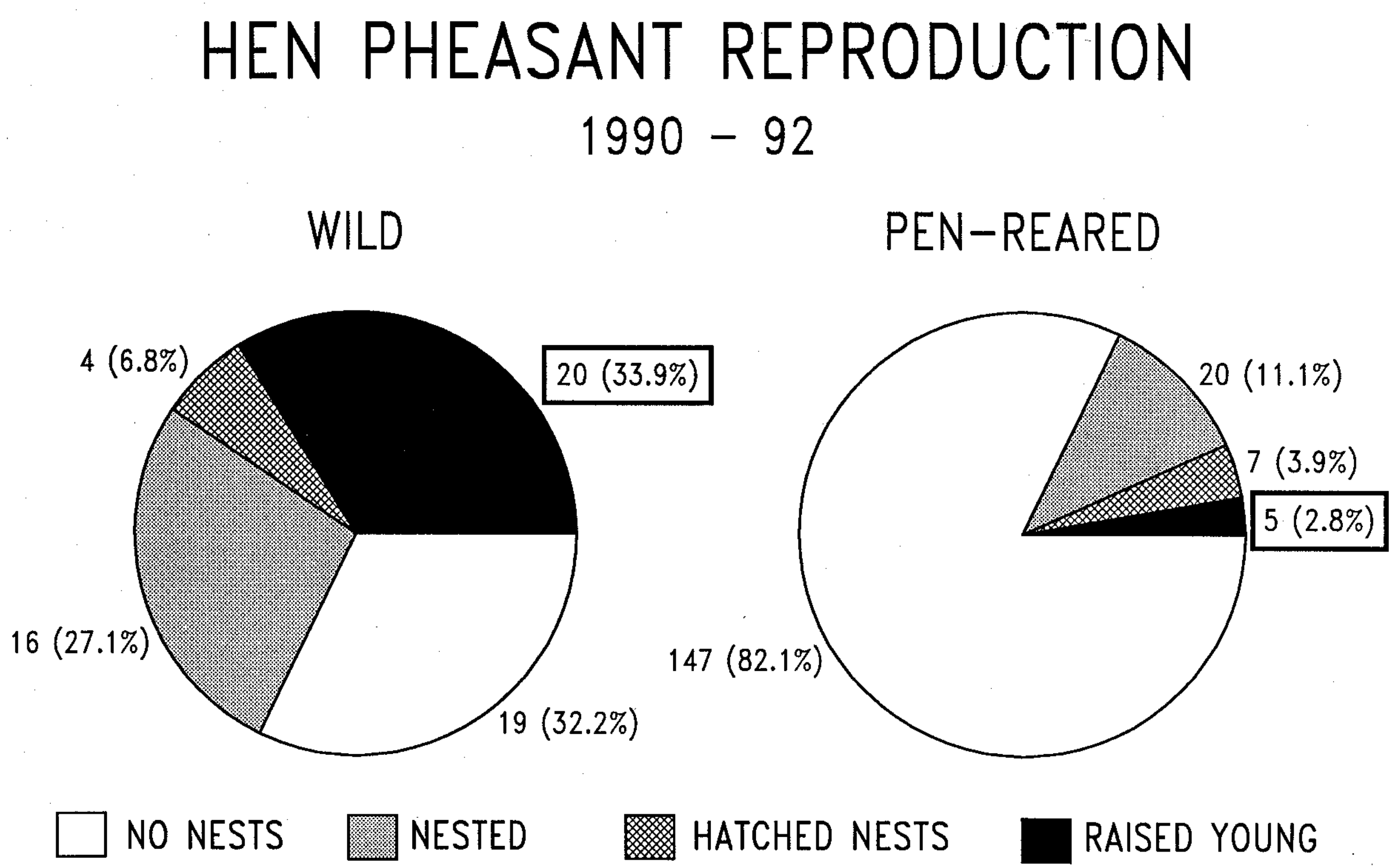
Thaler, E. 1986. Studies on the behaviour of some Phasianidae chicks at the Alpenzoo--Innsbruck. Int. Conf. World Pheasant Assoc. 3:82-89.

Trautman, C. G. 1982. History, ecology and management of the ring-necked pheasant in South Dakota. S.D. Dept. of Game, Fish and Parks Wildl. Res. Bull. No. 7. 118pp.

APPENDIX



Appendix Figure 1. Survival rates (simple percentages) of wild and pen-reared ring-necked pheasant hens from early April through early October (181-day reproductive period) in eastern South Dakota, 1990-92.



Appendix Figure 2. Stage of reproduction reached by wild and pen-reared ring-necked pheasant hens in eastern South Dakota, 1990-92.