MEMORANDUM

DATE: 14 February 1996

TO: Those interested

FROM: Michael A. Schroeder and Jim Tabor

SUBJECT: Survival of pen-reared pheasants

Washington Department of FISH and WILDLIFE

INTRODUCTION

The general purpose of this project was to evaluate the usefulness of programs for rearing ring-necked pheasants in captivity and releasing them into the wild. Ring-necked pheasants (*Phasianus colchicus*) are an important wildlife resource in Washington. Although pheasants are not native in Washington, they are commonly present in habitats dominated by grasses, shrubs, and/or forbs mixed with cropland, frequently irrigated. Pheasant populations have been influenced by numerous factors including: 1) habitat quality, 2) predation pressure, and 3) winter weather (Leopold et al. 1943, Yeager et al. 1951, Shick 1952, Stokes 1952, Robertson 1958, Wagner et al. 1965, Snyder 1985). Consequently, pen-reared pheasants are often released in areas with heavy hunting pressure in order to provide a harvestable surplus (Buss 1946; Siegler 1949; Dorr 1952; Westerskov 1952, 1953; Kabat et al. 1955; Robertson 1958; Ginn 1962; Gill 1976, Leif 1994).

Survival of wild pheasants is higher for females than males (for example 53 vs. 10%, Stokes 1952); most of the difference in sex-specific survival appears to be due to the influence of hunting pressure (Leopold et al. 1943, Stokes 1952, Mallette and Harper 1964, Dumke and Pils 1973, Warner and Etter 1983). In contrast to wild pheasants, pen-reared pheasants apparently have relatively low survival rates (Krauss et al. 1987, Leif 1994); perhaps as low as 4% (Buss 1946, Dorr 1952). Pen-reared pheasants also appear to have lower reproductive success than wild pheasants (Hill and Robertson 1988, Leif 1994). Pen-reared pheasants may have lower survival and reproductive rates because of their loss in foraging ability and their inability to adjust to predation pressure and food availability in a new environment (Kabat et al. 1956, Haensly et al. 1985, Leif 1994). Because of the low survival of pen-reared pheasants, timing of pheasant releases may be extremely important.

The overall purpose of this research was to examine survival of pen-reared ring-necked pheasants in central Washington. As part of this purpose several questions were addressed. 1) What is the survival rate

of pen-reared pheasants? 2) What are the primary causes of pheasant mortality? 3) When does most mortality occur? 4) Does survival differ for pheasants released in autumn and spring? 5) Do pen-reared pheasants successfully breed?

METHODS

Ring-necked pheasants were reared in captivity at the Lewis County Game Farm near Centralia, Washington. Birds were fitted with battery-powered radio transmitters, attached to either poncho-like collars or necklaces (Amstrup 1980, Johnson and Berner 1980, Warner and Etter 1983, Marks and Marks 1987, Marcström et al. 1989). The first release consisted of 20 females on 8 November 1992. The release site was 13 km northeast of Ephrata (47° 23' N, 119° 41' W) in habitat dominated by riparian vegetation (common cattail, *Typha latifolia*), planted shrubs (Russian-olive, *Elaeagnus angustifolia*), alfalfa, and shrub-steppe (big sagebrush, *Artemisia tridentata*). The second release consisted of 19 females on 5 May 1993 at the same site as the first release. The third release consisted of 13 females and 1 male on 26 May 1994. The release site was 11 km southwest of Ephrata (47° 15' N, 119° 39' W) in habitat dominated by riparian vegetation (common cattail), trees, planted shrubs, alfalfa, potatoes, and shrub-steppe (big sagebrush). The fourth release consisted of 17 females and 1 male on 25 May 1995 at the same site as the third release.

Radio-marked pheasants were located either visually or with triangulation using a portable receiver and antenna. Numerous biologists aided in the telemetry effort including Peggy Bartels, Matt Monda, Dan Peterson, Mark Quinn, Chad Rankin, and Michelle Dunn. When birds were not visually located they were considered alive if the signal fluctuated in intensity while the antenna was held steady. Locations for all observations were recorded to the nearest 100 m. Most radio-marked birds were observed at least twice each week. Previous work on pheasants (wild and pen-reared) indicated that most movements away from release sites would be less than 3 km (Buss 1946, Marcström et al. 1989, Wilson et al. 1992). Flights with fixed-wing aircraft were used to locate lost birds.

Evidence of predators was examined for recoveries of nests, dead birds, and/or radio transmitters; evidence included tracks, pellets, droppings, shell fragments, radio transmitters, feathers, bones, and bands (Darrow 1938, Einarsen 1956, Dumke and Pils 1973). Survival was estimated with the Kaplan-Meier product limit estimator and statistically analyzed with the log rank test (SAS Institute Inc. 1988, White and Garrott 1990). Survival was compared between release sites and season; only data on females were used in the analysis.

RESULTS

There were several different situations in which radio transmitters were recovered or lost (Table 1). More than 40% of all

radio transmitters were lost or fell off. In the first two releases a radio transmitter with a very high failure rate was used (several live birds were observed with malfunctioning radio transmitters). In addition, four radio transmitters fitted to ponchos apparently fell off during the first release. Although problems with the poncho design were subsequently corrected for the second release, similar design problems were encountered with radio transmitters fitted to necklaces. Radio transmitters fitted to necklaces apparently were removed by preening birds; one bird died as a result of 'catching' its leg in the necklace. Radio 'survival' during the fourth release was excellent. The primary predators appeared to include red-tailed hawks, coyotes, dogs, and racoons. These birds also appeared to be at extreme risk of mortality when fields of alfalfa were cut.

Table 1. Fate of radio-marked pen-reared ring-necked pheasants released in central Washington, 1992-1995.

	Release 1 n = 20		Release 2 n = 19		Release 3 n = 14		Release 4 n = 18		Overall n = 71	
Fate of pheasant	N	%	N	%	N	%	N	%	N	%
Mammalian predator	10	50.0	6	31.6	1	7.1	7	38.9	24	33.8
Avian predator	0	0.0	2	10.5	0	0.0	3	16.7	5	7.0
Unknown predator	0	0.0	0	0.0	1	7.1	1	5.6	2	2.8
Farming operation	0	0.0	0	0.0	2	14.3	4	22.2	6	8.5
Killed by radio	0	0.0	0	0.0	1	7.1	0	0.0	1	1.4
Radio fell off	4	20.0	0	0.0	7	50.0	1	5.6	12	16.9
Bird lost (dead?)	6	30.0	10	52.6	2	14.3	1	5.6	19	26.8
Alive > 90 days	0	0.0	1	5.3	0	0.0	1	5.6	2	2.8

Despite the technical problems with radio transmitters, it was clear that mortality rates were extremely high. Survival for the first 30 days following release was estimated as 10.5 (95% C.I. = 0.0 - 24.3%) for release 1, 24.6% (95% C.I. = 4.3 - 44.9%) for release 2, 29.2% (95% C.I. = 0.0 - 72.9%) for release 3, and 16.7% (95% C.I. = 0.0 - 33.9%) for release 4. The differences were not significant ($P > 0.1$)(Fig. 1). Because 'lost' birds were assumed to be dead in the first analysis, a second analysis was done in which lost birds were 'censored' from the analysis. The results of the second analysis were not substantially different from the first analysis. No differences were detected when survival was compared between release sites (releases 1 and 2 [NE Ephrata] vs. releases 3 and 4 [SW Ephrata]) and season (release 1 [autumn] vs. release 2, 3, and 4 [spring])($P > 0.1$). The overall survival rate was 16.7% (95% C.I. = 6.9 - 26.4%) for the first 30 days (Fig. 2), 12.3% (95% C.I. = 3.4 - 21.3%) for the first 60 days, and 4.9% (95% C.I. = 0.0 - 11.3%) for the first 90 days (Fig. 2). Only two birds were known to have survived more than 90 days.

Fig. 1. Kaplan-Meier product limit estimates of survival for pen-reared pheasants following four releases near Ephrata, Washington.

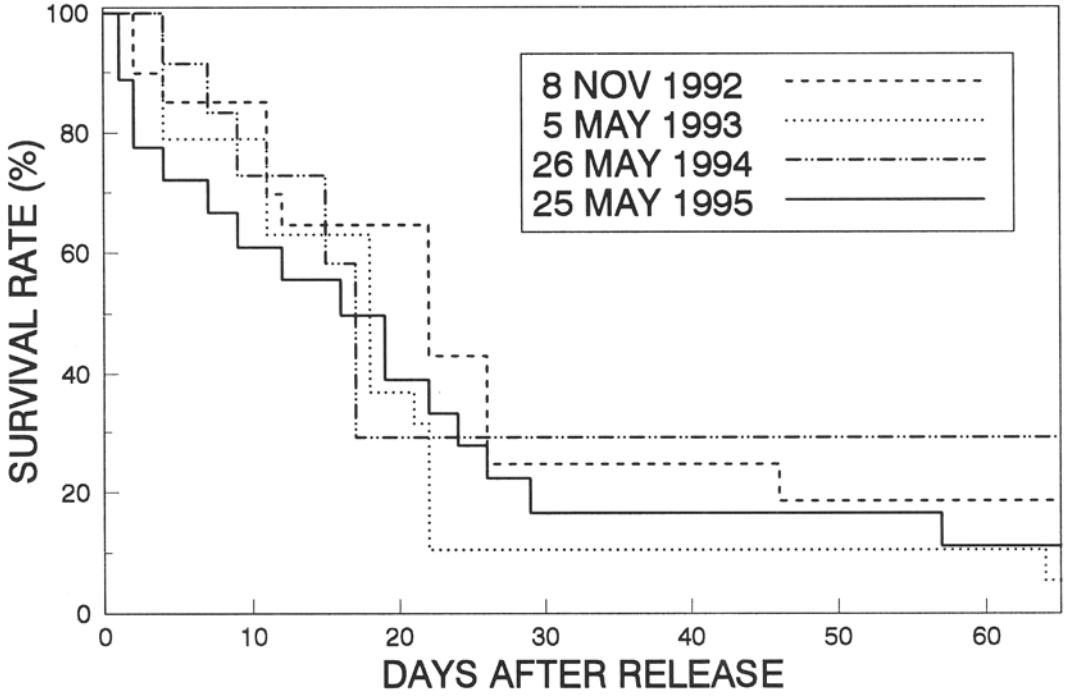
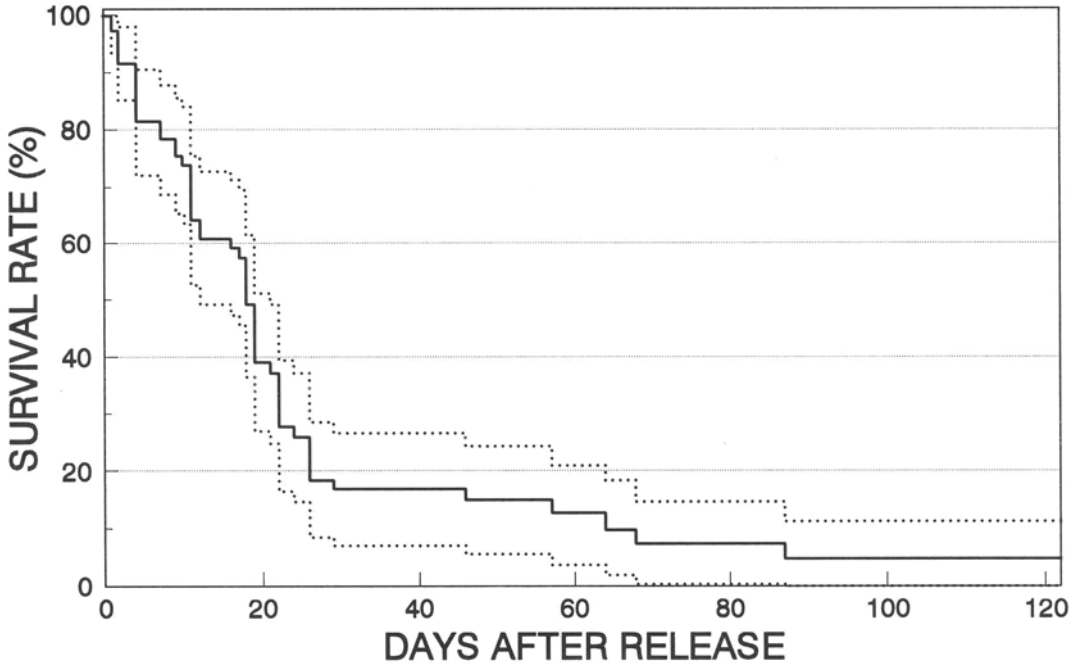


Fig. 2. Kaplan-Meier product limit estimate of survival for pen-reared pheasants following all releases near Ephrata, Washington, 1992-1995. Confidence intervals (95%) are represented by dotted lines.



Productivity of pen-reared pheasants was extremely low. Only 6 radio-marked pheasants were discovered at nest sites. No pheasants successfully produced a brood; three females were killed on nests, one female was killed while she was off her nest, and two females survived following the destruction of their nests by predators. Although no evidence was collected concerning the fertility of eggs, pen-reared females were observed in the proximity of wild males on numerous occasions.

DISCUSSION

Annual survival was not determined in this study. Nevertheless annual survival was probably close to 0%; only 2 birds were known to have survived longer than 90 days. This result is comparable to research indicating that survival of pen-reared pheasants can be as low as 4% (Buss 1946, Dorr 1952). In addition, although 49 hens were released in spring, only six hens were observed on nests. Pen-reared pheasants may have lower survival and reproductive rates because of their loss in foraging ability and their inability to adjust to predation pressure and food availability in a new environment (Kabat et al. 1956, Haensly et al. 1985, Leif 1994). We found no indication that timing of release of hen ring-necked pheasants would make a difference in either their survival or reproduction.

The low survival of ring-necked pheasants in this study indicates that the only direct benefit to releasing pen-reared pheasants may occur when they are released immediately prior to, or during, the hunting season. In addition, it has been suggested that pen-reared pheasants may decrease survival and productivity among wild pheasants by concentrating predators in the release area (Leif 1994). Unfortunately, there is little research available which documents the economic advantages and/or disadvantages of the various management practices.

LITERATURE CITED

Amstrup, S. C. 1980. A radio-collar for game birds. J. Wildl. Manage. 44:214-217.

Buss, I. O. 1946. Wisconsin pheasant populations. Wisconsin Cons. Dep., Pub. 326, A-46. 184pp.

Darrow, R. W. 1938. Possibilities of recognizing the evidence of predation and the species involved in the remains of grouse nests found destroyed. Trans. N. Am. Wildl. Conf. 3:834-838.

Dorr, D. E. 1952. Maine pheasant investigation. Maine Dep. Inland Fish. and Game, Game Div. Bull. No. 2. 47pp.

Dumke, R. T., and C. M. Pils. 1973. Mortality of radio-tagged pheasants on the Waterloo Wildlife Area. Wisconsin Dep. Nat. Resour., Tech. Bull. No. 72. 52pp.

Einarsen, A. S. 1956. Determination of some predator species by field signs. Oregon State College Monog., Studies in Zool. No. 10. 34pp.

Gill, M. 1976. Reared pheasants: a review of research and management. Game Conserv. Annu. Rep. 8:76-82.

Ginn, W. E. 1962. The ringneck pheasant in Indiana. Indiana Dep. Conserv., Pittman-Robertson Bull. No. 6. 107pp.

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. 13:521-528.

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

Johnson, R. N., and A. H. Berner. 1980. Effects of radio transmitters on released cock pheasants. J. Wildl. Manage. 44:686-689.

Kabat, C., F. M. Kozlik, D. R. Thompson, and F. H. Wagner. 1955. Evaluation of stocking breeder hen and immature cock pheasants on Wisconsin public hunting grounds. Wisconsin Conservation Department, Tech. Wildl. Bull. No. 11. 58pp.

Kabat, C., R. K. Meyer, K. G. Flakas, and R. L. Hine. 1956. Seasonal variation in stress resistance and survival in the hen pheasant. Wisconsin Conservation Department, Tech. Wildl. Bull. No. 13. 48pp.

Krauss, G. D., H. B. Graves, and S. M. Zervanos. 1987. Survival of wild and game-farm cock pheasants released in Pennsylvania. J. Wildl. Manage. 51:555-559.

Leif, A. P. 1994. Survival and reproduction of wild and pen-reared ring-necked pheasant hens. J. Wildl. Manage. 58:501-506.

Leopold, A., T. M. Sperry, W. S. Feeney, and J. A. Catenhusen. 1943. Population turnover on a Wisconsin pheasant refuge. J. Wildl. Manage. 7:383-394.

Mallette, R. D., and H. T. Harper. 1964. Population studies of ring-necked pheasants in California. Calif. Fish and Game 50:292-304.

Marcström, V., R. E. Kenward, and M. Karlbom. 1989. Survival of ring-necked pheasants with backpacks, necklaces, and leg bands. J. Wildl. Manage. 53:808-810.

Marks, J. S., and V. S. Marks. 1987. Influence of radio collars on survival of sharp-tailed grouse. J. Wildl. Manage. 51:468-471.

Robertson, W. B., Jr. 1958. Investigations of ring-necked pheasants in Illinois. Illinois Dep. Conserv., Tech. Bull. No. 1. 137pp.

SAS Institute, Inc. 1988. SAS/STAT user's guide, release 6.03 edition. SAS Institute, Cary, North Carolina, USA. 1028pp.

Shick, C. 1952. A study of pheasants on the 9,000-acre prairie farm Saginaw County, Michigan. Michigan Dep. Conserv., Wildlife Restoration Project Michigan 7-R. 134pp.

Siegler, H. R. 1949. The ring-necked pheasant in New Hampshire. New Hampshire Fish Game Comm., Survey Rep. No. 5. 82pp.

Snyder, W. D. 1985. Survival of radio-marked hen ring-necked pheasants in Colorado. J. Wildl. Manage. 49:1044-1050.

Stokes, A. W. 1952. Pheasant survival studies on Pelee Island, Ontario, 1946-1950. N. Am. Wildl. Conf. 17:285-293.

Wagner, F. H., C. D. Besadny, C. Kabat. 1965. Population ecology and management of Wisconsin pheasants. Wisconsin Cons. Dep., Tech. Bull. No. 34. 168pp.

Warner, R. E., and S. L. Etter. 1983. Reproduction and survival of radio-marked hen ring-necked pheasants in Illinois. J. Wildl. Manage. 47:369-375.

Westerskov, K. 1952. General principles in pheasant management. New Zealand Dep. of Internal Affairs. Wildl. Pub. No. 18. 12pp.

Westerskov, K. 1953. Techniques of pheasant liberation. New Zealand Dep. of Internal Affairs. Wildl. Pub. No. 25. 28pp.

Wilson, R. J., R. D. Drobney, and D. L. Hallett. 1992. Survival, dispersal, and site fidelity of wild female ring-necked pheasants following translocation. J. Wildl. Manage. 56:79-85.

Yeager, L. E., W. W. Sandfort, and L. J. Lyon. 1951. Some problems of pheasant management on irrigated land. N. Am. Wildl. Conf. 16:351-367.