



A two year study of pheasant stocking in the Gallatin Valley, Montana  
by Edwin F Roby

A THESIS Submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree  
of Master of Science in Wildlife Management  
Montana State University  
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**Abstract:**

A carefully planned small scale study was conducted in Gallatin County, Montana to secure survival data on game farm pheasants. The area selected for the study is an agricultural area northwest of Bozeman. Land use practices and natural topography make the area well suited for pheasants. Five hundred and fourteen 10 week old birds were used in the experiment. In 1948, 96 birds were released.

In 1949, 375 birds were released. Approximately one-half of each-release group was released by the gentle method and one-half by the violent method. Four release sites were used. All birds were marked and banded to permit field observations and identification of birds killed by hunters. In 1948 band returns were voluntary but in 1949 checking stations were also used to collect necessary information. During the winter of 1950 trapping operations were carried on to collect further data.

Dispersal from release sites suggested that the gentle release birds dispersed at a slower rate than the violent. In 1948; 11 bands (12.8 per cent of the total cocks released) were returned by hunters.

In 1949; 42 banded birds (14.5 per cent of the total cocks released) were killed by hunters or trapped during the winter. These figures suggest that returns from both years were about the same. Data obtained were compared with those, obtained in other states. In 1949 band returns were analysed on the basis of method and place of release. No marked difference in survival was found for the two release methods. Little information was obtained, when survival and habitat were compared. Checking station data showed that only per cent of the hunter kill were game farm pheasants. Sixty-seven per cent of the birds taken were wild birds of the year. The movement of 48 banded birds taken by hunters and trapping showed that 41.7 per cent moved less than one mile, 50 per cent moved from one to three miles, 2.1 per cent moved from four to five miles, and 6.2 per cent moved from nine to fourteen miles. Data indicate that more gentle release birds settled within one mile of release sites than did violent. More violent moved from one to three miles than gentles, and violent were in majority in movements from four to fourteen miles.

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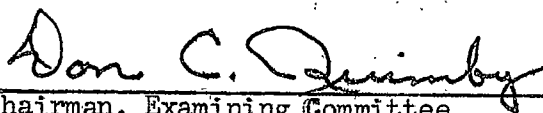
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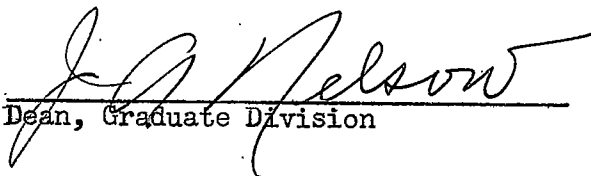
at

Montana State College

Approved:

  
Head, Major Department

  
Chairman, Examining Committee

  
Dean, Graduate Division

Bozeman, Montana  
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## ABSTRACT

A carefully planned small scale study was conducted in Gallatin County, Montana to secure survival data on game farm pheasants. The area selected for the study is an agricultural area northwest of Bozeman. Land use practices and natural topography make the area well suited for pheasants. Five hundred and fourteen 10 week old birds were used in the experiment. In 1948, 96 birds were released. In 1949, 375 birds were released. Approximately one-half of each release group was released by the gentle method and one-half by the violent method. Four release sites were used. All birds were marked and banded to permit field observations and identification of birds killed by hunters. In 1948 band returns were voluntary but in 1949 checking stations were also used to collect necessary information. During the winter of 1950 trapping operations were carried on to collect further data.

Dispersal from release sites suggested that the gentle release birds dispersed at a slower rate than the violent. In 1948, 11 bands (12.8 per cent of the total cocks released) were returned by hunters. In 1949, 42 banded birds (14.5 per cent of the total cocks released) were killed by hunters or trapped during the winter. These figures suggest that returns from both years were about the same. Data obtained were compared with those obtained in other states. In 1949, band returns were analysed on the basis of method and place of release. No marked difference in survival was found for the two release methods. Little information was obtained when survival and habitat were compared. Checking station data showed that only 4.5 per cent of the hunter kill were game farm pheasants. Sixty-seven per cent of the birds taken were wild birds of the year. The movement of 48 banded birds taken by hunters and trapping showed that 41.7 per cent moved less than one mile, 50 per cent moved from one to three miles, 2.1 per cent moved from four to five miles, and 6.2 per cent moved from nine to fourteen miles. Data indicate that more gentle release birds settled within one mile of release sites than did violent. More violent moved from one to three miles than gentles, and violent were in majority in movements from four to fourteen miles.

## INTRODUCTION

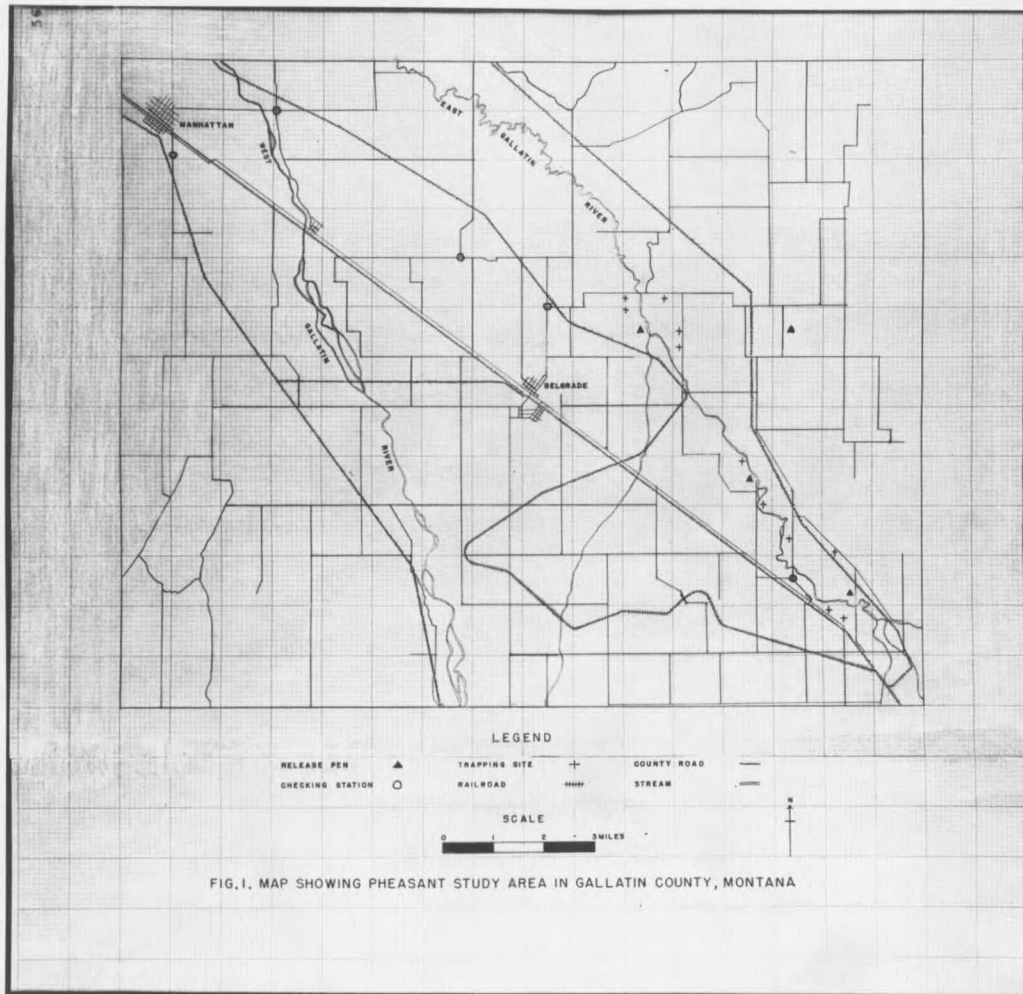
The annual stocking of game farm pheasants has long been practiced in Montana. Findings in other states (Gerstell 1936, Buss 1946, Ginn 1947, Pushee 1948, McNamara 1949) cast considerable doubt on the advisability of this practice when the results are analysed on the basis of "returns" in the hunter's bag. A detailed small scale study was conducted in Gallatin County to secure survival data on game farm pheasants released in that area. These data are evaluated on the basis of methods of release, habitat where released, and the relative importance of "returns" in the hunter's bag when compared with birds produced naturally in the field.

It is impractical to list all who aided in the study but the writer wishes to extend his appreciation to the following: Don C. Quimby for advice and guidance during the field work and preparation of the manuscript; Clifford V. Davis for suggesting the problem and aid on many occasions; the Montana State Fish and Game Department for financial assistance, materials, and the advice of their technical staff, especially W. K. Thompson and W. H. Bergeson; my father, George W. Roby, for helping with the construction of release pens; W. D. Brandt, H. S. Hecox, Arthur Buckley, and H. B. Manley for permitting me to conduct investigations on their property.

## THE STUDY AREA

The area selected for the study is an agricultural area northwest of Bozeman in the Gallatin valley (Fig. 1). General land use practices and the natural topography make the area well suited for pheasants. Much of the land is used for the production of cereal grains providing a food supply (see Hiatt 1947). Excellent cover, well interspersed with grain fields, is found along the banks of the many streams, roadsides and numerous small swampy areas. Willow (Salix sp.), chokecherry (Prunus melanocarpa), rose (Rosa fendleri), cat-tail (Typha latifolia), and hawthorn (Crataegus sp.) are found along roadsides and stream banks. The many fence rows contain Canadian thistle (Cirsium arvense), gooseberry (Ribes sp.), rose (Rosa fendleri), and tall grasses. In some of the more open areas much sweet clover and alfalfa are found.

Four release sites were selected as follows: release site 1 is in an abandoned farm yard and pasture, 200 by 800 feet, located in the northeast corner of the study area about 5.75 miles northwest of site 2, 3 miles northeast of site 3 and 3 miles east of site 4 (see Fig. 1). The vegetation includes quack grass (Agropyron repens), bluegrass (Poa pratensis), needle and thread (Stipa comata), western wheatgrass (Agropyron smithii), wavy leaved thistle (Cirsium undulatum), yarrow (Achillea millefolium), and fanweed (Thlaspi arvense). In the farm yard itself and around the buildings there are cottonwood (Populus angustifolia), apple (Malus sp.), rose (Rosa fendleri), loco



(Oxytropis lambertii), and wild licorice (Glycyrrhiza lepidota).

Vegetational types, irrigation ditches and other general features of the immediate vicinity are shown in Figs. 2 and 3.

Release site 2 is in a pasture 5.75 miles southeast of site 1, 3 miles east of site 3 and 7.5 miles southeast of site 4. The vegetation includes willow (Salix sp.), Canadian thistle (Cirsium arvense), rose (Rosa fendleri), yarrow (Achillea millefolium), aspen (Populus tremuloides), chokecherry (Prunus melanocarpa), snowberry (Symphoricarpos occidentalis), downy chess (Bromus tectorum), mountain brome (Bromus marginatus), timothy (Phleum pratense), western wheatgrass (Agropyron smithii) and Poa sp. (Figs. 4 and 5).

Release site 3 is also in a pasture situated 3 miles south of site 1, 3 miles west of site 2 and 4.2 miles southeast of site 4. The area contains the following plants: Canadian thistle (Cirsium arvense), yarrow (Achillea millefolium), sweet clover (Melilotus alba), iris (Iris missouriensis), bluegrass (Poa pratensis), western wheatgrass (Agropyron smithii), downy chess (Bromus tectorum), snowberry (Symphoricarpos occidentalis), willow (Salix sp.), cottonwood (Populus angustifolia), rose (Rosa fendleri) and poison hemlock (Conium maculatum) (Figs. 6 and 7).

Release site 4 is 3 miles west of site 1, 7.5 miles southwest of site 2 and 4.2 miles north of site 3. The vegetation in the area includes cat-tail (Typha latifolia), sedge (Carex sp.), poison

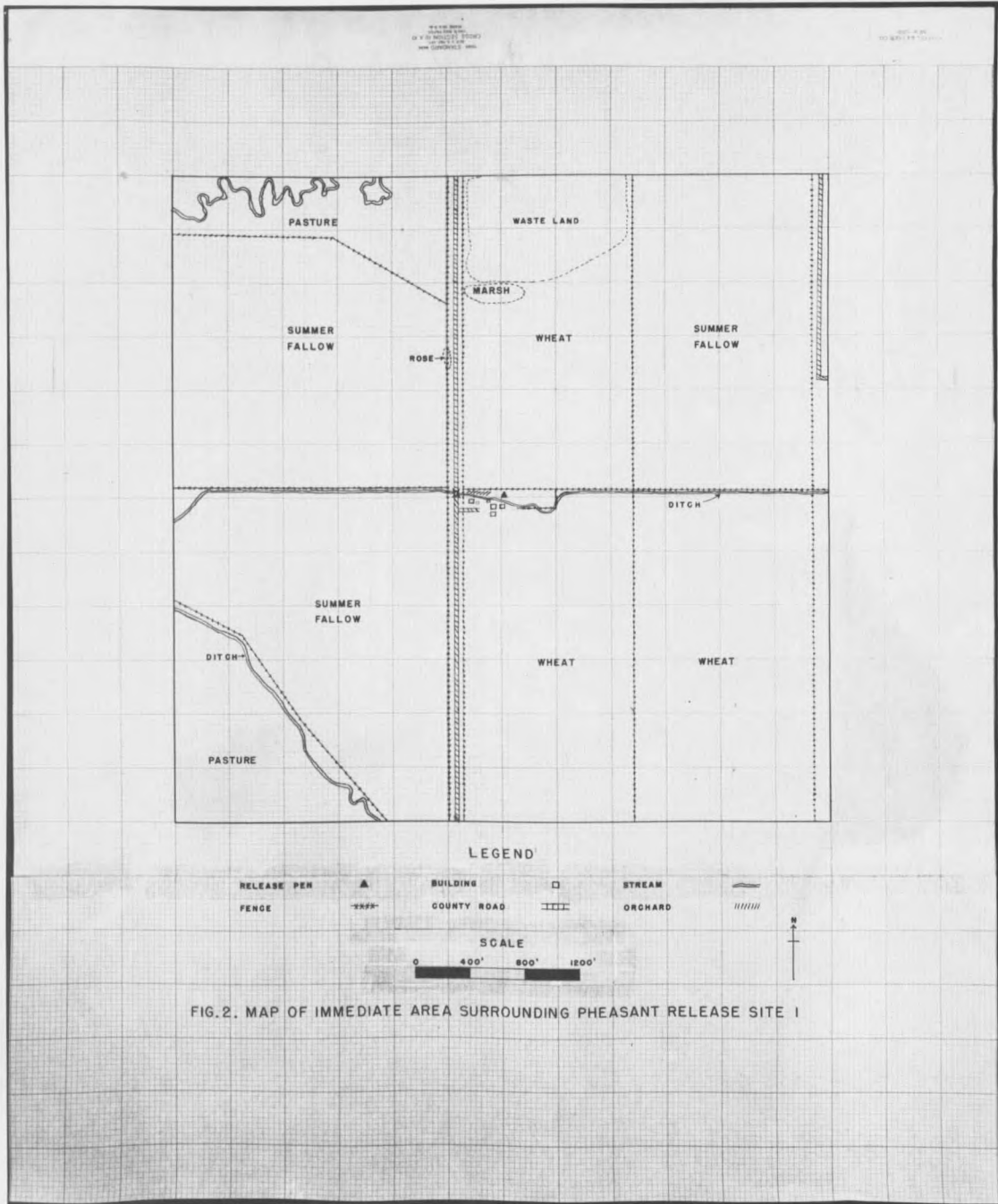


FIG. 2. MAP OF IMMEDIATE AREA SURROUNDING PHEASANT RELEASE SITE 1



Fig. 3. Release site 1 showing the gentle release pen.

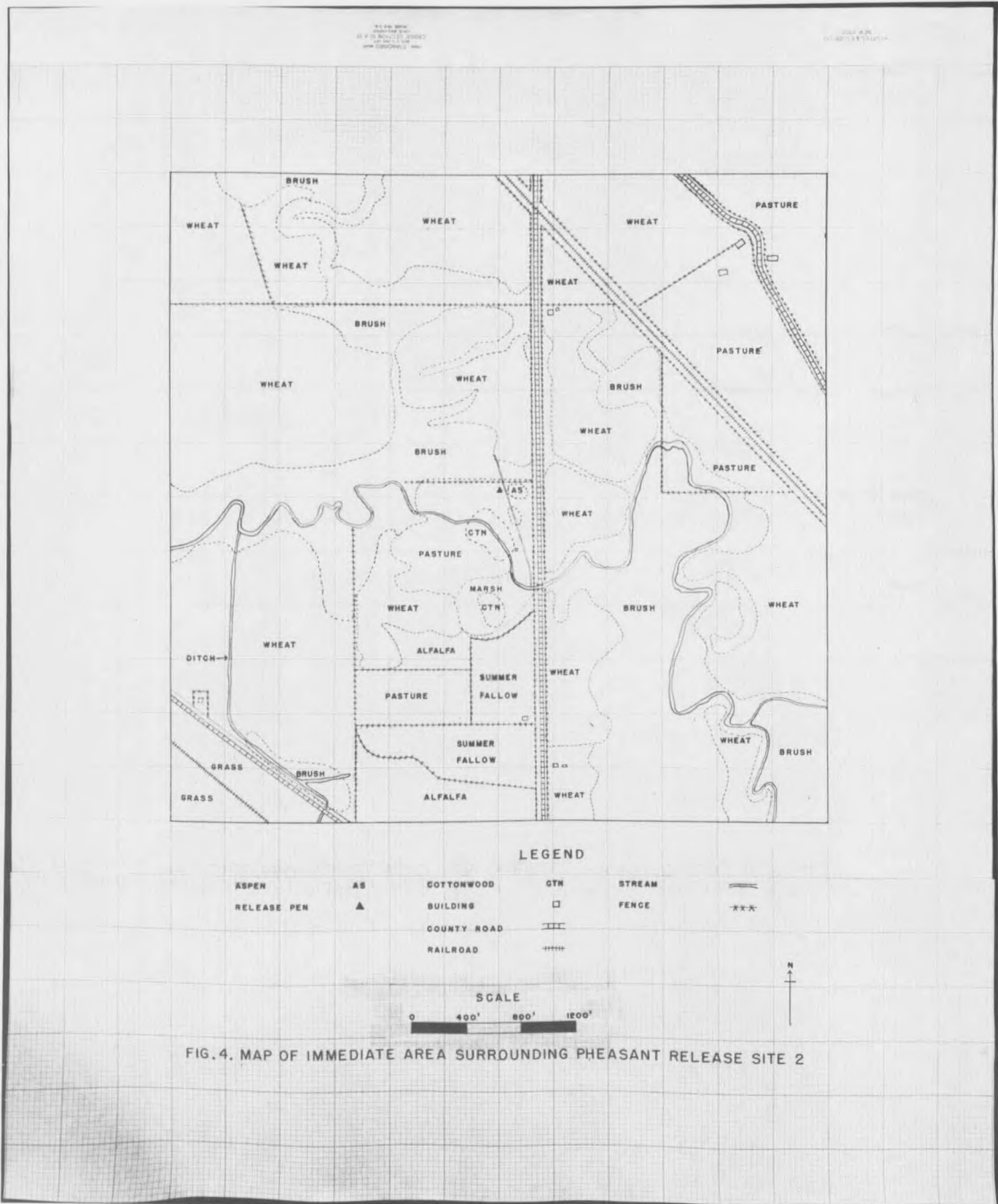




Fig. 5. Release site 2 showing the gentle release pen.

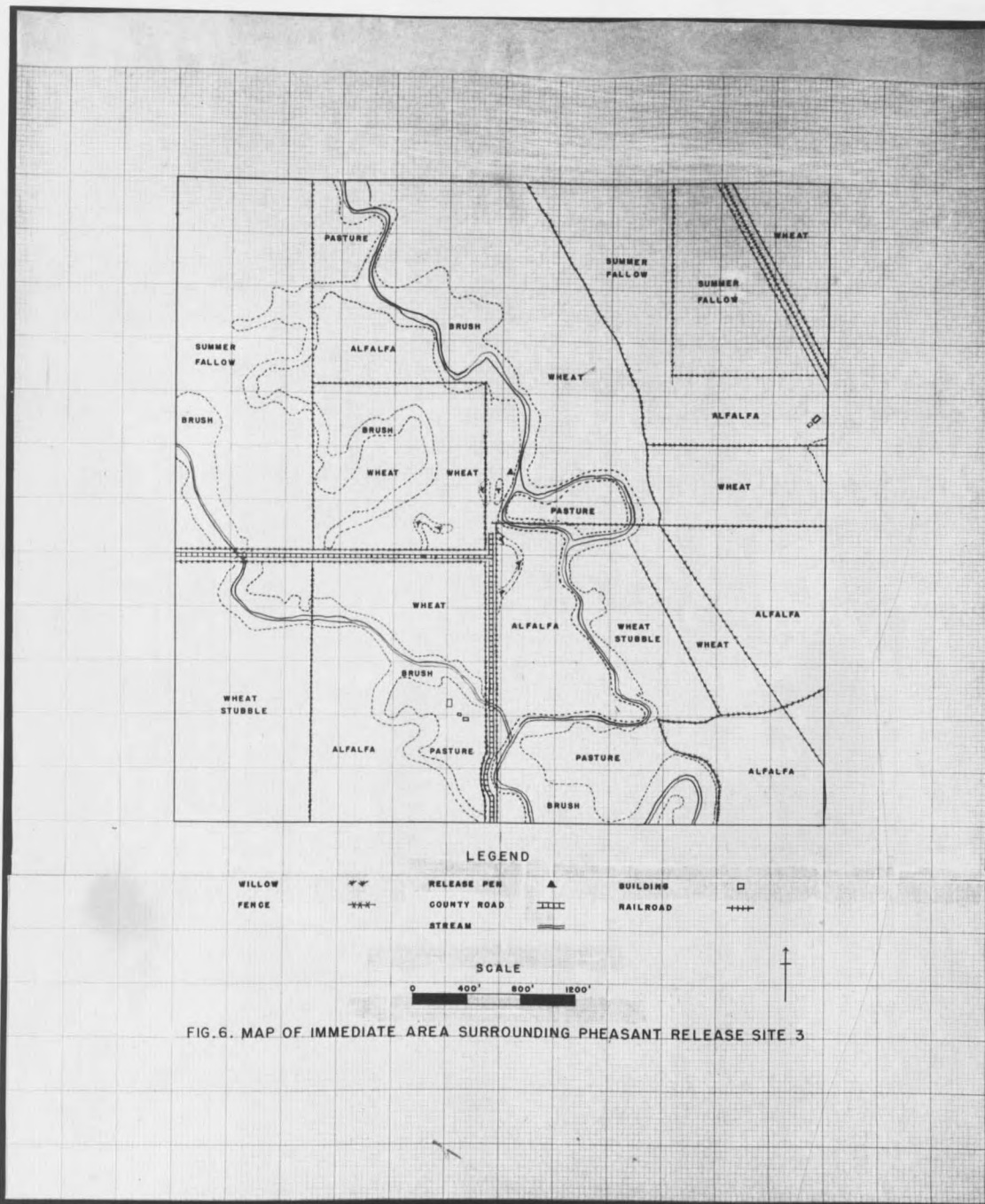


FIG. 6. MAP OF IMMEDIATE AREA SURROUNDING PHEASANT RELEASE SITE 3



Fig. 7. Release site 3 showing the gentle release pen.

hemlock (Conium maculatum), rose (Rosa fendleri), thistles (Cirsium arvense) and (Cirsium undulatum), willow (Salix sp.), cottonwood (Populus angustifolia), snowberry (Symphoricarpos occidentalis), gooseberry (Ribes setosum), orchard grass (Dactylis glomerata), timothy (Phleum pratense) and foxtail (Hordeum jubatum) (Figs. 8 and 9).

A release pen 50 by 25 by 4 feet similar to those described by Kozlik (1948) was constructed at each release site. The sides consisted of 2 inch mesh wire; the top of camouflage netting which provided shade. For protection against predators, an additional strip of 1 inch mesh wire was placed around the bottom to a height of about 18 inches. A single electrically charged wire was also placed at this height on two of the pens. A shelter was constructed in each to provide protection from inclement weather.

#### METHODS

Five hundred and fourteen 10 week old birds were used in the experiment. On August 16, 1948, 96 birds were released at release site 1; 45 ♂♂ by violent release method (no pre-release treatment) and 41 ♂♂ and 10 ♀♀ by the gentle release method (Kozlik 1948). In this method the pheasants were confined in release pens for two weeks where they were fed and watered regularly. Then the sides of the pen were elevated to allow the pheasants to escape gradually into the wild. In 1949, 418 birds were used in the study but only 375 (289 ♂♂ ) were actually released into the wild. Forty-

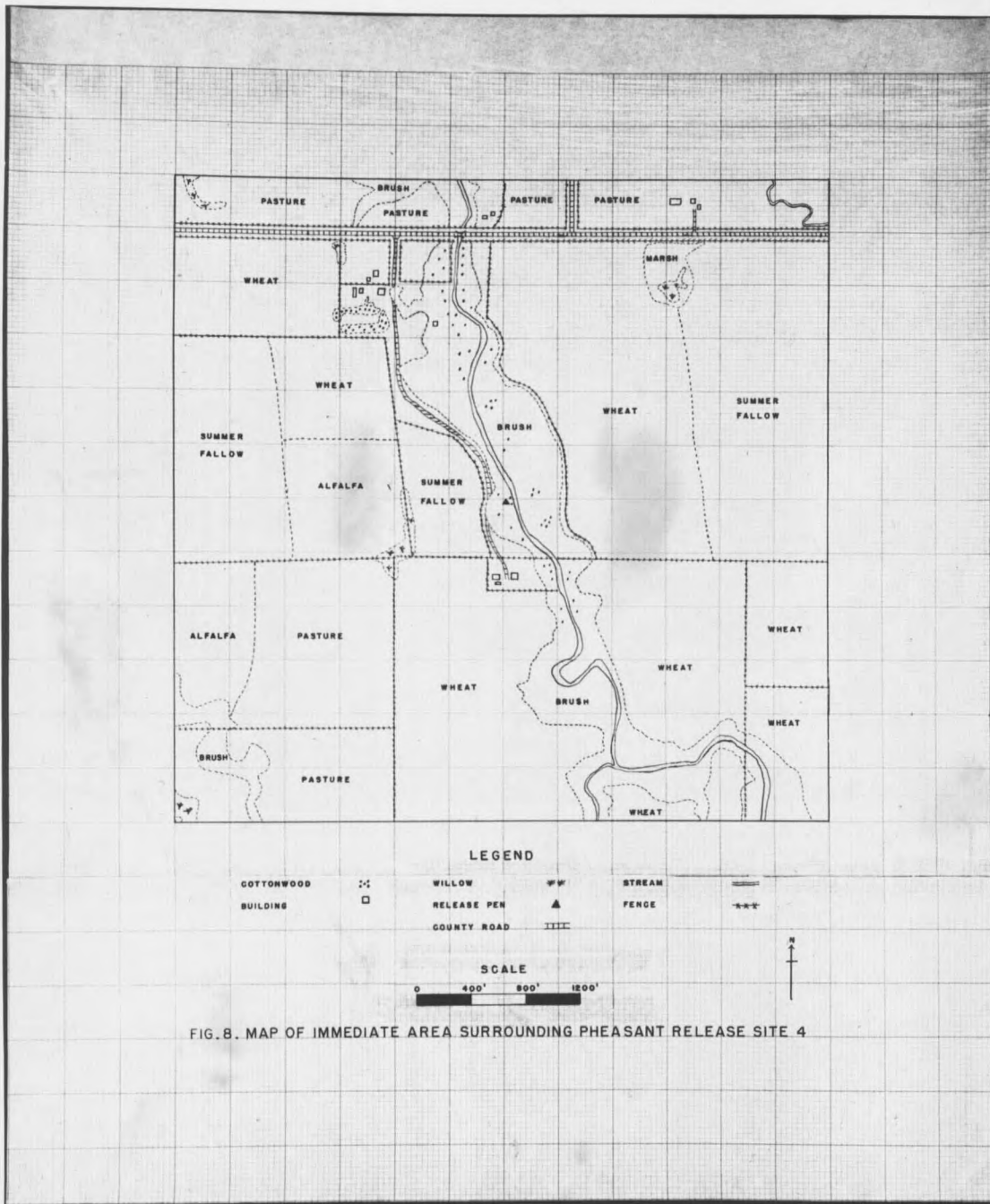


FIG. 8. MAP OF IMMEDIATE AREA SURROUNDING PHEASANT RELEASE SITE 4

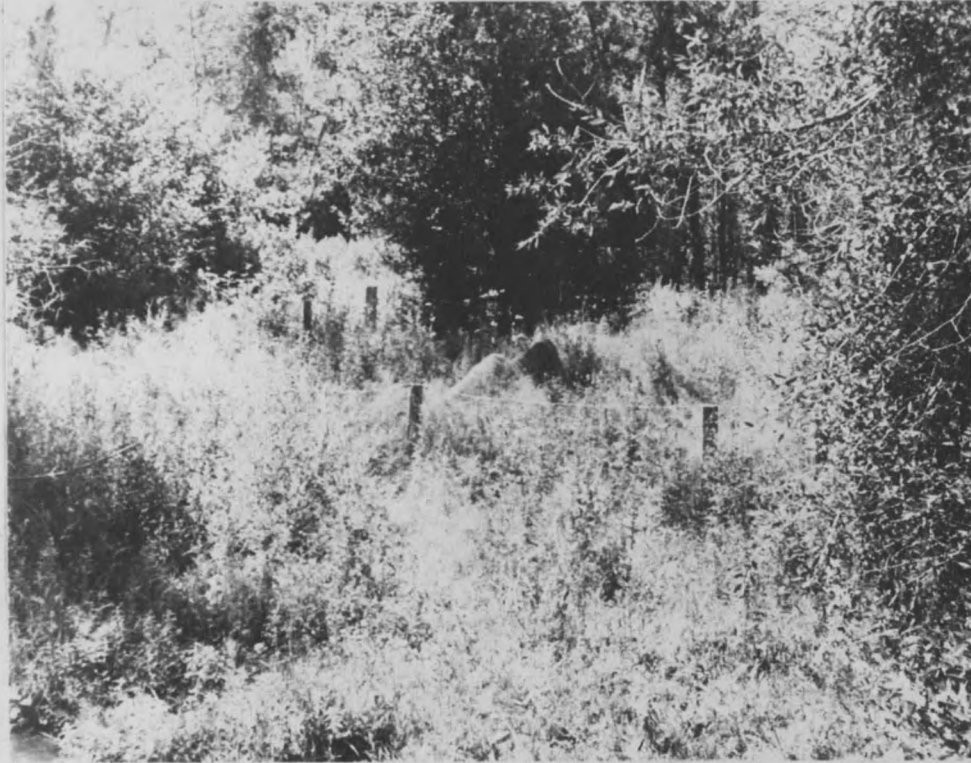


Fig. 9. Release site 4 showing the gentle release pen.

three died during the 2 week confinement in the release pens. This heavy loss was thought to be due to the poor condition of the birds when received rather than to any condition associated with confinement. No losses occurred in the release pen in 1948 when the birds received were in much better condition.

The birds were released August 29 as follows: Release site 1, 55♂♂ 5♀♀ violent release, 32♂♂ 14♀♀ gentle release; Release site 2, 55♂♂ 5♀♀ violent release, 28♂♂ 16♀♀ gentle release; Release site 3, 39♂♂ 8♀♀ violent release, 17♂♂ 18♀♀ gentle release; Release site 4, 46♂♂ 4♀♀ violent release, 17♂♂ 16♀♀ gentle release. The figures for violent release include 20 birds that escaped prematurely from the release pens.

Four methods were used to determine survival and movement; observations, hunter checking stations, trapping, and evaluation of band reports voluntarily returned by hunters.

All birds were marked and banded previous to release. In 1948 koroseal tags 2 by 3 inches were attached to the back of the birds' necks by means of a silver plated safety pin inserted through about  $\frac{1}{4}$  inch of skin, (Taber 1949). Red tags were used on those released by the gentle method, yellow on the others. In 1949 the birds were marked by painting the back of the head and neck with enamel. Eight colors, red, yellow, citron green, orange, orchid, dark blue, light blue, and dark green were used to identify the birds according to method and site of release. A month experiment with 27 captive birds

indicated the superiority of these enamels for permanency and visibility as compared to Rhodamine B extra, white side-wall paint, metallic aluminum paint, and yellow sheep marking paint. Daily observation in the release areas were made for 31 days in 1949 and 14 days in 1948 following releases. The cooperation of land owners in the immediate vicinity was solicited and prepared forms were supplied for recording observations.

Five hunter checking stations were set up at various strategic points in the valley and operated on week ends for ~~a total of~~ 5 days each during the hunting season (Oct. 30 to Nov. 13, 61 days after release) in 1949. The stations were located so as to intercept the majority of hunters from the area (Fig. 1). The kill of all hunters checking through the stations was examined. No checking stations were operated during the 1948 hunting season (Oct. 31 to Nov. 11, 75 days after release).

During the winter of 1950, 341 trap days (one trap one day) were completed between January 14 and March 16. The traps used were of the type described by Kutz (1945). They were placed in areas of pheasant concentrations and frequently moved (Fig. 1). Wheat and mixed grains were used for bait.

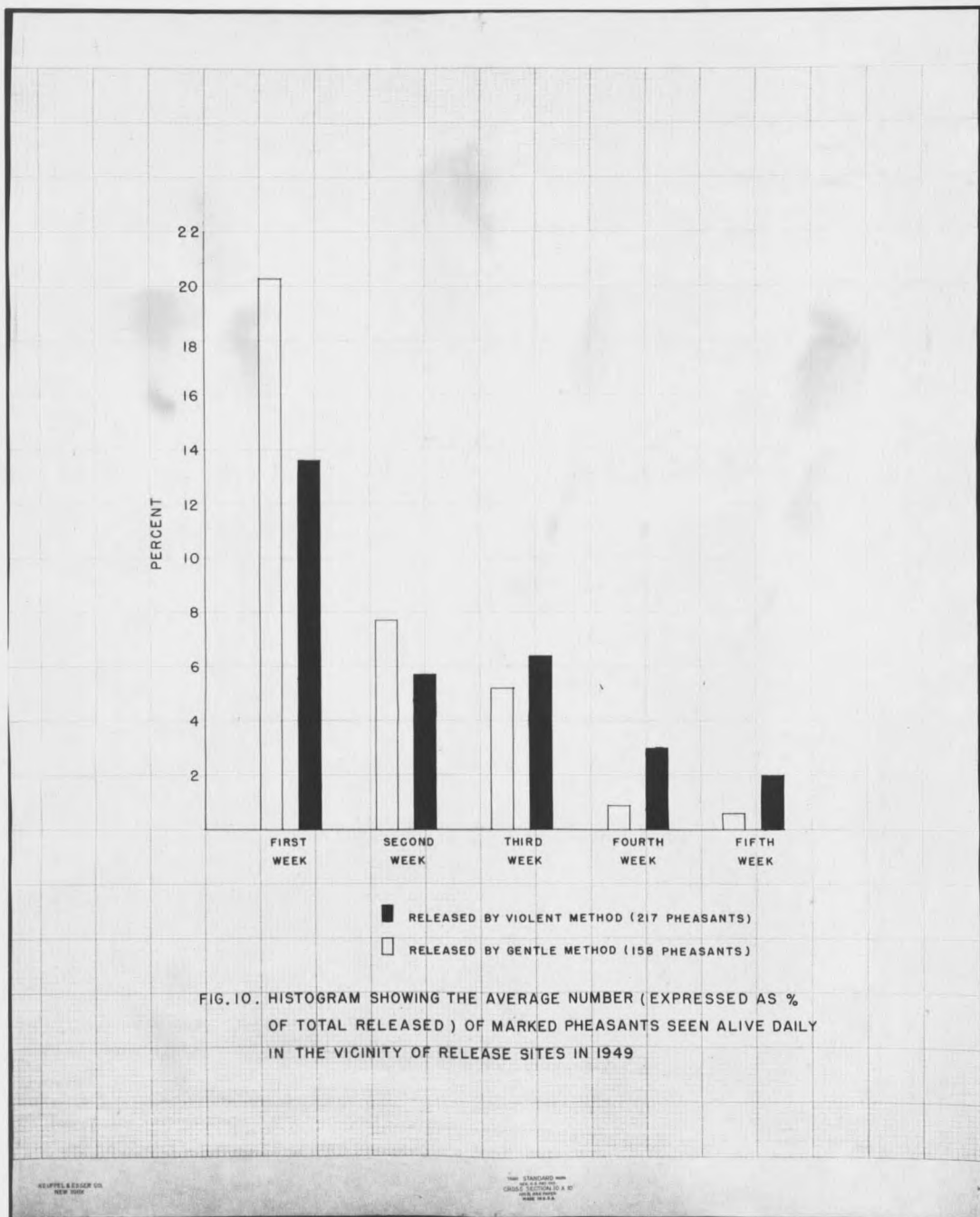
## RESULTS

### Dispersal From Release Sites

Several birds were seen in the vicinity of the release pen in 1948 following release but too few data were recorded for

quantitative analysis. In 1949 observations were intensified to determine the rate of dispersal of the pheasants released by the two methods. Eight hundred and thirty observations of marked birds seen in the vicinity of the release sites were recorded as sight records. Representatives of each of the 8 groups of marked birds were easily distinguished through the 21st day. From the 22nd to the 32nd day some difficulty was encountered in distinguishing the birds marked with the red and yellow. After 31 days, all markings were of limited value. The average number of birds from each release seen daily for each of the five weeks (only the first 3 days of the 5th week) following release are expressed as the percent of the total number released by each method in Fig. 10. The first week after release there was an average of 13.6 per cent of the violent and 20.3 per cent of the gently released birds observed in the areas daily. For the remaining weeks the percentages were as follows: second, 5.7 per cent violent, 7.7 per cent gentle; third, 6.4 per cent violent, 5.2 per cent gentle; fourth, 3 per cent violent, .9 per cent gentle; fifth, 2 per cent violent and .6 per cent gentle.

For the gentle release birds, the data definitely indicate a gradual dispersal from the release site. The same trend is suggested for the violent release birds. The data are not readily interpreted so far as comparing the dispersal rates of the two groups are concerned. During the first two weeks when about 73 per cent of the sight records were recorded, gentle release birds were seen more



often in the vicinity of the release sites. During the last 3 weeks, when only 27 per cent of sight records were recorded, the opposite was true. The fact that most of the sight records were recorded during the first two weeks would seemingly make that period most important for interpreting dispersal rates for the two groups. Furthermore, it would seem that some of the birds from each group would settle in the release area. If so, they could be represented in the sight records. Although the data available are not too conclusive, they suggest a slower dispersal rate for the gentle release birds. A later section on movements supports this conclusion.

#### Band Returns

Return of bands from birds taken during the 1948 hunting season was on a voluntary basis but local publicity was given the project. Only cocks were killed. There were 11 bands returned or 12.8 per cent of the total cock pheasant release. This total return consisted of 6 (13.3 per cent of violent release cocks) and 5 (12.2 per cent of gentle release cocks) (Table I). One female was found dead on a highway. One cock (1.2 per cent of the total cock release) was returned during the 1949 hunting season.

In 1949 when checking stations were used on week ends and trapping was conducted during the winter, bands from 42 cocks (14.5 per cent of total cock release) were returned. Thirty-one were violent and 11 were gentle release birds. These violent represented 15.9 per cent of the violent cock release and the gentles were 11.7

Table I

Number of Pheasants Released and the Number of Band Returns from Each Release Site

Year	Release Pen	No. Released	Band Returns 1948	How Taken	Band Returns 1949	How Taken
1948	I	Violent 45 ♂♂	6 ♂♂, 1 ♀	6 ♂♂ hunter 1 ♀ dead on highway	1 ♂	hunter
		Gentle 41 ♂♂, 10 ♀♀	5 ♂♂	5 ♂♂ hunter		
1949	I	Violent 55 ♂♂, 5 ♀♀			16 ♂♂	10 hunter 6 dead
		Gentle 32 ♂♂, 14 ♀♀			2 ♂♂	2 hunter
	II	Violent 55 ♂♂, 5 ♀♀			7 ♂♂	3 hunter 4 trapped
		Gentle 28 ♂♂, 16 ♀♀			7 ♂♂	2 hunter 2 trapped 3 dead
	III	Violent 39 ♂♂, 8 ♀♀			6 ♂♂	6 hunter
		Gentle 17 ♂♂, 18 ♀♀			7 ♂♂ 1 ♀	4 hunter 3 ♂♂ dead 1 ♀ dead
	IV	Violent 46 ♂♂, 4 ♀♀			9 ♂♂	8 hunter 1 dead
		Gentle 17 ♂♂, 16 ♀♀			2 ♂♂	1 hunter 1 dead

per cent of the total gentle release. By disregarding the trapping data a comparison with the 1948 figures can be made. Thirty-six cocks (12.5 per cent of total cock release) were taken by hunters. Twenty-seven were violent and 9 were gentle release birds representing 13.8 per cent and 9.6 per cent of the total releases respectively. These figures do not differ greatly from the 1948 figures suggesting that survival was about the same. The data further suggests that the voluntary return of bands in 1948 was about as effective as the use of checking stations in 1949.

Of the 87 cocks released at site 1 in 1949, 12 (13.8 per cent) were returned by hunters. Eleven (13.2 per cent) of the original 83 from site 2; 10 (17.9 per cent) of 56 from site 3 and 9 (14.3 per cent) of the 63 released from site 4 were returned by hunters or trapped during the winter (Table I).

Twelve, 1 hen and 11 cocks (3.8 per cent of the total cock release), were found dead from the time of release to the end of the hunting season.

For the two years the per cent band return (hunters and trapping) from released cocks was 14.4 per cent. A comparison of these results with some others obtained in other states are given in Table II. Although the data are not entirely comparable due to differences in method, time and place of release as well as differences in age classes it is apparent that the low rate of return for the present study is not inconsistent with results obtained

Table II

## A Comparison of Band Returns from Artificially Stocked Pheasants in Various States

Author and date of Publication	State	Number Released	Age at Release	Interval between Release and Hunting Season	Per cent Return			Comments
					1st yr.	2nd yr.	Total	
Gerstell, 1938	Penn.	1,983	Mature	6 weeks	19.1	.9		Vltry. Band Rtns.
		2,986	"	" "	24.2			" " "
		12,881	"	Spr. release	3.9			" " "
Buss, 1946	Wisc.	1,249	7-16 wks	35 to 110 days	11.0			" " "
		1,027	-	Released during hunting season	41.0			" " "
		1,210	8-12 wks	Released fall to summer	34.0			Checking hunters
		3,509	8 weeks	Late summer	9.7	.2		- -
Ginn, 1947	Ind.	4,203	8 weeks	July 13-Aug. 28	6.4			Vltry. Band Rtns.
Pushee, 1948	Mass.	6,363	6-20 wks	Summer-Fall	-	.1		" " "
		9,157	6-20 wks	" "	-	.3		Hunter Check
		5,935	-	-	-	.3		Postal Card Survey
		14,072	-	-	-	.5		
		17,827	-	-	-	-	-	
	Total	53,354				Below 10		
McNamara, 1949	New Jersey	16,219	-	July 15-Dec. 10	10.8	0.01		Checking Stations and Vltry. Rtns.
Present Study	Mont.	86	12 weeks	8 weeks	12.8	1.2		Vltry. Band Rtns. Trapping and
		289	12 weeks	" "	14.5			Checking Stations
	Total	375						14.4

elsewhere. The results obviously indicate a low return from artificially stocked pheasants. This fact need not be discussed here as it has been adequately covered by other authors.

The data indicate no marked differences in the survival rates of pheasants released by the two methods. For both years a higher percentage of violent release birds were recovered than gentle release birds (see above) but no particular significance can be attached to the small differences because of the small number of birds involved. Seemingly the survival rate for the two groups was somewhat the same. These data do not conform with the figures and statements of Kozlik (1948). From his work in Wisconsin he secured returns from gentle release birds as follows: 22 and 24 per cent from August releases of 6-week old birds and 51 per cent from full grown cocks released in October just a few days before the hunting season. Although he does not give figures in support, he concludes, "All evidence gathered in Wisconsin indicates that pheasants stocked from the gentle release pen have an increased survival." Figures published by Kozlik (1949) at a later date do not substantiate this earlier statement. His figures indicate a return of 180 and 179 respectively of crate and pen released birds when 307 ten-week old birds were released by each method in August. Further data by Kozlik (personal communication) likewise show no marked difference in survival rate of gentle and violent release birds. In August 1949, 306 juvenile cocks were stocked by each of the methods. The per cent

return was 49 and 56 per cent respectively for the violent and gentle methods. These later findings of Kozlik corroborate the findings of the present study so far as comparative survival rates of pheasants released by the two methods is concerned.

Because of the small number of pheasants and the small area involved in the study (see Study Area) it is difficult to correlate survival with the place of release. Although all the release areas are somewhat different all are included in the same general type. The data show a slight predominance in the hunter take from birds released at site 3 (17.9 per cent of cock release). The returns from the other areas were site 4 (14.3 per cent), site 1 (13.8 per cent), and site 2 (13.2 per cent). In the absence of quantitative measurements of good pheasant cover it is difficult to state which of the release areas possess the best cover. Figures 2, 4, 6, and 8 reveal that release site 1 has the least ground cover in the way of brush and dense herbaceous vegetation. Each of the three other areas have much brush and dense herbaceous vegetation in the immediate vicinity. Inasmuch as only one of these, site 3, apparently had a greater survival than site 1, the data do not reveal sufficient information for conclusions regarding survival at the four release sites.

A possible cause for the slight predominance of returns from site 3, could be due to the fact that this area is extremely well liked by hunters because it is never closed to hunting, and is easily

accessible to hunters from nearby towns. The relationship of habitat to survival has been discussed at some length by Gerstell (1938) and McNamara (1949). They concluded that the highest returns came from areas possessing better pheasant range in Pennsylvania and New Jersey.

#### Artificial Stocking vs Natural Reproduction

The checking station data for 1949 supplies a reasonably large sample of the source of pheasants in the hunters' bag. During the five days that the checking stations were in operation 493 pheasants killed by hunters were checked. Twenty-one (4.3 per cent) were banded in August 1949 (Table III). These data indicate that game farm pheasants supplied only a small part of the hunter take. This conclusion is justified because all pheasants released in the area in 1949 were banded. In light of the work of Buss (1946) the possibility of a game farm pheasant losing a leg band seems remote. He states, "To prove or disprove the allegation that pheasants lose aluminum butt-end bands, 1,000 mature birds were banded at the Wisconsin State Experimental Game and Fur Farm, banded, and released during the fall of 1940 in 40-acre fields planted to corn and grown to weeds and scrub oak. When checked in the spring of 1941 these pheasants showed no band losses." The possibility of any of these birds being of game farm origin from releases earlier than 1948 is very small. McNamara (1949) from his own work and the work of others, states, ". . . the survival of pen-reared pheasants from the first to the second hunting season based on bands returned from

Table III

Age Class and Source (Game Farm or Wild) of Pheasants Checked at Checking Stations in 1949.

Age Class	Number			Bursa	Spur	Mandible <sup>1</sup>
	Banded	Not Banded	Total			
Juvenile	5	0	5	?	?	?
	16	232	248	Present	Less than 3/4"	Not ossified
		19	19	"	"	?
		43	43	"	"	Ossified
		19	19	"	More than 3/4"	Not ossified
		7	7	"	"	Ossified
		1	1	"	"	?
		10	10	?	Less than 3/4"	Not ossified
Total	21	331	352			
Adults		88	88	Absent	More than 3/4"	Ossified
		13	13	"	Less than 3/4"	"
		8	8	"	More than 3/4"	Not ossified
		2	2	"	Less than 3/4"	?
		1	1	"	More than 3/4"	?
		2	2	"	Less than 3/4"	Not ossified
		5	5	?	More than 3/4"	Ossified
	Total	0	119	119		
Unknown		22	22	?	?	?
Total	21	472	493			

<sup>1</sup> Not ossified indicates that mandible did not support weight of bird.

? Denotes character was not checked or inconclusive.

Bands indicate Game Farm Pheasants.

27,592 birds is less than one per cent."

An analysis of the age classes of the birds checked at the station supplies additional information on the importance of natural reproduction. Wildlife students from Montana State College were employed. They were instructed in methods of determining age classes. Three methods were used: examination for presence of bursa (Gower 1939, Linduska 1943, Kirkpatrick 1944, others), in which its presence indicates a juvenile; the use of the age gauge, (Kimball 1944) in which the age is determined by the length of the spur. Birds with spurs less than  $3/4$  inch long are considered juveniles; and the mandible test of Linduska (1945) which involves lifting the bird by the mandible to determine whether it will support the weight of the bird. This method determines the amount of ossification of the skull. A soft mandible which breaks indicates a juvenile bird. The checking station operators were instructed to be extremely careful in all observations and to record all questionable data as such. They were further instructed to make all three tests on birds only when it was possible to do so without delaying hunters during rush hours. For this reason data are incomplete for some. In some instances the only data secured was whether the bird was banded. All birds were checked for bands. Even in cases where data are complete, the three methods did not always give uniform results (Table III). In questionable cases, the presence or absence of the bursa was considered sufficient for determining the proper age class. Kirkpatrick (1944) states that

the presence of the bursa is a positive indicator of juvenile birds. Where the bursa character was not known a combination of the spur and the mandible tests was used.

Of the 493 birds checked, 331 (67.1 per cent) were wild juveniles, 21 (4.3 per cent) were game farm juveniles, 119 (24.1 per cent) were wild adults, and 22 (4.5 per cent) were wild birds of unknown age classes. These data clearly indicate that the majority of birds taken by the hunter were juveniles and only a minor proportion of these were game farm birds. The ratio of juvenile to adult was 2.9 to 1. The ratio of wild juveniles to wild adults was 2.7 to 1. Allen (1947) published data indicating birds of the year make up the important part of the hunter take. The ratio of adult to juveniles ranged from 1:2.6 to 1:16.3 for six hunting seasons at the Rose Lake Experiment Station in Michigan.

#### Movements From Release Sites

Band returns on 48 pheasants released in 1948 and 1949 provided information on the movement of artificially stocked birds (Table IV). The information was obtained from hunters, by trapping, and from reports accompanying band returns. The exact location where banded birds were taken was not always definitely established. For this reason, the data are grouped into convenient categories.

Table IV. Distances traveled from release site by game farm pheasants as indicated by band returns and trapping.

Method of Release	Distance Moved (miles)			
	Less than 1	1 - 3	4 - 5	9 - 14
Gentle	9 (56.2%)	6 (37.5%)	0	1 (6.2%)
Violent	11 (34.4%)	18 (56.2%)	1 (3.1%)	2 (6.2%)
Total	20 (41.7%)	24 (50%)	1 (2.1%)	3 (6.2%)

Of the 48 birds, 20 (41.7 per cent) moved less than one mile, 24 (50 per cent) moved from 1 to 3 miles and 1 (2.1 per cent) moved from 4 to 5 miles. The remaining 3 (6.2 per cent) moved from 9 to 14 miles. Most of these movements were accomplished between the time of release and the end of the hunting season (62 to 76 days). Two killed by cars had moved 1.5 miles in 18 days. The 6 trapped were caught about .5 miles from the release site 192 to 199 days after release. The maximum movement, 14 miles, was accomplished in 62 days. The data are few but indicate that more gentle release birds settled within a mile of the release sites than violent release birds (56.2 and 34.4 per cent respectively). More violent (56.2 per cent) moved 1 to 3 miles than gentles (37.5 per cent). For movements of 4 to 14 miles the violent were also in the majority (see Table IV). Observations, discussed under dispersal, verify these findings.

These data compare favorable with those of McNamara (1949).

He studied the drift of 315 male pheasants. About 50 per cent were shot within one mile and 98 per cent within ten miles of the release sites. The maximum drift was 23 miles. Wandell (1945) on returns of 881 male pheasants, found that 65.9 per cent moved less than one mile and 96.4 per cent drifted less than 10 miles from the point of release.

## SUMMARY

1. A detailed small scale study was conducted in Gallatin County, Montana 1948-50 to secure survival data on game farm pheasants released in that area.
2. The data are evaluated on the basis of dispersal from release sites, band returns, band returns as influenced by method and place of release, relative importance of banded pheasants in the hunters' bag, and movements of game farm pheasants.
3. Four-hundred and seventy-one game farm pheasants were released at four release sites by the gentle and violent release methods.
4. The data suggested a slower dispersal rate for the gentle release birds.
5. Band returns secured by the use of checking stations, traps, and hunter reports indicated a 14.4 per cent return of released cocks.
6. No marked difference in the survival rate of gentle release pheasants and violent release pheasants was noted.
7. Only 21 (4.3 per cent) of 493 pheasants checked at hunter checking stations in 1949 were game farm birds. Of the remainder 331 (67.1 per cent) were wild juveniles, 119 (24.1 per cent) were wild adults, and 22 (4.5 per cent) were wild birds of unknown age classes.
8. Movements from release site to point of kill for 48 birds was determined. Twenty (41.7 per cent) moved less than 1 mile,

24 (50 per cent) moved from 1 to 3 miles, 1 (2.1 per cent) moved from 4 to 5 miles, and 3 (6.2 per cent) moved from 9 to 14 miles. A greater percentage of gentle than violent release birds settled in the immediate vicinity of the release sites.

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