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An Evaluation of Conservation Reserve Lands in Relation to Pheasant Production and Survival

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AN EVALUATION OF CONSERVATION RESERVE LANDS IN RELATION TO PHEASANT PRODUCTION AND SURVIVAL

by

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Richard M. Bartmann

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INTRODUCTION

The ring-necked pheasant (Phasianus colchicus) is one of the most important upland game species over much of the nation. It is also one of the most difficult to effectively manage for the increasing hunter population. The high value of agricultural lands renders habitat improvement programs by state agencies a financial impossibility except on an extremely localized basis. Therefore, the primary pheasant management tool largely remains hunting season manipulation.

The federal government through various agricultural programs may have an influence upon pheasant habitat. Public Law 540 entitled "Agricultural Act of 1956," more commonly referred to as the "Soil Bank Act" (Congress, 84th, 2d Session 1956, 1957), seemed quite promising in this respect. This act provided for two programs, the Acreage Reserve and the Conservation Reserve. The first was a short term program and of negligible value for pheasants. The second was of longer duration and is the one under which remaining Soil Bank lands are included.

Under the Conservation Reserve, cropland was taken out of production and a sound conservation practice established in an attempt to balance the total production and demand of surplus crops. Farmers signed contracts for periods of three to ten years. The federal government then shared the cost of establishing conservation practices and made annual payments for maintaining them during the contract periods. The Conservation Reserve program has not been extended since 1960. Consequently, all remaining contracts will have expired by the end of 1971.

Relatively little Conservation Reserve land has been put into "G" practices specifically designed for wildlife. These include such things as wildlife food and cover plantings, development or restoration of shallow water areas, and construction of ponds and wildlife watering facilities. Instead, the bulk of wildlife benefits will have to be derived from the "A-2" practice, the establishment of permanent vegetative cover, since this is the one most widely employed. Any appraisal of the Conservation Reserve then is, in actuality, an evaluation of habitat provided by the "A-2" practice.

Some states have studied the effects of the Conservation Reserve program for wildlife: Kentucky (Hornsby et al., 1962), Michigan (Fouch, 1963), and South Dakota (Trautman, 1962). Little research has been done in the west.

About 208,000 acres of permanent vegetative cover were established in Utah under the Conservation Reserve program (U. S. Department of Agriculture, Utah Agricultural Stabilization and Conservation State Office, n.d.). Most of this was located outside the pheasant range, but considerable amounts were present in some areas supporting good pheasant populations. Therefore, a project was initiated by the Utah Cooperative Wildlife Research Unit in cooperation with the Utah State Department of Fish and Game to evaluate the Conservation Reserve for the pheasant in northern Utah. The study ran from April, 1964, to December, 1965.

The study had two objectives:

(1) to determine the extent of pheasant use of Conservation Reserve lands for the different phases of reproductive cycle.

(2) to determine the general cover characteristics that effect pheasant use of, and survival in, Conservation Reserve and other vegetation types.

For ease of readability, the term "Soil Bank land" will be considered synonymous with "Conservation Reserve land" in this study.

REVIEW OF LITERATURE

Few studies concerning the value of Soil Bank lands for pheasants and other game birds have been published. Schrader (1959) conducted an extensive type study. He tried to correlate pheasant densities with Soil Bank lands. Data from road-side counts made in five midwestern states were used. Though a low correlation coefficient (+0.262) was derived, he did find that counties containing five or more per cent of Soil Bank land appeared to have the highest pheasant densities.

Hornsby et al. (1962) concluded that Soil Bank lands were generally not important game bird habitat, particularly for bobwhite (<u>Colinus virginianus</u>), in Kentucky. This was mainly due to the choice of fescue grass as a cover crop. This species tends to become dense and matted.

Fouch (1963), in Michigan, measured pheasant crowing, brood use, and hunter success on Soil Bank farms compared to cultivated farms. His studies revealed that measurable increases in each of these items resulted from Soil Bank practices.

The most intensive Soil Bank nesting studies have been done in South Dakota. Trautman (1962) rated established Soil Bank cover as the most important nesting type from the combined standpoints of size, pheasant use, hatching success, and brood production. He also listed three characteristics that distinguished Soil Bank cover from all other types: (1) excellent supply of residual vegetation, (2) freedom from mechanical disturbance, and (3) freedom from excessive mammalian predation. Dahlgren (pers. letter, 1965) mentioned that a substantial increase in pheasant populations occurred in South Dakota with the start of the Soil Bank, and that a substantial decrease is now noted each year as the program is going out.

DESCRIPTION OF STUDY AREA

General Study Area

The general study locale is in the southern half of Blue Creek Valley in north-central Box Elder County, Utah. This area is commonly referred to as Howell Valley (Figure 1). For purposes of this report, Howell Valley will include that land bounded by the hills to the east and west, Interstate 80-N to the north, and Thiokol Chemical Corporation Plant 78 to the south. This includes an area approximately six miles wide by nine miles long. The elevation ranges from about 4500 to 4800 feet. Rainfall averages between 12 and 14 inches yearly, about one-third of which falls during April, May, and June (Northern Utah Soil Conservation District et al., 1960).

Nearly 3000 acres in the central portion of the valley are irrigated. Principal crops grown there are alfalfa (*Medicago sativa*), barley (*Hordeum vulgare*), and wheat (*Triticum aestivum*). Cattle and sheep are grazed on the meadows along the main Blue Creek drainage.

Dry-farm land is devoted primarily to a winter wheat-summer fallow rotation. Smaller acreages are in barley and alfalfa. Grass-legume plantings have been made under various agricultural programs. Sagebrush (*Artemisia tridentata*) is common along gullies, fencerows, road-sides, and in other untillable areas. The surrounding sagebrush covered hills are utilized as spring and fall sheep range.

Water is scarce during the summer on dry-farm land. The main free water sources at this time are Blue Creek Reservoir, situated to the

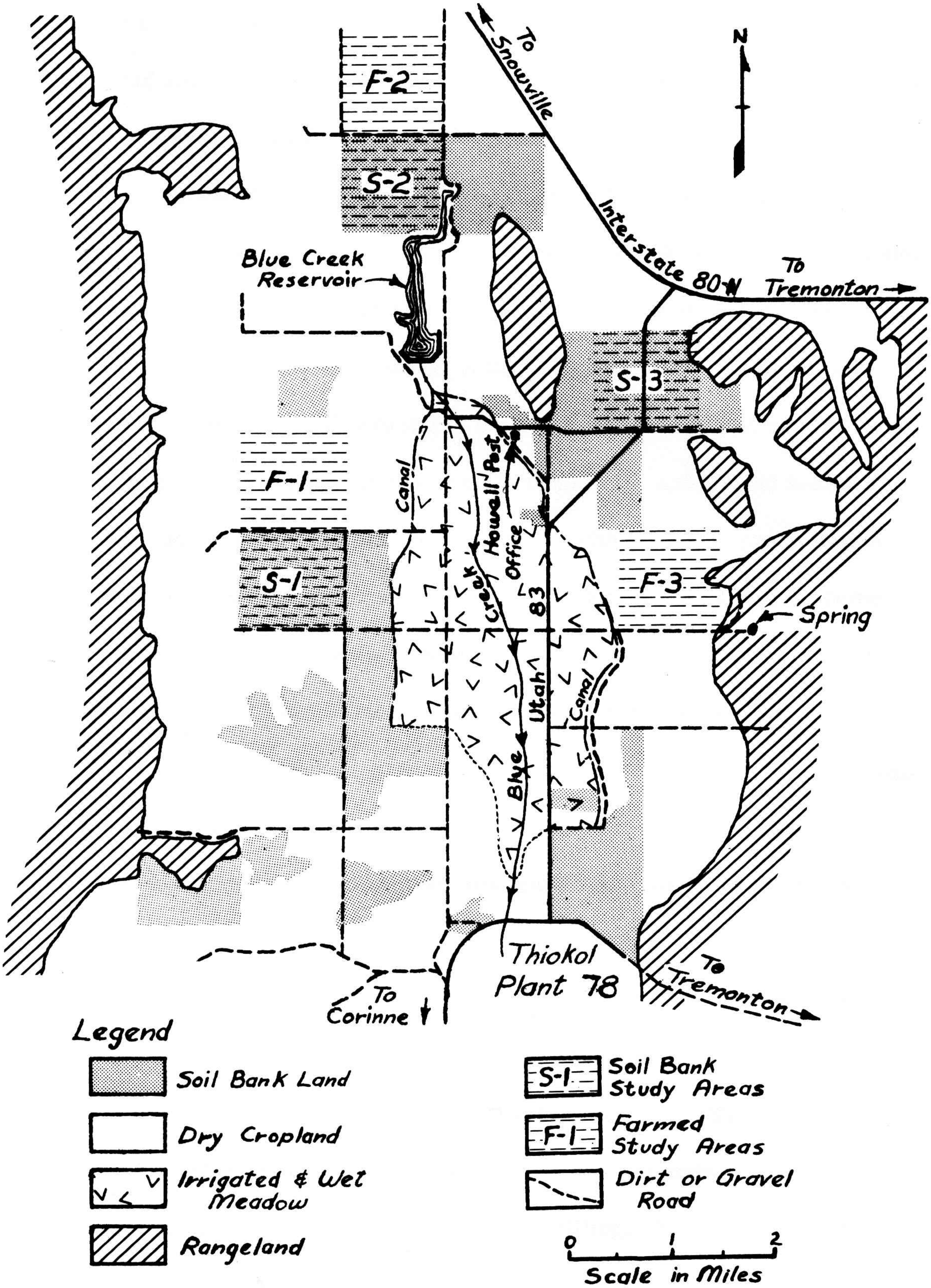

Figure 1. Location of pheasant study areas in Howell Valley, Utah, 1964-65.

north of the irrigated cropland, and two irrigation canals. The reservoir is spring fed and contains about 2000 acre-feet of water when full (Northern Utah Soil Conservation District et al., 1960).

A small watershed project is currently under construction in Blue Creek Valley. Some provisions that may benefit wildlife are: artificial watering devices (gallinaceous guzzlers), grassed waterways, and debris basins. Twenty "guzzlers" have been placed in the hills adjacent to the dry cropland. Debris basins are earthfill structures built at the lower ends of major drainages to collect sediment. They are designed to contain the anticipated sediment accumulation for a 50-year period. However, with favorable precipitation they could provide free water on dry-farm land during the summer. Some woody plantings were made along watercourses. Most of these were killed by crop sprays and were subsequently omitted from the work plan.

Land in Howell Valley was placed in the Soil Bank from 1956 through 1960. At the start of the study in 1964, over 6000 acres, nearly 20 per cent of the farmed area, were under Soil Bank contracts. All of these will have expired by 1970.

Soil Bank land in the valley was planted to an alfalfa-crested wheatgrass (Agropyron cristatum) mixture (Figure 2). Planting rates varied between landowners, but most drilled about two pounds of alfalfa and four pounds of crested wheatgrass per acre. The resultant stands were largely dependent upon weather conditions following drilling. For the most part, results were good (Figure 3).

Figure 2. Soil Bank lands in northern Utah were planted to an alfalfa-crested wheatgrass mixture. Note the abundant old vegetation. (Utah Cooperative Wildlife Research Unit).

Figure 3. Excellent pheasant cover provided by alfalfa and crested wheatgrass on Soil Bank land. Picture was taken in August. Black specks are alfalfa fruits.

Specific Study Areas

Three pairs of dry-farm sections were selected as intensive study areas (Figure 1). One section of each pair was in the Soil Bank and the other was farmed. Soil Bank sections were designated as S-1, S-2, and S-3. Their farmed counterparts were labeled F-1, F-2, and F-3. The cover types and their respective acreages on the study areas are shown in Table 1.

There is a 24-acre difference between the 1964 and 1965 total acreage figures for farmed sections in Table 1. Section F-2 contained 58 acres of expired Soil Bank cover that had not been plowed when the study began. By 1965, 24 acres of this had reverted to regular farming practices and were included as part of the study area.

Aside from alfalfa and crested wheatgrass, cheatgrass (*Bromus tectorum*) was the only other abundant species on Soil Bank lands during the first part of the summer. Later, prickly lettuce (*Lactuca scariola*), gumweed (*Grindelia squarrosa*), Russian thistle (*Salsola kali*), and sunflower (*Helianthus annuus*) began appearing. Good stands of alfalfa and crested wheatgrass seemed to act as weed suppressants. Consequently, these four weed species were restricted to less densely vegetated areas (Figure 4).

Sagebrush was the only type common to both Soil Bank and farmed sections. Other prevalent species in this type were rabbitbrush (*Chrysothamnus* spp.), cheatgrass, and Canada wildrye (*Elymus canadensis*). The latter occurred in the moister gully bottoms. The same four late summer weeds described previously as occurring in Soil Bank fields also appeared in sagebrush.

Table 1. Cover types and their acreages on pheasant study areas in Howell Valley, Utah, 1964-65

	Soil Bank study areas		Farmed study areas	
Cover type	1964 (acres)	1965 (acres)	1964 (acres)	1965 (acres)
Soil Bank	1582	1582		
Sagebrush	294	294	101	101
Wheat			528	772
Barley			59	0
Alfalfa			98	85
Grass-legume			58	164
Grass			20	20
Fallow			979	725
Total acres	1876	1876	1843	1867

Alfalfa, as a harvested crop, occurred only on section F-1. Another unharvested 13 acre stand, which had been planted as diverted acreage, was present on section F-3 in 1964 only.

Grass-legume plantings, identical in most respects to Soil Bank cover, were present on two farmed study sections. Plantings on section F-1 were made under the Agricultural Conservation Program. Cover development there was generally poor (Figure 5). These areas were also grazed sporadically during the year. In 1965, section F-3 had new plantings on diverted acreage. No appreciable growth occurred until weeds appeared later in the summer.

One farmer on section F-3 had planted a 20-acre field to crested wheatgrass on his own initiative. The resultant vegetation was sparse and no crop was harvested either year.

Weather data during the study were obtained from a station maintained at Thiokol Chemical Corporation Plant 78 at the south end of the valley (U. S. Department of Commerce, Weather Bureau, 1964-1965).

Pheasant Populations

The status of pheasant populations in Howell Valley prior to the study is not known. My own observations show that the population increased during the two year study period. The sequence of general conditions leading and contributing to this increase are given in the following summary.

The winter of 1963-64 was characterized by prolonged deep snow and unprecedented periods of below zero temperatures. Some damage to haystacks occurred when pheasants concentrated around farmsteads to find food. Many

Figure 4. The less densely vegetated areas on Soil Bank lands produced abundant weed growth in late summer.

Figure 5. Grass-legume plantings made under various other federal agricultural programs generally provided little cover for pheasants on the farmed study areas. Fallow ground is on the right.

farmers estimated the number of dead pheasants around their farmyards to run into the hundreds.

Cold wet weather prevailed through mid-June of the 1964 nesting season. Residual vegetation had been literally flattened by snow and new growth did not begin until late April. Once started, however, it developed rapidly spurred by abundant moisture.

The following winter, 1964-65, was comparatively mild. Snow cover was infrequent as were below zero temperatures. Pheasants remained scattered over the valley and suffered no undue hardships.

The 1965 nesting season was considered successful. Residual cover was abundant and new growth started in early April.

METHODS

Most pheasant habitat management is done to improve production and reduce mortality. It is in regard to these two items that Soil Bank lands appeared to hold most promise. Therefore, the possible effects of Soil Bank cover on pheasant production and survival were measured by the following parameters: spring density (crowing counts), nesting density (nest counts), summer density (brood counts), fall density (hunter success), and winter density (roost counts). Vegetation analyses provided bases upon which to interpret results of the above surveys.

Vegetation Analysis

The point frame method (Levy and Madden, 1933) was used to determine vegetation density. Temporary transects extended diagonally across each cover type (Figure 6). Stops (ten density readings per stop) were equally spaced, by pacing, along the transect lines. A total of 25 stops was used in each cover type on each section except for the 1964 analysis in grainfields when 10 stops were used. Two height measurements were also made at each stop.

Two analyses were made during spring and summer each year to compare general vegetation characteristics in Soil Bank, grain, and alfalfa types during the growing season. Two additional analyses in March and October, 1965, were made to determine residual cover differences between Soil Bank and stubble fields.

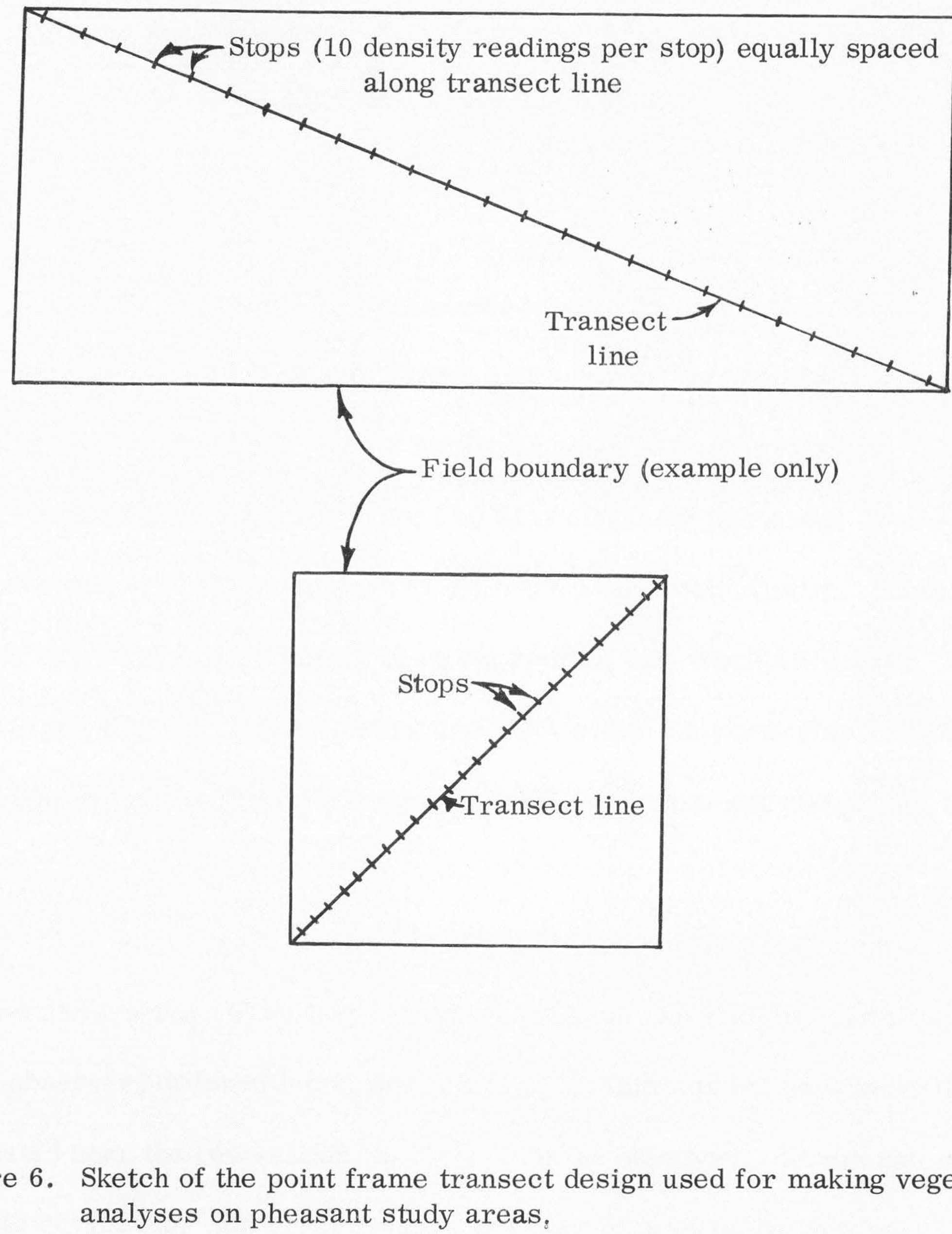

Figure 6. Sketch of the point frame transect design used for making vegetation analyses on pheasant study areas.

Three types were not surveyed: sagebrush, grass, and grass-legume. The growth form, irregular topography, and erratic distribution of sagebrush areas precluded analysis. The importance of the grass and grass-legume types was negligible due to poor cover development.

Pheasant Population Analysis

Spring density

Crowing count results were used as comparative indices of pheasant cock densities on Soil Bank and farmed areas during the breeding season. Crowing counts were made in late April and early May of both years. A modification of the method described by Kimball (1949) was used. A crowing route was established on each of the three study section pairs. Each section corner was designated a counting station; thus there were eight stations per route. All calls emanating from within the particular section under observation at each station, during a three minute interval, were recorded.

A problem arose in deciding whether or not certain calls originated with the study area. When they occurred along the two section lines adjacent to the observer, differentiation was quite easy. This was not so when calls originated near the two section lines opposite the observer. No attempt was made to correct for this error in 1964 as I thought it would balance out. The second year, I counted only the clearest calls. Judgement error became a factor this time, but I do not believe that it was of any greater consequence than in the previous instance.

Nesting density

Nest searches were conducted in 1964 and 1965 to compare nest densities in Soil Bank, alfalfa, grain, and sagebrush cover. A one-half acre circular plot (83.3 ft. radius) was used as the basic sampling unit. Each was randomly chosen with the aid of a dot grid and aerial photos, and located in the field by pacing from known landmarks or from previously established plots. If part of a plot, excluding the center point, overlapped another type, the plot was moved perpendicular to the type edge far enough to exclude the adjacent type. On irregular areas, such as narrow gullies, where the use of circular plots was not feasible, a segment equal to one-half acre was marked off and searched.

It was recognized that certain areas would have no chance of being included in the sample if circular plots were used. On the other hand, much time was saved in locating and searching circular plots and I believe efficiency was increased.

Each plot was systematically searched in concentric circles from the center outward (Figure 7). A metal rod was hammered firmly into the ground at the center point. A rope tied to the rod was used to keep the radius of each successive circle constant. The vegetation was parted with a stick.

The sampling rate in 1964 varied somewhat between types but averaged about 1 acre in 17. The additional time and labor available the next year allowed searching an average of 1 acre in 14. Plots were checked once in 1964 from June 3 to August 26. Most plots were checked twice in

Figure 7. Pheasant nest searches were conducted on one-half acre circular plots. Center post is barely visible in the upper right corner. (Utah Cooperative Wildlife Research Unit).

1965: once from May 11 to June 11 and again from June 16 to August 16. Mowing prevented a second search of alfalfa fields. Except for the first search in 1965, grainfields were checked after combining. This prompted the late completion date each year. An assistant was hired in 1965 only.

Grass-legume and grass types on farmed sections were not searched because of small acreages and poor cover conditions.

Summer density

Brood transects were run during August of 1964 and 1965. Brood use of Soil Bank and farmed sections was compared on the basis of young pheasants per 1000 feet.

Twenty-four points were equally spaced along each of two adjacent sides of a section (Figure 8). One point from each successive group of six was randomly chosen. A straight line drawn across the section from each of these points delineated a brood transect. This design proved effective in giving a proportionate sample of each cover type. The maximum deviation from actual proportions was 1.5 per cent.

Brood transects were run on horseback four times each year beginning immediately after wheat harvest. Counts were made three times daily: morning, noon, and evening. Morning counts began one-half hour after visible sunrise,[1] noon counts at 11:00 a.m., and evening counts two and one-half hours before visible sunset.[1] The number of young pheasants

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[1]Visible sunrise and sunset are defined as those times that the sun appears and disappears over the local horizon, respectively. In the small confines of a valley, these times can vary considerably. Therefore, a compromise time between extremes was used.

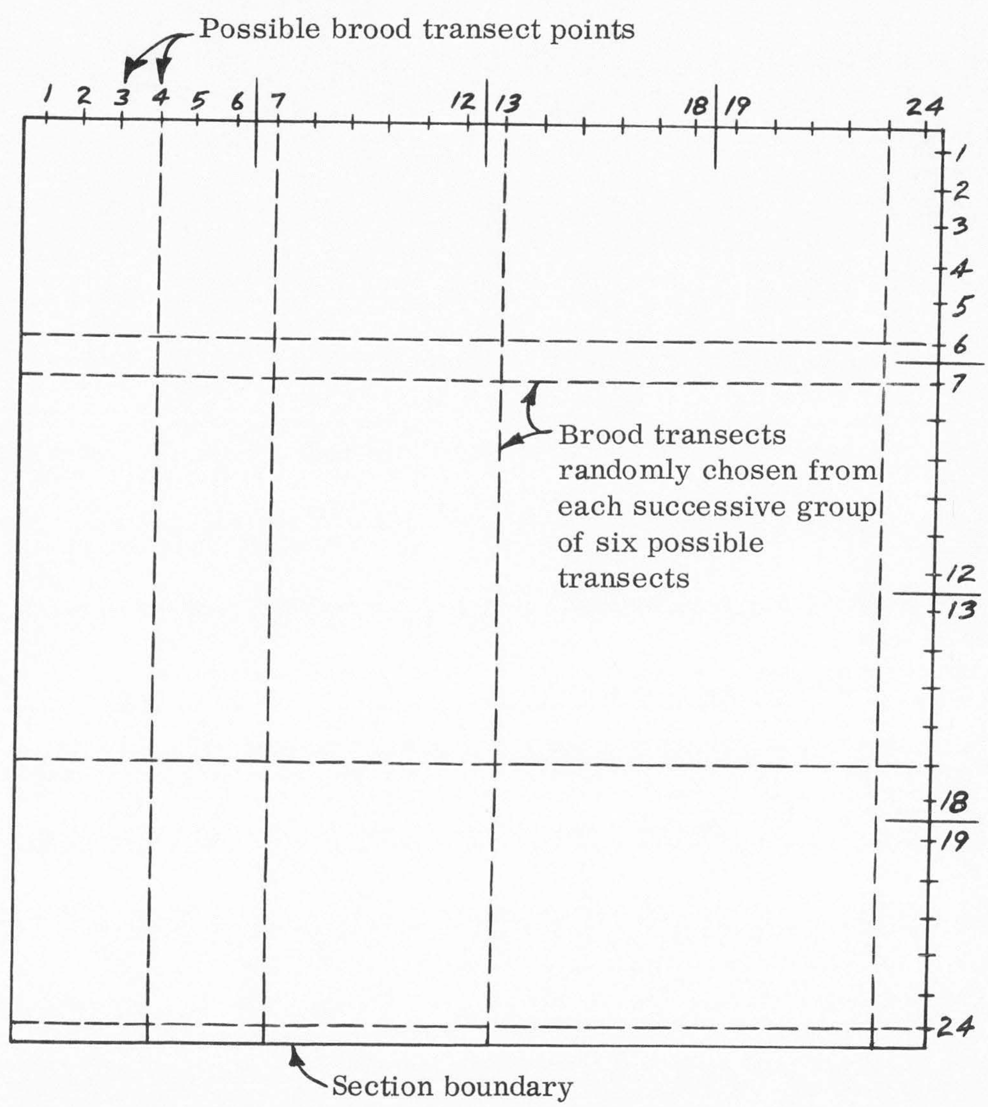


Figure 8. Sketch of the pheasant brood transect design used on study areas.

flushed within 100 feet of the transect line, and the cover type flushed from, was recorded. Landmarks were used to prevent straying off the routes.

Fall density

Hunting season studies were made each year to determine hunter preference of, and success on, Soil Bank versus farmed areas. Investigations were made on the 23,000 acre Howell posted hunting unit. The season lasted seven days in 1964 and nine days in 1965. Surveys were limited to opening weekends because light hunting pressures after that yielded little data.

Hunter preference. Hunter preference of hunting area was determined by use. An equal number of sample strips, each about one-fourth mile wide by one mile long, was selected on Soil Bank and farmed areas throughout the valley. A total of 14 strips was used in 1964 and 20 in 1965. The number of hunters on each strip was counted three times daily (morning, noon, and afternoon) in 1964. Hourly counts were made the second year. These started at shooting time and lasted until hunting pressure dropped to near zero. Landmarks were used to identify the bounds of each strip.

Hunter success. Hunter success was determined in conjunction with the preference studies. Hunters were interviewed as they finished hunting a particular area. The number of hunters, time spent hunting, and the number of birds bagged was recorded. In 1965, interviews were supplemented with envelopes imprinted with these same questions. Hunters were asked to fill in the desired information when they returned to their vehicles and then tack the envelope conspicuously on a nearby post. A pencil and tack were provided.

Winter density

Two methods were tried to evaluate winter roosting. Temporary belt transects were set up on study sections. These were to be run several days after each fresh snow fall and the number of new roosts recorded.

Detonations were used to stimulate crowing (McClure, 1944). Firecrackers (silver salutes) were discharged during late evening and early morning hours when pheasants would be on their roosts.

RESULTS

Vegetation Analysis

Abundant spring moisture in 1964 produced good growth in all vegetation types. A total of 5.3 inches of precipitation fell from April 1 to June 15.

Rainfall was less plentiful in 1965 and vegetation differences between cover types were more apparent. Only 3.9 inches of rain fell from April 1 to June 15, 2.5 inches of which occurred before April 15. Hayfield vegetation had the highest density the second year followed by Soil Bank and grain (Table 2). Plant height was similar in each type.

A density reduction occurred in Soil Bank cover between May 15 and June 15, 1965. I believe this was attributable to a heavy infestation of alfalfa weevil (*Hypera postica*).

Residual vegetation in Soil Bank fields was more dense than in stubble fields during March and October. Soil Bank cover height was similar both times but stubble height varied considerably. Stubble height was greater in March and reflected the luxuriant growth of the previous year.

Hayfields had high cover value only for a short period during the growing season, After that, mowing and grazing usually kept vegetative cover to a minimum from about mid-June until the following spring. Mowing started on June 23 in 1964 and on June 14 in 1965. Regrowth was generally slow due to limited summer rains.

In spring, dry-land grain densities were usually lower than those in

Table 2. Variation in vegetation analyses by cover type on pheasant study areas in Howell Valley, Utah, 1964-65

	Vegetation density			Vegetation height		
	Soil Bank study areas	Farmed study areas		Soil Bank study areas	Farmed study areas	
Date	Soil Bank[a] (%)	Grain (%)	Alfalfa (%)	Bank[a] (in.)	Grain (in.)	Alfalfa (in.)
June 1, 1964	50	50	41	16	12	16
July 1, 1964	54	b	49[c]	28	39	29[c]
March 1, 1965	16	6	d	23	17	d
May 15, 1965	31	23	39	11	9	9
June 15, 1965	24	23	40	18	22	19
October 15, 1965	14	4	d	19	11	d

[a]Only new growth was measured during the growing season.
[b]Grain was too advanced to permit a density determination.
[c]Analysis made on one 13 acre field.
[d]Provided no cover.

other types containing alfalfa. This was primarily due to the linear growth form and wide row spacing in the former type.

Most farmers fallow stubble in early spring. Thus, it is present for winter use but not for nesting. Residual vegetation on Soil Bank lands is present from one growing season to the next.

Though sagebrush was not surveyed, it warrants mention. Wind blown weeds collected in many sagebrush areas. These, together with shrubs and other old vegetation, contributed most to the cover value of this type during the year.

Pheasant Population Analysis

Spring density

Soil Bank sections averaged about 80 per cent more calls per station than farmed sections (Table 3). A paired comparisons analysis showed this difference to be highly significant ($t = 6.69$, 79 d.f.).

Table 3. Results of pheasant crowing counts on Soil Bank and farmed study areas in Howell Valley, Utah, 1964-65

	Total calls on study areas		No. of stations		Average no. of calls/station	
Year	Soil Bank	Farmed	Soil Bank	Farmed	Soil Bank	Farmed
1964	1148	773	32	32	36	24
1965	1049	458	48	48	21	10

The results of each years' counts are not entirely comparable. This is due to the revised counting procedure used in 1965 that was mentioned earlier under "Methods."

The average number of calls per station on Soil Bank and farmed sections differed least in 1964. This may have been due to the poor cover conditions which existed early that spring. Residual vegetation was at a low level on most areas and cock pheasants, when establishing their crowing territories, may not have been overly attracted to any one place.

During the 1965 breeding season, residual cover was plentiful in Soil Bank fields and cock pheasant calls on these sections were over twice as numerous as on cultivated types. Fouch (1963) found this magnitude of difference in favor of Soil Bank farms during a two year study in Michigan.

The lower pheasant population in 1964 may have affected the crowing count results to some extent. I doubt, however, that this had as much influence as cover availability.

Nesting density

During both years, 73 nests were found on sample plots. Additional nests were located off plots but the error resulting from the observability differential between hatched, unhatched, and destroyed nests prohibited their use in calculations. There was one exception to this. Near complete searches of an 85 acre hayfield were made each year after mowing and raking. The area between windrows was checked. This constituted about 80 and 90 per cent of the field in 1964 and 1965, respectively. Except for purposes of statistical analysis, the results of these more complete searches will be used exclusively.

In 1964, nest density was highest in Soil Bank cover followed by alfalfa, sagebrush, and grain (Table 4). The next year, Soil Bank was again first followed by sagebrush, alfalfa, and grain. No nests were found in grainfields either year. Soil Bank produced the largest nest density increase in 1965, while alfalfa showed a large decline. The high density in Soil Bank cover in 1965 may be partially due to the increased effectiveness imparted by two searches.

The data were analyzed in a contingency table upon recommendation by personnel in the Applied Statistics Department at Utah State University. The resultant Chi square value of 37.40 (3 d.f.) was highly significant (significant at the 1 per cent level). Individual comparisons with 1 degree of freedom were made between cover types. Highly significant differences occurred between Soil Bank and grain, sagebrush and grain, and alfalfa and grain. A significant difference (significant at the 5 per cent level) occurred between Soil Bank and sagebrush.

Too few nests were found in most cases to compare nest success between types. Soil Bank cover averaged 25 per cent nest success for both years (Table 5). This does not compare favorably with the five year average of 36 per cent found in this type by Trautman (Ross, 1965).

Mammalian predation was the largest single cause of nest failure in Soil Bank cover. It accounted for 14 and 35 per cent of all nests in this type during 1964 and 1965, respectively. Most of this destruction was attributed

Table 4. Results of pheasant nest searches on one-half acre sample plots on study areas in Howell Valley, Utah, 1964-65

Year	Cover type	Acreage of type	No. of plots	Sampling rate	No. of nests	Nests/ 100 acres
1964[a]	Soil Bank	1582	170	1/18.6	14	16
	Sagebrush	395	62	1/12.7	4	13
	Grain	587	72	1/16.3	0	0
	Alfalfa[c]	98	13	1/15.1	1 (10)	15 (14)
1965[b]	Soil Bank	1582	226	1/14.0	49	43
	Sagebrush	395	56	1/14.1	4	14
	Grain	772	114	1/13.5	0	0
	Alfalfa[c]	85	13	1/13.1	1 (1)	15 (3)

[a]Each plot searched once.
[b]Each plot, except those in alfalfa, searched twice.
[c]Figures in parentheses include nests found during a near complete search of a mowed and raked 85 acre hayfield.

Table 5. Pheasant nest success in various cover types on study areas in Howell Valley, Utah, 1964-65

Year	Cover type	Number of nests: Hatched	Destr.	Aband.	Unknown	Nest success (%)
1964	Soil Bank	4	6	4	0	29
	Sagebrush	2	1	0	1	50
	Grain	0	0	0	0	0
	Alfalfa[a]	2	8	0	0	20
1965	Soil Bank	12	27	9	1	25
	Sagebrush	1	2	1	0	25
	Grain	0	0	0	0	0
	Alfalfa[a]	1	1	0	0	50
Both years	Soil Bank	16	33	13	1	25
	Sagebrush	3	3	1	1	38
	Grain	0	0	0	0	0
	Alfalfa[a]	3	9	0	0	25

[a]Includes nests found during a near complete search of a mowed and raked 85 acre hayfield.

to badgers (Taxidea taxus). Observations indicate that the greater nest predation in 1965 may have reflected the lower rodent population that year.

Mowing destroyed two-thirds of all nests in the hayfields. No one specific agent was responsible for nest failures in sagebrush.

The drop in nesting use of haylands in 1965 was probably a function of cover availability. Pheasant nesting started earlier than in the previous year. Residual cover was plentiful in Soil Bank fields and may have been used at the expense of the yet too short alfalfa cover. Hanson and Labisky (1964), in Illinois, theorized similarly to explain the high degree of pheasant association with grass-legume cover during April. Linder et al. (1960) also mentioned this to explain the low nesting use of alfalfa in dry years. The reduction in hayfield nesting was widespread around Howell Valley in 1965. Farmers who mowed irrigated alfalfa frequently commented on the small number of nests they uncovered.

Early nesting cover in sagebrush was plentiful being provided by shrubs and old vegetation (Figure 9). New growth in spring was usually sparse and its contribution to nesting did not appear important.

It was surprising to find no nests in grainfields either year. One nest was located off plots but was later destroyed by a badger. McKean (1941) reported finding no nests in irrigated grain near Corinne, Utah. Knott et al. (1943), in western Washington, reported only light use of dry-land grain. They and Baskett (1947) both suggest renesting as the primary use of this type because of its later development. Linder et al. (1960) and Trautman (1962) found light nesting use of grainlands, but high chick production.

Figure 9. Shrubs and old vegetation provided most early pheasant nesting cover in the sagebrush type.

Summer density

More young pheasants were counted per 1000 feet on Soil Bank transects than on farmed transects (Table 6). The magnitude of difference was about five, nine, and four times as great during morning, noon, and evening counting periods, respectively. A group comparisons analysis of each daily period shows that a highly significant difference existed in every instance (A.M., $t = 3.00$, 35 d.f.; Noon, $t = 4.56$, 30 d.f.; P.M., $t = 2.89$, 25 d.f.).

The number of young per 1000 feet in the two cover types on Soil Bank sections was similar for morning and evening periods. During midday, broods overwhelmingly preferred sagebrush areas. The data for most types on farmed sections are highly variable. Consequently, the results show inconsistency, but broods appear to prefer sagebrush cover during all three daily periods.

Pheasant broods apparently move readily about among cover types during morning and evening feeding hours; but they prefer the protective cover, i.e., sagebrush and Soil Bank. Fouch (1963) found a similar preference for Soil Bank farms in Michigan during morning and evening periods.

Shrubs provide excellent shade and considerable openness beneath their branches. This was probably why broods concentrated in these areas during the heat of the day (Figure 10). In Illinois, Hanson and Labisky (1964) found pheasants most frequently associated with woody cover, primarily small trees and shrubs, during all periods of the day in warm dry weather in August. Kozicky (1951), on the other hand, found the most broods in alfalfa fields. He did not mention the availability of woody cover nor the time of day that he made the most observations.

Table 6. Results of pheasant brood surveys on Soil Bank and farmed study areas during three daily periods in Howell Valley, Utah, 1964-65

		Total length of transects			Number of young pheasants			Young pheasants per 100 feet		
Study area	Cover type	AM (feet)	Noon (feet)	PM (feet)	AM	Noon	PM	AM	Noon	PM
Soil Bank	Soil Bank	246,920	299,585	260,215	109	34	89	0.44	0.11	0.54
	Sagebrush	56,930	65,400	45,830	23	134	22	0.40	2.05	0.48
	Total all types	303,850	364,985	306,045	132	168	111	0.43	0.46	0.36
Farmed	Stubble	150,770	99,725	106,645	5[b]	0	6[b]	0.03	0.00	0.06
	Sagebrush	27,780	16,845	15,875	17	6[b]	18	0.61	0.36	1.11
	Grass-legume	22,585	16,040	12,875	0	6[b]	0	0.00	0.37	0.00
	Alfalfa	12,300	6,295	6,585	4[a]	0	0	0.33	0.00	0.00
	Grass	6,465	5,135	5,640	6[b]	0	1[a]	0.93	0.00	0.18
	Fallow[c]	127,765	100,965	91,180	0	0	0	0.00	0.00	0.00
	Total all types	347,665	245,005	239,430	32	12	25	0.09	0.05	0.10

[a]Observed at one time.
[b]Observed at two separate times.
[c]Only fallow fields situated between two cover types on each transect were surveyed in 1965.

Figure 10. Pheasants concentrated around sagebrush during hot summer days as evidenced by the many dusting sites observed there.

Figure 11. High grasshopper populations caused considerable defoliation, particularly of alfalfa, in Soil Bank fields. Picture was taken in late July.

Few broods were observed in stubble in Howell Valley. Kozicky (1951) found that the number of broods in grainfields dropped after harvest. This may indicate that pheasants used this type primarily for loafing.

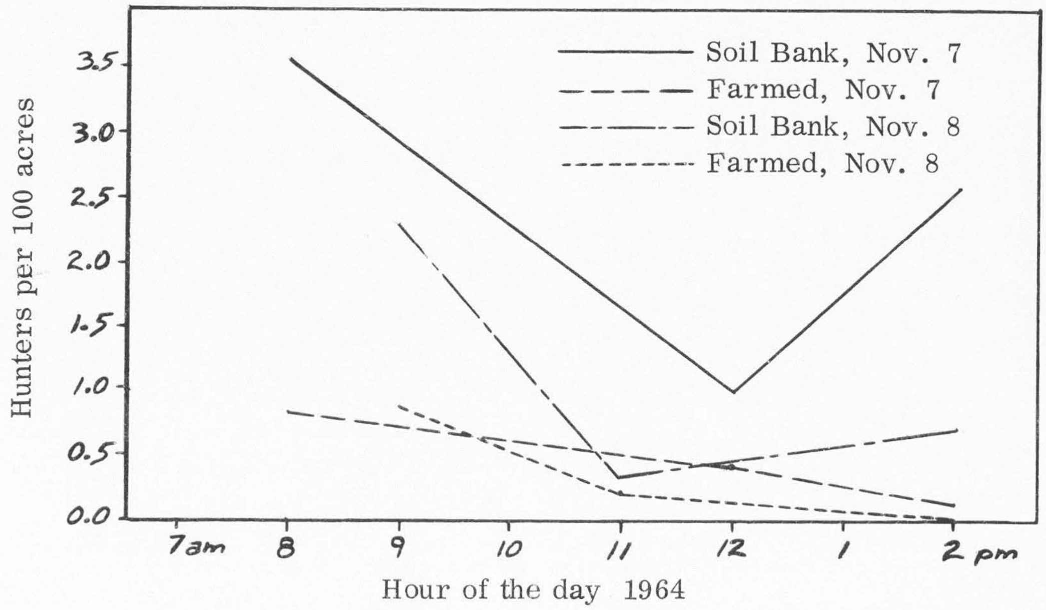
Insects for young pheasants were abundant in Soil Bank fields each year. Grasshoppers (Orthoptera) began appearing in June near the peak hatching period and were available throughout the summer. These insects caused widespread defoliation by midsummer, particularly of alfalfa (Figure 11). High insect populations were noted by Fouch (1963) on Soil Bank farms in Michigan.

Fall density

Hunter preference. Mild weather characterized the openings of both the 1964 and 1965 pheasant seasons in Howell Valley. Potential hunter densities were comparable as 1000 permits were issued each year. The main difference was in pheasant populations; the higher existing in 1965.

An average of 2.3 hunters per 100 acres was present on Soil Bank land on opening day of both years (Figure 12). This was over twice the number, 1.0 hunter per 100 acres, that occurred on farmed areas. The difference the second day was of the same magnitude; 1.0 and 0.5 hunter per 100 acres on Soil Bank and farmed types, respectively. A group comparisons analysis of the combined data shows that there was a highly significant difference between hunter densities on the two areas ($t = 3.03$, 32 d.f.).

Hunter success. During the first two days of the 1964 pheasant season, hunters bagged 24 and 10 cocks per 100 gun hours on Soil Bank and



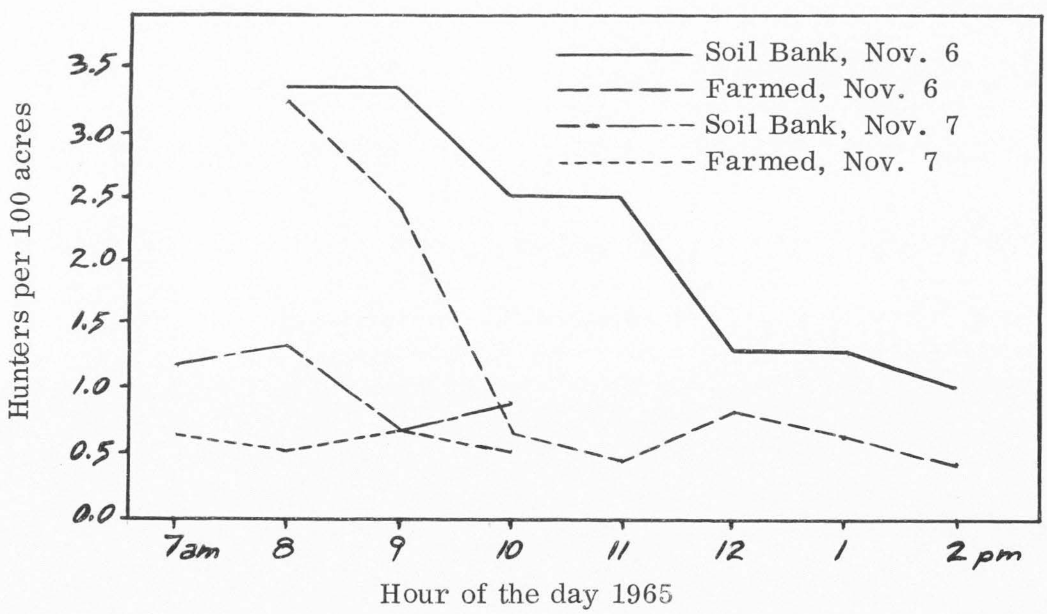


Figure 12. Comparisons of pheasant hunter densities on Soil Bank and farmed lands during opening weekends of the 1964 and 1965 seasons in Howell Valley, Utah.

farmed land, respectively (Table 7). For some unknown reason the success was reversed in 1965. Hunters shot 39 cocks per 100 gun hours on Soil Bank areas but killed 58 cocks on farmed types. Hunter success based on two year's pooled data was 41 per cent greater on farmed than on Soil Bank types.

Each year's hunter success data was analyzed by a separate group comparisons analysis because of the dissimilarity between seasons. No significant difference was shown either year (1964, t = 0.70, 27 d.f.; 1965, t = 0.62, 97 d.f.).

Two years data in Michigan (Fouch, 1963) showed only slightly higher success on Soil Bank farms as opposed to controls. It was noted that the success differential between those two areas was greater in the "good" pheasant ranges rather than in the "best." This was explained by the combined effects of abundant birds and light hunting pressure in the "good" range.

Hunters in Howell Valley were generally favorable towards Soil Bank cover. Most people hunting this type gave up easily, but the few persevering ones had good success.

During both years, persons hunting Soil Bank lands with dogs averaged 32 cocks per 100 gun hours while those without dogs averaged 41 cocks per 100 gun hours. The large tracts of cover provided ample opportunity to work dogs but the dry dusty conditions that prevailed each year handicapped their effectiveness. The tendency for pheasants to run rather than hold in fields with heavy cover, which varied from about one-half to a full section in size, did not help the situation.

Table 7. Pheasant hunter success on Soil Bank and farmed areas during opening weekends of the 1964 and 1965 seasons in Howell Valley, Utah

Date	Area	No. of hunters	No. of gun hours	No. of birds	Birds/100 gun hours
11/7/64	Soil Bank	51	134.8	34	25
	Farmed	29	36.3	3	8
11/8/64	Soil Bank	20	14.1	2	14
	Farmed	24	13.5	2	15
11/6/65	Soil Bank	165	210.8	101	48
	Farmed	106	187.2	119	64
11/7/65	Soil Bank	58	87.6	16	18
	Farmed	24	28.3	3	11
Both years	Soil Bank	294	447.3	153	34
	Farmed	183	265.2	127	48

Winter density

No quantitative data were derived from this phase of the study. Snow was insufficient to completely cover old roosts and thus prevented the use of belt transects. Detonations failed to stimulate crowing by roosting pheasants. Probably the noise produced was not loud enough.

An observation relating to pheasant roosting was made the evening of February 5, 1965. The temperature at sunset was in the mid 40's. During a brief period of several minutes, just as darkness was closing in, about 25 pheasants were observed to fly from stubble to an adjacent Soil Bank field. The birds landed in Soil Bank cover even though sagebrush was readily available. They settled in loose groups which cumulatively encompassed a large area. Several minutes later I walked out and flushed one of these groups from the same place I saw them light. No similar movement was noticed the following evening or the next weekend when temperatures at dusk were near or below freezing.

Pheasant preference of winter roosting cover has been studied by some authors. Shick (1952), in Michigan, was unable to relate roosting use to cover type or to proximity of available food and cover. In Colorado, Lyon (1954) found vegetation height in excess of 15 inches to be the only factor in common among preferred winter roosting types. Density and food availability appeared not to affect the choice of roost sites. Dry-land stubble was used little and then only in mild weather.

Soil Bank and sagebrush are the only types that meet Lyon's (1954) criteria of good winter roosting habitat. Alfalfa fields are barren in winter and stubble is generally too short.

DISCUSSION

The success of pheasant populations is largely dependent upon cover conditions during crucial periods. A serious deficiency of safe nesting cover will tend to hinder population growth. In a similar manner, inadequate cover during severe winters will cause an increased mortality rate.

Data from the spring and summer seasons in this study appear quite conclusive. Each year, pheasants preferred Soil Bank habitat for crowing, nesting, and brood rearing. This preference was most pronounced in 1965 and reflected the excellent spring cover conditions that existed on these areas. Residual vegetation in Soil Bank fields was greatly reduced by deep snow in early 1964. As a result, the preference differential between Soil Bank and farmed lands that year was smaller.

The effect of sagebrush interspersion on the pheasant use of Soil Bank lands was not studied. The large number of broods observed in this type during midday indicates that its presence was important during summer. This may also be true during winter.

Quantitative data are lacking concerning the winter value of Soil Bank cover. Observations indicate that the use of this type decreases with severity of winter. Whether this decrease is abrupt or gradual is not known.

Two characteristics of Soil Bank cover in this study stand out above all others. One is the availability of year around cover and the other is the lack of human disturbance. The first feature is particularly important early in the nesting season. Residual vegetation can attract hens away from other "less safe" types which depend entirely upon new growth to provide nesting cover. This was a logical explanation for the reduction in nest density that occurred in hayfields in 1965. Linder et al. (1960) observed that nesting use of road-sides each year varied with the quality and quantity of residual cover.

The second characteristic is no less important than the first. Farming practices, particularly mowing, can take a heavy toll of pheasant nests and young. Thus, any pheasant habitat free from these should tend to benefit pheasant production.

It has been shown that clutch size decreases as the season progresses (Hamerstrom, 1936). Therefore, any reduction in disturbance to allow early nests to succeed should help enhance the total production.

CONCLUSIONS AND RECOMMENDATIONS

It seems quite unlikely that a mere shift in numbers could be responsible for the high pheasant use found on Soil Bank lands. However, this possibility can not entirely be ruled out. A measure of pheasant population trends before, during, and after treatment would give a better indication if such a shift occurred.

I believe the real value of this study lies in pointing out certain features to incorporate in pheasant habitat improvement programs. Any such program should insure an adequate supply of high quality residual vegetation for early nesting. This cover should remain as undisturbed as possible throughout the nesting and brood rearing seasons. In any area where farming practices take a large toll of nests, the presence of these two items should favor pheasant production.

It is doubtful that a state conservation department could financially support a pheasant habitat improvement program of sufficient magnitude to materially increase pheasant populations except on an extremely localized basis. The most effective course of action for these agencies would be to support federally-sponsored, long-term farm land retirement programs and to encourage and assist farmer participation in them. Long-term programs are a necessity on dry-farm land as it takes one to several years to produce adequate cover because of arid conditions. The success of plantings should not be ignored. Poor success results in a cover deficiency during the critical nesting period.

SUMMARY

Research was conducted in Box Elder County, Utah, to evaluate the Conservation Reserve Program of the 1956 Soil Bank Act for pheasants. Six sections of dry-farm land in Howell Valley were selected as intensive study areas. Three sections were in the Conservation Reserve and three were farmed.

Soil Bank lands were planted to an alfalfa-crested wheatgrass mixture. The major land use on cultivated sections is a winter wheat-summer fallow rotation. Minor acreage is devoted to alfalfa and barley. Grass-legume plantings have been made under various agricultural programs. Sagebrush is present on untillable portions of all sections.

Vegetation analyses showed that the density of new growth during spring and summer was generally highest in alfalfa fields followed by Soil Bank and grain. Plant height was similar in each type early in the season. Residual vegetation in Soil Bank fields was taller and more dense than in stubble fields during fall and early spring.

Data from nests found on sample plots and from a near complete search of a mowed and raked 85 acre hayfield revealed that nest density was highest in Soil Bank cover followed by sagebrush, hayfields, and grain. Statistical analyses of sample plot data only, show significant differences in nest density between Soil Bank and sagebrush, Soil Bank and grain, sagebrush and grain, and alfalfa and grain. Soil Bank showed the greatest increase in nest density the second year while hayfields showed a large decrease. No nests were found in grainfields either year.

Mammalian predation accounted for nearly one-third of all nests on Soil Bank lands. Two-thirds of all hayfield nests failed due to mowing.

Brood transect data show significantly more young pheasants were present on Soil Bank sections during morning, noon, and evening periods. Most broods observed during midday were associated with sagebrush.

No quantitative data were obtained concerning pheasant preferences of winter roosting cover. Insufficient snow prevented the use of belt transects and detonations failed to stimulate crowing during late evening and early morning hours. Observations indicate that pheasants made considerable use of Soil Bank cover at least in mild weather.

Hunting season data show that significantly more hunters were present on Soil Bank than farmed areas during the first two days of both seasons. No significant difference was found between hunter success on the two areas. The number of pheasants per 100 gun hours was highest on Soil Bank land in 1964 but highest on farmed land in 1965.

It was recommended that pheasant habitat improvement programs stress the provision of high quality residual vegetation for early nesting and discourage disturbance of this cover during the nesting and brood rearing seasons. The best course of action by state agencies to attain these goals on an extensive basis is to support federally-sponsored long-term farm land retirement programs and to encourage and assist farmer participation in them.

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