A MANUAL FOR

PHEASANT HABITAT MANAGEMENT ON PRIVATE LANDS

IN UTAH

by

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SECTION I

INTRODUCTION

I.A. Purpose of the Manual

The Pheasant Habitat Management Project (PHMP) Manual will provide a basic framework for setting up, operating and administering the Division of Wildlife Resources' habitat improvement program which is designed to increase and improve pheasant cover on privately owned farmland. Within the manual, a brief summary of the seasonal habitat requirements is included as well as information on land uses and farming practices detrimental to pheasants. Alternative practices designed to reduce the impacts of these factors are also presented where possible. Instructions and suggestions on designing farm cover-management plans and various forms of improvements are included to form a foundation for intensively upgrading pheasant habitat in local areas. The manual will also explain the organization of the PHMP and will outline the approach to pheasant cover improvements on individual posted hunting units.

I.B. Scope of the PHMP

Past habitat improvement work done by several states indicates that, in order to effectively improve the private farm landscape for pheasants, two specific concepts need to be followed. First, habitat improvement work needs to be done on an intensive basis through small units the size of a township or less. Second, in order to secure support and insure the survival of habitat work for significant periods of time, incentives of some form need to be provided the individual landowner which are as appealing as the added income he can receive from farming the areas of desired habitat. Incentives similar to past federal soil bank programs or outright payments equivalent to the profit a landowner would receive from extra crop production appear to be the most attractive. Trespass enforcement and protection is often considered an important requisite that may be included as an incentive payment. The PHMP was initiated and designed to include all three concepts (intensive improvements, incentives and trespass enforcement) into a program enticing private farmers to leave proper amounts and types of cover for pheasants.

Initially, the PHMP will be developed on an experimental basis on one candidate area within the state's prime pheasant range. The candidate area will be selected by a combination of landowner cooperation and acceptance as indicated by interviews, relative pheasant abundance and an area's potential for intensive habitat improvements of significant quantity and quality. As success dictates, the expansion of the program to include other areas in the state will be made.

A second program of auxiliary activities will be incorporated into the main PHMP. This segment of the program will be directed toward improving pheasant cover in areas other than those directly involved in the intensive program. Approaches will include:

1. Mapping and cooperative work with established Posted Pheasant Hunting Units and Controlled Trespass Units for pheasant habitat improvements.

2. Organizing and operating an "Acres for Wildlife" program to solicit cooperation from farm groups, youth clubs, sportsmen club and other organizations for setting aside and improving local areas for pheasant cover.

3. Developing and extending informational brochures and other media resources to the public for explaining and providing information on pheasant problems and methods of improving the farm environment for pheasants.

I.C. Expected Benefits of the PHMP

Benefits to be derived from successful implementation of the PHMP should at least include the following:

1. Local increases in pheasant numbers as a result of the improved and increased habitat.

2. Improved pheasant hunting in areas involved in the program.

3. Landowner interest in pheasant welfare as a result of economic incentives received from pheasant hunting fees.

4. Increased amounts of land open and available for pheasant hunting.

5. Improved sportsmen-landowner-DWR relations.

6. Public education on the value and potential of habitat improvement on pheasant populations.

7. Resolution of access and trespass problems currently existing in Utah pheasant range.

SECTION II

SEASONAL HABITAT REQUIREMENTS

The habitat requirements of the ring-necked pheasant vary from season to season due to climatic factors or biological influences such as the onset of breeding. The following paragraphs briefly describe habitat utilization by seasons.

II.A. Winter Habitat Requirements

1. General winter habitat--The habitat areas utilized during the winter months consist mainly of lowland slough and river bottom vegetative types, where it is available. Brushy coverts, shelterbelts and dense weed patches also provide shelter during this period.

   A major problem faced by the pheasant in winter is the distance separating the various cover types. Weather conditions make many cover areas unavailable for pheasant use; consequently, the birds concentrate into "pockets" of good-quality cover. Evidence in several states has shown that pheasants seldom range over one quarter of a mile from roosting cover to a winter food source. Survival in pheasant concentrations has been found higher when these two cover types are located in close association to one another, allowing pheasants to move back and forth without exposing themselves to the elements or predation.

2. Winter roosting cover--Pheasants tend to prefer open, low-growing vegetation lacking a canopy for night roosts, except in times of harsh weather. Grain stubble, alfalfa stubble, pastures, grassy swales, fence lines and ditch banks depict the vegetative types generally preferred. During periods of wind, snow or rain, pheasants can be found utilizing brushy areas or dense marshy vegetation to a larger degree as roosting sites. Salt grass is highly used when available.

3. Winter loafing cover--In contrast to roosting cover, pheasants have been found to utilize vegetation providing a canopy as loafing cover. Brushy areas and cattail-type marsh vegetation provide excellent midday loafing cover.

4. Winter foods--During the winter months, corn and other waste grains are the most important pheasant food. Weed seeds, fruits and green vegetation all become part of the pheasant diet as availability of each source dictates. If food is limited in an area, late winter and early spring (before regrowth) will be the critical period. At this time, waste

grain is often depleted, snow covered or deteriorated and is not available. Weeds and fruit-bearing plants have generally lost most of their seeds and most forms of green vegetation are scarce.

Pheasants can withstand relatively long periods of food absence without detriment. Food as a general habitat deficiency is not believed to be too critical, except in respect to distribution and close proximity to winter cover or in local areas or abnormal years.

II.B. Spring and Summer Habitat Requirements

1. General spring and summer habitat--During the spring months, there is a general dispersal of pheasants from the lowland areas and brushy coverts to the upland farm landscape. Warm days in late February and early March will often extend movements to greater distances than those of the winter days preceding. Aggressive behavior among roosters may be observed as the mating season approaches. Later in March and April and into the early summer, the courtship behavior becomes obvious.

2. Crowing cock territories—It is somewhat disputed as to whether courting roosters actually outline and defend a territory as such from other males. However, the areas in which crowing and other courtship activity takes place are usually the same from day to day. Generally, they are typical of the farm landscape at this time of the year. Open, bare ground or low-growing vegetation in conjunction with weed stands or patches of brush are often included in the courtship area. The rooster utilizes the open portions as his crowing and display areas.

   The size of the "territory" has been shown to vary considerably and may be influenced by hen movements, population density or pressure from neighboring roosters.

3. Nesting habitat--Mid-April is most often the period when initial nesting is attempted. At that time, the modern farm has a minimum of cover suitable for nesting. The only cover remaining is often waste areas, roadsides, fence lines or other narrow strips of cover which still retain vegetation from the previous year. These areas of "strip-cover" and residual vegetation, therefore, have high nest densities. Hatching success of nests located in these cover types is generally low due to high abandonment of initial nests and predatory activity taking place along these natural travel lanes.

   As agricultural crops (chiefly alfalfa and other hay crops) attain a height of 8 to 10 inches, pheasants begin nesting or renesting in the cover provided. Alfalfa provides an attractive, dense plant cover for nesting, and the resulting

hazards to both hens and nests located in this vegetation are well-known. Due chiefly to hay harvesting operations, nesting success in hay is low. Nesting hens are also killed and subsequently lost to successive reproductive attempts.

Generally, agricultural crops other than hay do not receive intensive use as nesting sites. Small grains, however, are important to total chick production. Grainfields do not harbor high nest densities but do cover extensive blocks of land. Success is normally high because this cover is not disturbed for harvesting until well after the hatching peak. Heavy losses to nests located in other cover types (chiefly hay) often result in a large percentage of the total chick production originating from nests in small grains.

4. Brood habitat--Broods remain in close proximity to the nest site for the first few weeks after hatching. The nesting cover, therefore, provides the bulk of the brood cover initially. As broods mature, they begin to venture further from the nesting area while accompanied by the hen until normal daily movements are attained.

   Hayfields are devastating to young broods, as well as incubated nests. Since the young broods remain close to their nests, hay harvesting becomes a threat. Depending on the methods of hay cutting employed, heavy losses can result. Modern swathers move fast and make escape difficult. If the hayfield is cut from the outside-to-the-inside, in a circular-type motion, young chicks are herded toward the center as they attempt to avoid exposure in the cut portion of the field. When the last swath is cut, several young chicks become trapped and often fall to the swather reel.

   Cutting hay as suggested in Section III.B. will help reduce this form of mortality to young birds.

II.C. Autumn Habitat Requirements

Autumn marks the beginning of the end for the vast crop cover that occupied the farm landscape in summer. Crop harvests and fall plowing again reduce cover to waste and strip-type habitat. Although cover depletion is rampant during this period of the year, it does not become a critical problem until the winter weather arrives.

During autumn, pheasants begin movements back to lowland sloughs and brush areas for cover. These cover types become more important as the farm landscape is turned bare and daily movements again become restricted as winter conditions mount.

SECTION III

LAND USES DETRIMENTAL TO PHEASANT HABITAT WITH SOME ALTERNATIVES

It is ironic that pheasants are dependent on agriculture for their very lives, while agricultural operations deal the heaviest blow to pheasant production. Virtually all studies dealing with pheasant nesting make note of the large losses of nests and incubating hens as a result of man's influence. Studies have shown that 44.6 percent to 70 percent of all destroyed or unsuccessful nests were attributed to man--chiefly farming operations.

Some of the practices that cause cover losses or nest and hen destruction are covered briefly in the following sections. Also included under each heading are suggestions of alternative practices which would minimize the losses incurred by previous methods.

III.A. Farm Size

If one area of current farm management had to be picked as the culprit causing problems for pheasants, it would probably be the trend toward large corporate farm operations and the "clean farming" practices that accompany them. Farm size trends for Utah over the past 40 years are given in Utah Agricultural statistics. The record high number of farms for Utah occurred in 1936 with 30,800. In 1940, 28,500 farms were owned with an average of 354 acres per farm. By 1966, there were only 16,000 farms with the average farm size being 838 acres. The 1974 statistics show 12,400 farms averaging 1,048 acres per farm. In the eight-year period between 1966 and 1974, 3,600 farms were lost and the average farm size increased by 210 acres. This was approximately a 23 percent loss of the farms recorded for 1966 with the average farm increasing in size nearly one third of a section. The given farm sizes include large dry-farm and ranch operations. Average irrigated farm size is substantially smaller than 1,000 acres.

Accompanying the increased farm size is an increase in field acreage at the expense of ditch and fence line cover. Besides the outright cover losses from fewer fence lines and ditches, those that do remain are kept free of brush and other vegetation. Ditches are now being lined with concrete and bank cover is being removed for convenience and to give a clean appearance to the landscape. These cover losses decrease the amount of interspersion and contribute to large, monotypic cover types that have been shown to house fewer wildlife. Sprinkler irrigation is also reducing the need for extensive ditch networks.

There is probably little that can be done to thwart the increases in field size or reduction of cover that result due to conflicts with farm economics. The best approach to combatting this problem is probably through the Pheasant Habitat Management Program that is now developing. This will provide monetary or other incentives to urge landowners to leave fields in the smallest practical acreages and to provide border cover. Until the program is proven workable and is available throughout Utah, little can be expected to slow field size increases. However, landowners should still be informed of what they can do, and even requested to delay or postpone any field size increases they have planned. They should also be requested to leave good quality cover along what ditches and fencelines they have remaining.

III.B. Haymowing

Hayfields are attractive to nesting pheasants, but they are also the habitat type with the highest nest and hen losses in most areas. With the advent of night mowing, birds incubating and roosting can also be lost in addition to the attendant nest destruction.

Most hayfield nests are established when the vegetation reaches 8 to 10 inches in height. It takes approximately 14 days for a hen pheasant to lay an average clutch of 10 or 11 eggs at 1.3 days per egg and an additional 23 days for incubation. Therefore, a hayfield needs to have approximately 37 days of unmolested time to hatch a nest that was initiated when hay was at the 8- to 10-inch stage. This is seldom the case, resulting in the high nest destruction. Researchers in Wisconsin wrote that the cutting date of hay averaged 35 days after a height of 8 to 10 inches was reached.

Some suggestions on how to reduce hayfield nesting losses would be to first delay the mowing date as long as possible. This, however, could result in a loss of quality in the hay. Second, mowing from the center of the field outward is advocated on the ground that it would help herd young broods out of the field and prevent their loss. A sometimes more practical suggestion is to mow from one side of the field to the other, thus herding young chicks out of the field ahead of the swather. Also, in large fields that take more than one day to cut, it would allow nests on the outer edges more time to hatch.

A third idea is to leave islands of uncut hay around nests of known location. The island should be as large as practical to avoid predation or other disturbances.

Flushing bars for use with mowers have provided varied success in the past. Today, however, tractor speeds have increased and the flushing bar approach to reducing hen mortalities is limited. The use of swathers reduces the time needed to cut and rake hayfields

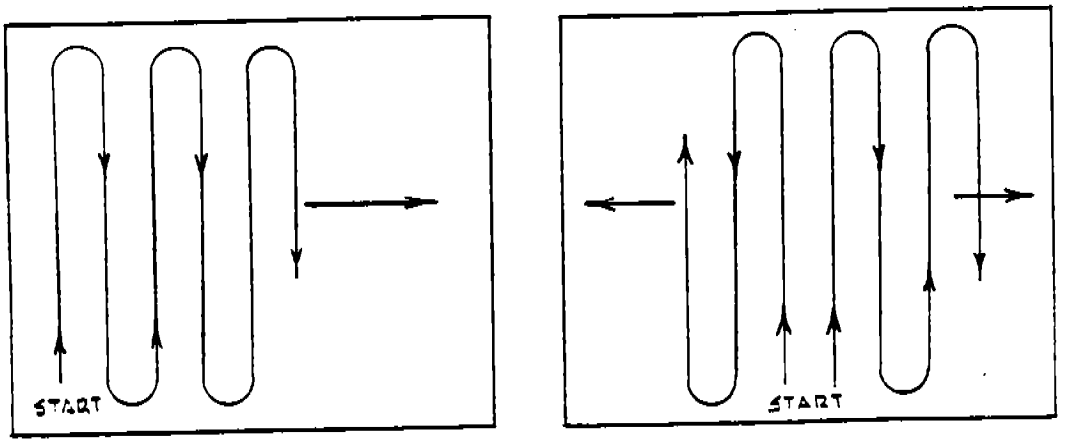

Figure 1. Mowing field from one side to the other or from the center to the outside will help herd chicks out of the field.

and they are also more lethal to nesting hens. Flushing bars are ineffective on swathers. However, work on an amplified sound system for use in flushing birds is currently being done in Nebraska. The indications are that this technique may be effective in reducing hen mortalities from hay harvesting operations.

III.C. Grazing Practices

Grazing has a detrimental influence on winter cover, travel lanes, foods and nesting cover. The amount of grazing that is allowed in the fall and winter on agricultural fields determines the amount of cover that will be left along fence lines, ditch banks and waste areas in spring. These areas often provide the only available cover for early spring nesting. The increasing loss of fence line brush, ditches and the like from agricultural land makes river bottom vegetative types more and more valuable for winter cover. Grazing these areas and woodlots further reduces the amount of cover that is available for wintering pheasants.

A suggested approach to reduce the damage inflicted from grazing is to encourage rotation grazing of pastures with the proper stocking rates. Encourage landowners to take half and leave half of the pasture vegetation to provide good plant vigor and better cover. Obviously this method will be deemed impractical by a large percentage of landowners.

Running one strand of electric fence around field margins would help protect fence line cover. The same would be true of streams, ditch banks, rocky outcrops and other flow feed value. The trampling of stream banks by cattle can cause sedimentation and soil loss in addition to sod destruction.

III.D. Fall Plowing

Ecofallowing is an alternative in some situations. Fall plowing is widely used in agriculture today. It provides several advantages to a landowner, such as moisture conservation, seedbed improvement and reduced crop planting time for the following spring. The influence of fall plowing is felt in the winter and spring seasons resulting in losses in winter cover, winter food and nesting cover.

Practices such as "rough fallowing" or ecological farming as an alternative to plowing should be encouraged. This entails minimum tillage and setting disks at straighter angles, resulting in the soil being broken deep, but only partly turned. This practice would leave some stubble in the field for cover and feed.

If a landowner has more property than he can plow in the fall, it would be of most benefit to pheasants if he would leave those portions near good winter cover for spring plowing. This would provide food and cover within a short distance of winter concentration points.

III.E. Burning For Weed Control

Farmers often use burns in attempts to control weeds and remove obstructing vegetation from ditches and waterways. This practice obviously reduces cover. Its effect on habitat depends on the time of the year it is carried out. Fall burning will reduce food and cover available to wintering birds, and its effects would be most detrimental in areas of winter concentration. Since burns are generally done along ditches, fence lines, roadways and similar areas, they eliminate travel lane cover that becomes valuable in winter when the fields are bare and birds are forced to travel longer distances across open and exposed areas.

Spring and early summer burns reduce the amount of residual cover available for nesting and also destroy nests already established in this cover.

If burning is to be used, landowners should be persuaded to do it in the period of time that would cause the least disturbance to local pheasants. In Utah, this would probably call for fall burns since safe nesting cover is generally considered to be limiting factor to most areas.

Herbicidal weed control would be less damaging to total pheasant cover and would be more effective in controlling trouble spots of weeds. Burning sets succession back and provides a disturbed soil surface ideal for invasion by weedy plants. Weed control experts at USU maintain that burning holds little benefit, if any, as a weed control practice.

III.F. Wetland Drainage

Wetlands provide good, safe, winter cover for pheasants. The small, low spots of marshy vegetation on farms are often drained to provide more farmable land. Also, major reclamation projects involving large acreages are rapidly removing prime pheasant cover on a large scale. The small wetland areas may often be too wet to farm in several years unless extensive drainage systems are developed. Wetlands and low spots, due to standing water, remain unproductive except in years with conditions dry enough to permit their tillage and harvest.

Wherever possible, attempts should be made to persuade landowners to leave small wetlands. Muskrat trapping may be feasible in some of the areas and should be suggested as an alternative income to drainage for farming. Both recreation and monetary returns could be produced by the wetlands in the form of waterfowl hunting, pheasant hunting and muskrat trapping. Much of the wetland drainage that is carried out is done with ASCS funding at the county level. Continued contacts with these committeemen should be made to curtail drainage programs.

III.G. Grain Harvesting

The present harvest of feed corn for silage leaves little standing cover or waste grain for pheasants. The crops are cut and chopped in the field and hauled to bins or dugouts for storage and curing. All that remains in the field is a short stubble which is then grazed off or plowed under.

There is little that can be done on a practical basis to alter the methods utilized in harvesting silage and other crops. Where corn is growing near winter cover, however, landowners should be persuaded to leave a few rows standing along the edges for wildlife.

Small grain harvesting under current methods leaves ample stubble and standing grain. Plowing before winter is common and landowners should be asked to leave a little stubble and standing grain along field edges, etc.

III.H. Rights-of-Way Management

Rights-of-way often receive heavy use by nesting pheasants. Their value as nesting cover, however, is dependent on their management. Roadsides are often mowed during the peak of the nesting season resulting in heavy losses to nests. Canals and railroad rights-of-way are often burned to control growth and obstruction or to reduce the hazard of uncontrolled fires. The timing of these burns, as mentioned previously under section III.E., will determine their effect on pheasants.

Researchers in Illinois found that over 50 percent of the roadsides were normally mowed by June 15, and over 95 percent were mowed by August 1. Yet, the study showed that of the nests established in roadside cover, only 15 percent of those hatching are completed by June 15. By July 1, nearly 70 percent of the roadsides were mowed, but less than one half of the nesting hens had completed incubation by this date.

Road agencies need to be won over to the idea of delayed mowing. The DWR has initated work with county commissions within pheasant range and with the Department of Transportation to delay mowing and limit the widths of all necessary cuts. Continued contacts should be made to benefit nesting birds. If mowing is necessary, it should be done after August 1, but before April 15 of the following year. Agencies involved in canal maintenance should also be persuaded, as well as railroads and utility companies, to alter their mowing or burning practices to allow safe and successful nesting.

SECTION IV

GUIDELINES FOR HABITAT MANAGEMENT AND IMPROVEMENT

IV.A. Distance Relationships of Cover Developments

It is well established that pheasants live most of their lives on relatively small land areas when all habitat needs are provided. Most studies have found that average seasonal movements rarely exceed three miles. Daily movements of pheasants are also reported to be small, usually in the range of one-fourth to one-half mile and often less.

For optimum pheasant habitat, then, it is necessary for all life needs to be located in close proximity to each other. Interspersion of cover types needs to be held foremost in habitat development, especially on the vast monoculture-type farm landscape.

The literature on pheasant habitat provides four points that are important and should be applied wherever practical.

1. Habitat improvement plans should be designed in blocks approximately four miles in diameter, centered on existing winter concentration points. Seasonal movements rarely exceed three miles and the summer and winter habitat areas usually make up the extreme ends of the three-mile distance. There is some evidence that nest densities are higher in cover found relatively close to winter cover than that found at a greater distance. The four-mile diameter blocks can be used as subunits within large development plans such as a township.

2. The basic principle of interspersion should be followed without breaking cover types into insignificant fragments.

3. All forms of existing vegetation should be worked into the plan and tied to other developments. Attempts should be made to tie all significant areas together with travel lanes.

4. The amount of farmland that can be expected to be diverted is meager; therefore, quality cover should be stressed. While competing with agricultural economics for cropland, the best use of the land available is mandatory.

A simple diagram of an "integrated cover development" should be held in mind while mapping an area for habitat improvement.

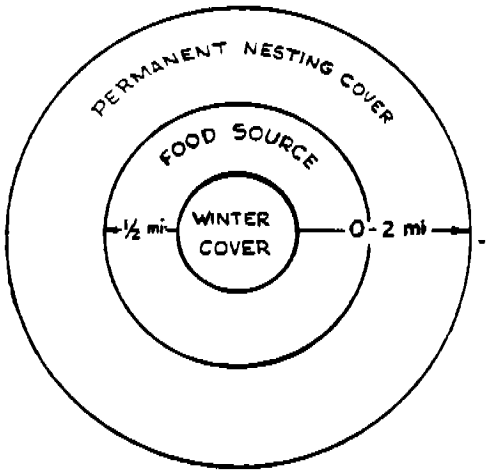

Figure 2. Habitat improvement plans should be centered around winter concentration areas, and include an area of approximately four miles in diameter.

The target area or base plan should radiate out from good quality blocks of winter cover, as farming operations allow. Food sources should be located as close to winter cover as possible, but no further than one-half mile away. Travel lanes should also be provided to allow easy and safe travel between winter cover, food sources and permanent nesting cover. Since winter survival is better when food and cover are close and nest densities are higher in fields near wintering areas, the units should be as compact as possible.

There is generally at least one major wintering area within a township or similarly sized land plot. This wintering area typically houses a fair number of birds and is important. However, there are commonly smaller "satellite" pockets of winter cover found within the four-mile diameter drawn around the major site. These "satellite" wintering areas in total are important and critical to the habitat diversity of the landscape and often hold more birds in the aggregate than one major wintering area. The "satellite" wintering areas should not be overlooked in the overall habitat plan.

IV.B. Nesting Habitat Improvements

The easiest and most logical method of providing nesting cover in significant amounts is to protect waste areas, fence lines, roadsides and similar vegetation from cover removal. However, if an area is to be planted to nesting cover, the following points should be applied to provide the most attractive and valuable cover to nesting hens.

1. Residual cover--In early spring, cover must be available for nesting to help draw hens out of hayfields. The cover planted must be capable of withstanding lodging or flattening from winter snows or winds. A seed mixture of alfalfa and grasses, such as wheatgrass, has proven effective in providing this cover. Alfalfa planted alone is not of much value for early nesting due to leaf loss and lodging; the grass stems give standability and provide early cover. Alfalfa, known for its attractiveness to nesting hens, adds to the cover as it develops.

   The plant species selected for nesting cover should provide residual vegetation that is at least 8 to 10 inches in height.

2. Plot size and configuration--Evidence in the literature suggests that fields should be managed for large and square-shaped plots of nesting cover. Nest densities appear to be greatest in fields approximately 10 to 20 acres in size. As fields progressively become longer and narrower, nest densities appear to be reduced. However, today's farm economics will seldom allow fretting over such problems as plot size and, therefore, nesting cover should be planted wherever practical.

3. Nest cover planting methods--Clumped or row-type seedings have proven to be more attractive to nesting birds than cover uniformly broadcast. Plants giving a bunched growth form (such as some wheatgrasses), seeded in rows through a grain drill will provide the desired result.

   Until further research and experience dictate, the directions for planting pasture mixtures in Utah should suffice for nest cover establishment. The cooperative booklet published by the Utah Agricultural Experiment Station (1970) and titled Pasture Planting Specifications for Utah provides planting instructions, seeding rates and seedbed preparation for several grass species and alfalfa. Pertinent parts of this publication are reproduced here for instruction. The species listed in Table 1 all provide good nesting cover for pheasants and may be used as indicated by soil capabilities.

Table 1. Vegetation for use in block or strip nest cover plantings.

Common Name	Scientific Name	Location
Reed canarygrass	*Phalaris arundinacea*	Moist banks, marshes and meadows.
Smooth brome	*Bromus inermis*	Seeded as pasture grass-reseeds mountain.
Bluejoint	*Calamagrostis canadensis*	Wet places in meadows and woods.
Alfalfa	*Medicago sativa*	Cultivated for hay.
Crested wheatgrass	*Agropyron cristatum*	Used extensively to reseed western ranges.
Western wheatgrass	*Agropyron smithii*	
Tall wheatgrass	*Agropyron elongatum*	
Intermediate wheatgrass	*Agropyron intermedium*	
Blackwell switchgrass	*Panicum virgatum* Blackwell	

a. General planting suggestions for nesting cover.

Seedbed preparation—Plant in firm seedbed that is free of weeds and volunteer grain. Level or smooth irrigated fields as needed to insure uniform distribution of irrigation water.

Time of planting--Irrigated planting can be made in April, May, June and August. Planting legumes later than August 15 is discouraged. Nonirrigated plantings can be made in September through November and during March and April.

Planting--All seed should be placed in the soil by a drill or specialized planter. The drill or planter should be equipped with drags or packers. Place seed 1/4 inch to 1 inch below the soil surface. Row spacing can range from 6 to 14 inches (row spacing should be closer to 6 inches than to 14). Grasses and legumes can be planted together or separately in alternating rows.

Fertilizer--Apply to irrigated seedings only. Apply 50 to 80 pounds of available nitrogen per acre. Phosphate fertilizer should be added as determined by soil test. Fertilize just prior to or at the time of planting.

Weed control--Competitive vegetation can be controlled by chemical treatment or by mowing. Obtain specific recommendations for spraying from agricultural advisors. Mow when the competitive vegetation is about 12 inches tall.

Grazing--Irrigated seedings may be clipped or moderately grazed late during the first season. Nonirrigated areas should not be grazed before the plants have gone through two growing seasons.

Irrigation—Applies to irrigated seeding only. Irrigate frequently during the seedling stage.

b. Seed quality—High quality seed (high germination and weed seed content at minimum levels) should be used to insure that the seeds are viable with good seedling vigor. The minimum pure live seed (PLS) percent is given in Table 2.

c. Drill settings--Table 2 provides information which is useful in adjusting drills to the desired seeding rate. The table shows the number of seeds per foot of drill row for 1 pound of seed per acre when the spacing between rows is 6 inches. Seeds per foot times the recommended pounds

Table 2. Seed quality and total seeds per square foot per acre.

Grass or Legume	Recommended Pure Live Seed (PLS)*	Seed per Linear Foot per Pound per Acre for 6-inch Drill Row Spacing**
	Percent	Number
Crested wheatgrass	75	2.3
Intermediate wheatgrass	80	1.2
Reed canarygrass	65	6.0
Smooth brome	75	1.5
Tall wheatgrass	80	0.9
Alfalfa	85	2.6

*Compute pure live seed (PLS) as follows from the information on the seed tag: Purity percent x germination (including hard seed) = PLS.

**Multiply by number of seeds given in the table by the following factors other row spacings: 7-inch spacing, 1.16; 10-inch spacing, 1.66; 12-inch spacing, 2.0; 14-inch spacing, 2.32.

per acre gives the total seeds that are dropped in each foot of drill row. The drill can be run over a canvas and the seeds counted. The number of seeds per foot for other drill row spacing can be computed by multiplying the seeds for 6-inch row spacing by the appropriate factor listed in the table footnote.

d. Seed rates and types for various soil characteristics--Tables 3 through 8 give planting rates and mixture information for various soil conditions found in Utah.

4. Nest cover maintenance--Occasional mowing or grazing over the life span of the planting may be required to restore plant vigor or depress rodent populations which will depredate the alfalfa component of the cover mixture. Old stands of nesting cover also appear to harbor some increased predator activity over newer cover areas.

A cover removal rotation periodically over the years may help interrupt this pattern. All decisions on when to remove cover during the planting's predicted life span should be made as observations dictate. However, plantings should generally be left for a three-year minimum stretches between mowing or grazing whenever it is practical.

All cover removal should be done with the pheasant in mind. The less the cover is disturbed the greater its value for nesting. If clipping or grazing is decided upon, it should be done after August 1st, but before April 1st of the following year.

Table 3. Land without major soil limitations and with adequate irrigation water.

Description - Soils of all textures where water readily penetrates the soil without causing ponding or waterlogging. Soils may have minor problems of salinity and wetness. If erosion is a problem, use alternatives a, c and d, or sprinkler irrigate.

Recommended seeding rate for each species

Grass and Legume Species	Pounds per Acre	
	c	d
Smooth brome	9	
Intermediate wheatgrass		10
Alfalfa*	2	2
Totals	9-11	11-12

*Optional. Grass may be planted alone.

Table 4. Land with tight soils (clayey) and with adequate irrigation water.

Description - Soils are clayey or tight with low permeability. Ponding and wetness are generally problems. The surface of the soils usually remains wet longer than 3 days after irrigation. There also may be minor problems with salinity or high water tables.

Recommended seeding rate for each species

Grass and Legume Species	Seed Alternatives (Pounds per Acre)	
	b	d
Tall wheatgrass	10	
Reed canarygrass		6
Alfalfa*	2	
Totals	10-12	6

*Optional. Grass may be planted alone.

Table 5. Saline and saline-alkali land with water table.

Description - All soils where salts are present in quantities that make the area unsuitable for the production of corn or wheat (electrical conductance of the saturated extract ranges from 8 to 20 millimohs per centimeter). The water table can range from 10 to 40 inches. Frequent irrigation is needed to establish the seeded plants.

Recommended seeding rate for each species

Grass and Legume Species	Seed Alternatives (Pounds per Acre) b
Tall wheatgrass	10
Sweet clover*	1
Totals	10-12

*Optional. Grass may be planted alone. Do not plant alfalfa where high water tables exist.

Table 6. Land with inadequate irrigation water or subject to drought.

Description - All lands where irrigation is limited to May and June and sandy soils where interval between irrigations exceeds 20 days. Soils are not salty or wet.

Recommended seeding rate for each species

Grass and Legume Species	Seed Alternatives (Pounds per Acre) a	b	d
Intermediate wheatgrass	10		
Smooth brome		9	
Crested wheatgrass			6
Alfalfa*	2	2	2
Totals	10-12	9-11	6-8

*Optional. Grass may be planted alone.

Table 7. Nonirrigated land that generally receives more than 12 inches annual precipitation.

Description - Land located in the upland or mountain climatic zones. Generally less than 40 percent of the total annual precipitation occurs during the period when plants are growing. In areas where erosion is a problem, use either seeding alternative c or d.

Recommended seeding rate for each species

Grass and Legume species	Seed Alternatives (Pounds per Acre)		
	b	c	f
Crested wheatgrass*	6		
Intermediate wheatgrass		10	
Smooth brome			9
Alfalfa*	2	2	2
Totals	6-8	10-12	9-11

*Includes Siberian wheatgrass.

**Optional. Grass may be planted alone.

Table 8. Nonirrigated land that generally receives less than 12 inches annual precipitation.

Description - Land located in the semidesert climatic zone and in the transition area between the semidesert and upland zones. About 50 percent of the total annual precipitation generally occurs during the period when plants are growing. Where erosion is a problem, use seeding alternative c.

Recommended seeding rate for each species

Grass and Legume Species	Pounds per Acre a
Crested wheatgrass*	
Alfalfa**	2
Totals	6-8

*Includes Siberian wheatgrass.

**Optional. Grass may be seeded alone.

IV.C. Food Plots

Pheasants are omnivorous feeders, and dietary components shift with seasonal and local availability. Farm grains, particularly corn when available, provide the largest single food source in the pheasant's diet. Generally, farm grains comprise 70 to 80 percent of the annual diet. Weed seeds and green plant materials also are important and become more so in periods of snow cover when waste grains are scarce.

Food stress may occur in some areas during late winter and early spring; therefore, food plot developments should target on providing available foods at this period.

1. Food plot placement--The daily movements of pheasants are small, as pointed out in section IV.A. Winter weather restricts movements and birds are more vulnerable to predation and other decimating factors if they are required to move great distances between winter roosting cover and an available food source. Strategically placed food plots can make unused winter cover areas more attractive and help distribute the wintering population over the range. The better distribution may help reduce the effects of decimating factors, such as stress or predation, that occur in large concentrations of birds.

   In planning a food development the following guidelines should be followed.

   a. Cover proximity. The food source should be developed as close to winter cover as possible, but no further than one-half mile. Fence lines or other protective travel lanes should be used where possible to tie the food patch to winter cover.

   b. Preferred or worthwhile food species. The food plants utilized in the plot should obviously be attractive to pheasants.

   c. Availability. Local winter conditions should be considered and plants utilized that provide food under late winter conditions. Food plots should also be large enough to provide a good quantity of food throughout the winter.

   d. Food plot strength. Related to food availability, plants used in the plot should have strong stem strength and persistent fruits or seeds. Strong stems will help reduce flattening and food loss to winter snow and winds.

2. Food plant species--In both pheasant preference and plant qualities, corn has been found to be the best all-around species for food plot developments. Evidence also has shown that "shotgun" mixtures of food plants are not attractive to pheasants and are exploited heavily by songbirds. The best approach is to provide one or two food types preferred by pheasants instead of conglomerate mixtures.

   Table 9 lists pheasant food plants in their approximate order of preference.

3. Food plot size and configuration--Most research on plot size has indicated that food plots of 1/4 acre to 2 acres are sufficient. An ideal condition would be to have approximately 5 to 10 acres of corn or food plants for every 100 acres of winter cover. Generally, a food plot of 1/4 to 1 acre per 150-acre farm would be adequate if located near good cover. A few rows of corn or swaths of grain left standing in wintering areas can accomplish this with little effort. As experience dictates, plot sizes should be modified to meet increased needs.

   Based on limited research, long and narrow food patches may provide better results over a "squared" plot design, again, easily acomplished through standing swaths of grain near field borders.

IV.D. Winter Habitat Improvements

Cover proximity and easy access through travel lanes, as explained in Sections II.A.1., IV.A. and IV.B., have direct influences on the value of a block of winter cover. Since there is a general drift of pheasants to lowland areas during winter and the productivity of these areas is low, winter cover improvement and development will have greater impacts if done here. As in all cover improvement, the protection of existing areas is the first and most practical step.

Winter cover quality is greatly determined by vegetative density at the ground level. A thick understory of brush or herbaceous growth in a thicket or the dense cover of a cattail patch will break the wind and afford protection from the elements. If the understory of brush patches is removed through grazing, as is often the case, the overstory provides little protection by itself. For winter cover, shrubby understory rather than height is best.

Snow drifting into relatively narrow or small areas of cover should be considered. Shrubbery should be managed to provide cover high enough to account for these conditions.

Table 9. Plants suggested for use in food plots, listed in approximate order of pheasant preference.

Common Name	Scientific Name
Corn[1]	Zea mays
Wheat	Triticum spp.
Oats	Avena sativa
Sorghums[2]	Sorghum spp.
Sunflower	Helianthus annuus
Barley	Hordeum spp.
Millets[3]	Setaria spp.

[1]Field corn is preferred over sweet corn due to its durable kernel. When corn is to be used for planting, the local agricultural agent can supply information on disease or insect selected hybrids that will minimize the production losses from these sources.

[2]Sorghums (including milo) are only adapted to the warmer areas of the state. The county agricultural extension agent can provide more information on a county basis.

[3]Millets do well on soils of poor fertility.

Planting winter cover may be necessary in some parts of the pheasant range. Two approaches can be taken in providing this cover; one is through annual or short-term plantings and the other long-term or permanent plantings.

1. Annual or short-term plantings--The best method for establishing this type of cover is to make it dual-purpose by creating a combination food-cover plot. Cornfields cultivated until the corn reaches a good height then left to grow "weeds" will provide good, short-term, winter cover. Annual plantings are, of course, extra work and are unfeasible on a large scale due to fleeting benefits. However, in areas definitely lacking suitable winter habitat, some farmers may be interested in providing this form of brief pheasant cover.

2. Long-term or permanent plantings--The best use of permanent, woody cover plantings is to enhance existing brush or weed patches, lowlands or slough areas. Plantings should be made on windward sides of the existing cover to prevent drifting snows from filling the site and reducing its value. The plant species used should be a relatively low-growing and bushy variety. The best plants to use are those that are native to the site; however, Table 10 gives a tentative list of woody plant species that have been used in the past in several areas.

Care should be utilized when selecting a plant to protect the landowner from a pestful invasion. Most woody species, when planted along a field that is intensively cultivated, will not become a problem due to continual soil tillage.

Two designs of permanent plantings are generally applied if woody cover is to be used as a block planting and not just as an enhancement to existing cover. First are block plantings that are designed primarily to provide a new package of winter cover to the landscape. The size of the planned site will determine the degree to which the planting can be made. Starting from the outside of the block and working in, progressively shorter and brushier types of plants should be used. In large developments, the outermost rows may be trees with the centermost area being grasses or herbaceous plants.

Woody vegetation is also utilized for travel lane cover in the form of hedges or fence line plantings. On the current farm landscape these plantings are rare and are not favored by landowners. The species listed in the previous table that are suitable to this form of planting are indicated and should be used whenever the opportunity arises. Hedge or fencerow plantings provide the most benefit when they are relatively wide. Row plantings should be established with no less than two rows of shrubs. Plant spacing of two feet in staggered fashion in rows separated from one another by

Table 10. Woody species for block or strip plantings.

Common Name	Scientific Name	Locations
Cockspur thorn	Crataegus crus-galli	cultivated
Washington thorn	Crataegus phaenopyrum	cultivated
English hawthorn	Crataegus oxyacantha	cultivated
One-seeded thorn	Crataegus monogyna	hedges
Siberian pea	Caragana arborescens	hedges
*Redosier dogwood	Cornus stolonifera	moist, shady placed
*Russian-olive	Elaeagnus angustifolia	cultivated
Silver buffaloberry	Elaeagnus utilis	native and cultivated
Western chokecherry	Prunus virginiana	streams and thickets
*American plum	Prunus americana	streams and thickets
*Matrimony vine	Lycium halimifolium	cultivated
*Multiflora rose	Rosa multiflora	cultivated
*High-bush cranberry	Vibernum trilobum	cultivated
Tatarian honeysuckle	Lonicera tatarica	cultivated
*Pyracantha	Pyracantha coccinea	cultivated

*Plants recommended in the literature for use along fence lines or in hedge rows.

two feet has been used elsewhere and is recommended. Plants should be pruned occasionally to maintain a low, brushy growth form. Cultivation should be done for the initial growth stages to insure good seedling survival.

Hedge-type plantings will provide the most benefit, if they can "lead" to other permanent cover areas, such as river bottoms, waste areas or brush patches.

IV.E. Sites Providing Opportunities for Intensive Work

The private farm landscape is dissected by several public rights-of-way lands. Public utility lines, public roadsides, railways, public ponds or lands are fairly common in farming areas. These areas provide excellent opportunities to increase pheasant cover, particularly nest cover, if controlling agencies can be persuaded to manage them with pheasant cover in mind. The bands or patches of "natural" cover that these parcels create should be tied to other developments on neighboring farmland.

In some instances, where areas are large enough and have a gentle slope, cover plantings can be beneficial. A common complaint in the management of "waste" areas is that they are a source of weeds for agricultural land. Hence, many practices are currently centered completely on weed control; yet, the widespread use of burning as a control tool enhances annual weedy growth. Wholesale mowing operations are also uncalled for in most cases. Plantings of nonaggressive grasses and alfalfa mixtures on roadsides, railways, canal banks and other areas will give effective competition to weed invaders. Roadside development work in other states has proven highly encouraging for increasing overall pheasant nesting cover. Section IV.E.1. will provide suggested methods of improving roadsides (or other similar cover areas) for pheasant nesting cover.

1. Roadside nest cover improvement--Sections II.B.3., III.H. and IV.B.1. explained the importance of residual vegetation (standing plant material from the previous year) to early nest establishment and success. Roadsides and similar cover types are often the only form of residual vegetation suitable for nesting that remains on the farm landscape in early spring. Depending on management, the quality and quantity of these areas can be greatly reduced or enhanced.

   The first step in improving these cover types for pheasant nesting cover is to substitute spot mowing or spraying over burning as weed control tools. If the area is mowed as an annual management procedure, agreements calling for a delay in the mowing dates to August 1st or later should be established.

Mowing only for snowdrift control on roadsides can be obtained by clipping only a narrow band along the road shoulder rather than the complete roadside. Once spot weed control, burning and delayed mowing can be established, a planting operation to improve nest cover quality can be initiated if necessary.

Experience from other states has shown that great increases in available nesting cover can be created, which spur improved pheasant production, when roadsides with proper qualifications are developed. Research indicates that the following three points are necessary for a good return on a roadside cover planting.

Plantings

a. Placement. Plantings should be developed in areas where surrounding vegetation will provide supporting cover to the roadsides. Roadsides adjacent to waste areas, wetlands, fence line cover, or good cropland should receive planting priority over those lying adjacent to grazed pastures, intensive feedlots or clusters of buildings.

b. Width slope and stability. The roadside, canal bank or railway should be rather stable in terms of width and usage. The wider the roadside, the more priority it should receive for planting. An average width of about 16 feet provided good results in Illinois. Their findings showed that areas eight feet and less in width were too small to be included in a planting improvement. They should be managed by delayed mowing as with all areas. Roadsides having gentle slopes to the ditch should be given higher priority for plantings due to the ease of operating planting equipment on more level ground.

c. Extent. Plantings made on an extensive basis, such as all roadsides in a four-section area, provide better results than those made on a random or spotty design. Roadsides and similar areas should be managed to provide a maximum of high quality residual cover. Plantings should, therefore, utilize plant species that have good stem strength to withstand lodging under the pressures of winter snows. As in the nesting cover plantings discussed in previous sections, grass-legume mixtures provide good residual nest cover for early spring nesting and are also preferred or at least highly attractive to pheasants.

Planting procedures and seed species for establishing nest cover as given in Section IV.B.3. should be followed for roadside cover work. Alterations and adaptations will no doubt be required on individual areas as problems are encountered. Cover maintenance given in Section IV.B.4. also applies to roadside plantings. However, consideration to traffic visibility and snowdrift hazards should also become a part of a roadside cover maintenance plan where local conditions require it.

SECTION V

INDIVIDUAL FARM HABITAT MANAGEMENT PLANNING

The information in this section is designed to provide assistance in evaluating pheasant habitat on individual farms and for creating farm cover management plans that will improve cover at minimum interference with farming. Little information exists in the form of quantitative measurements of pheasant habitat; therefore, the techniques used for habitat evaluation are still in the realm of an art. Interpretation of habitat quality is entirely dependent on the observer's experience, knowledge of pheasant habitat requirements and his ability to visualize how close an area resembles the ideal.

The ideal time of the year for evaluating pheasant habitat is when the cover is at a minimum. In most every case, this period will be late winter and early spring when nesting is being initiated. Virtually any farm appears rich in habitat during summer and fall when crops are growing. If it is at all possible, areas which are to be mapped and evaluated should be visited in late winter, even if only briefly. Cover plans can be drawn from relatively short visits if proper notes are made.

The operating landowner should accompany the biologist into the field. Arrangements should be made to accommodate the landowner.

V.A. On-site Cover Mapping

The easiest method of preparing a cover map is to provide the landowner a farm worksheet and ask that he sketch his farm property on the section or township form. He can quickly show relative field positions, field sizes, crops, ditches, waste areas, sloughs, etc. Crop rotations and general farming operations should also be noted. The period of the year that pastures are used should be noted, if not obvious. Also, directions, size and distances to permanent cover on land adjacent to his should be recorded.

The landowner can also provide information on areas of his land that currently receive pheasant use, such as areas of heavy nesting, wintering concentrations or other seasonal relationships. Once the evaluator feels familiar with the farm layout, evaluation can begin and the landowner can be left to continue his business.

Enough of the farm should be visited and observed to obtain notes on:

1. Travel lane (permanent ditches, fences, hedges, canals, roadways, etc.) characteristics, such as:

   a. Vegetative composition--herbaceous, grassy or woody.

   b. Average width of the permanent cover strip.

   c. Average vegetation height, density, understory, etc. (the consistent use of terms, such as good, poor, etc., compared to an average or ideal may be used to evaluate density and understory.)

   d. Relationship to other cover areas--where do the travel lanes lead?

2. Waste areas and odd, hard-to-farm corners.

   a. Vegetative type dominating such sites.

   b. Potential value as nesting cover, protective cover or feed area, etc.

3. Availability of winter cover sites on the farm.

4. Availability of standing crops as winter food source.

V.B. Criteria for Assessing the Relative Quality of Specific Cover Types

Section IV.A. explains the close distance relationship that is necessary between cover types in good quality pheasant habitat. An area's potential for providing a specific habitat need can be assessed on its positioning to other significant areas and its relative ease of access.

Section II. provides insight into the general habitat requirements of the pheasant for the various seasons. The following brief summaries specify what components of various habitat types determine the relative quality of that type of habitat. Obviously, they are seldom present at once in the same plot, but should provide a standard for measuring habitat quality.

1. Winter cover--The following characteristics are associated with a high quality winter cover area whether it be a lowland slough or upland brush or weed patch.

   a. Relatively large--A minimum size of approximately 1/4 acre.

   b. Close to food source--Located within 1/4- to 1/2-mile from an available food source; the closer the better.

c. Good access--At least one good quality travel lane intersecting the plot.

d. Strong-stemmed vegetation--The dominant vegetative species has a strong stem and resists snow flattening. Tall vegetation, such as cattails that bend and enhance the cover value, is also desirable.

e. Dense understory—A rank understory protected from snow drifting and extreme weather conditions.

f. Depth--Wide enough to provide protective cover in periods of deep snows and winds.

2. Nesting cover--The following characteristics are typical of good quality nesting cover.

a. Vegetation height--Cover utilized for nesting is generally tall, if a choice is given; usually over 8-10 inches in height.

b. Residual cover--Preferred nesting vegetation provides cover in early spring resulting from the previous year's standing vegetation. Vegetation that will provide good residual cover is tall with strong stems to resist flattening.

c. Density--Relatively dense vegetation is preferred for nest concealment.

d. Plot size--The size of the cover area is important, with relatively larger blocks of cover harboring higher nest densities. An ideal plot would be over 10 acres in size.

3. Travel lanes--Quality travel lanes may provide additional nesting cover and protective cover in addition to values as interspersion, edge and general travel.

a. Width should be sufficient to prohibit blockage by snow drifting (4-foot minimum).

b. Height should be sufficient to allow concealment to nests and traveling birds (12-inch minimum).

c. Density in relation to height and width should be sufficient to conceal both birds and nests.

d. Destination of travel lanes, ideally, should tie in and lead to other permanent cover or food sources.

V.C. Edge Determination or Interspersion Indexes

The subjective evaluation of the amount of edge or interspersion on the farm may be useful. Field sizes and fence line or ditch condition could be used as a comparative value.

On larger areas, such as posted hunting units or areas of similar size, an interspersion index system could be established to compare relative pheasant numbers to edge or interspersion. The index may be established by drawing an imaginary straight line across the land unit and counting the number of vegetative changes that occur along that line. From this rough index, areas of high pheasant densities could be compared to those of lower densities to assess influence of field size and crop monocultures, etc.

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