

P R E F A C E

Over 97 percent of the land in Nebraska is in private ownership. This means that farms, ranches, and other privately-held rural lands of Nebraska produce most of the state's wildlife. From these lands hunters harvest about three-fourths of all game taken annually. Many people also enjoy seeking wildlife with binoculars or cameras.

Wildlife does have value:

Visual beauty - aesthetics

Fur - bobcat, coyote, raccoon, mink . . .

Pheasant - quail - deer - turkey - rabbit . . . as food

Fish for the table

Nongame birds eat insects

Predators clean up killed animals

Recreation - fishing, hunting, birdwatching, and photography

These management guides for selected wildlife species were assembled for use in promoting more and better wildlife habitat diversity in intensely cultivated, as well as rangeland, areas of Nebraska.

Managing the land for wildlife as well as crop or range production is good business. It has been proven that wildlife is a byproduct of fertile healthy land which in turn is accomplished by practicing a good soil and water conservation program.

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LAND MANAGEMENT GUIDE FOR PHEASANT - Nebraska

Good Pheasant Range

Cropland:	65-80%	Undisturbed	
Grassland:	10-20%	herbaceous	
Woody or shrub cover:	5-10%	vegetation:	3-10%



Pheasant Requirements

Cover: Winter Cover - Consists of shrubs, shrub and tree combinations, or tall herbaceous vegetation, such as emergent aquatic vegetation, sweetclover, or annual weeds. These areas should be of sufficient size or arranged in such a way that part remains somewhat free of drifting snow. They should be located near a reliable food source. Tall, warm-season native grass stands in excellent condition also provide good winter cover. Bulldozed piles of trees can provide usable cover if they have adjacent weedy, grassy areas.

Nesting Cover is medium-high herbaceous vegetation of medium density. A stand of cool-season grasses, such as intermediate wheatgrass and brome grass mixed with alfalfa, is ideal. In order to assure high reproductive success, at least 5-10% of the land should provide undisturbed nesting cover during May and June. Minimum width of strips: 20 feet. Minimum size: 1 acre; preferably up to 20 acres. Average height of ideal cover: at least 6 inches in April.

Brooding Cover - The ideal site will have a good mixture of weedy or brushy fencerows, undisturbed grassy odd areas, and crop border of grain within an 80-acre area. Draws, with grasses, forbs, shrubs, and small trees passing through two or three different cover types, furnish all the needed requirements.

Roosting Cover - Consists of medium or tall herbaceous vegetation, including annual weeds, alfalfa, and small-grain stubble during snow-free months. Tracts of sweetclover, tall annual weeds, and tall emergent aquatic vegetation provide the best roosting cover during the winter.

Loafing Cover is furnished by any vegetation described for winter cover and escape cover during all seasons except during winter months when loafing cover will be limited to winter cover. Field or cover edges also provide loafing areas.

Escape Cover - If requirements are met for winter cover and loafing cover, the requirements for escape cover will also be adequate.

Food: Staple or preferred foods are farm crops, usually consisting of corn, wheat, barley, oats, and millet occurring as waste; weed seeds such as foxtail millet, kochia, smartweed, and sunflower; insects; and plant foliage. The primary food source is from annual plants. Emergency foods of importance are the fruit of russianolive, wild rose, buckbrush, and other available woody plant fruits.

Water: Free drinking water is usually not required, except during drought periods when dew is lacking. Otherwise, any preference or need for drinking water during the heat of summer has not been established.

The seasonal range of pheasants is about two square miles, but is considerably less when their year-round needs are provided in a small area. For this reason, year-round needs should be duplicated as many times as possible on any area or farm unit for highest populations--this provides diversity. A balanced habitat is one in which the proper amounts of food, cover, and water are properly distributed and are found to meet the daily requirements. A pheasant must find food, cover, and water fairly close together, especially during times of stress. See standards and specifications for Wildlife Upland Habitat Management (645), Technical Guide, Section IV, for additional management considerations.

HABITAT CHECKLIST

	Type of Cover	Adequate		Changes Needed To Improve Area for Wildlife
		Yes	No	
Winter				
Nesting				
Brooding				
Roosting				
Loafing				
Escape				

LAND MANAGEMENT FOR BOBWHITE QUAIL - NEBRASKA

Good Bobwhite Quail Range

Cropland	40-60%
Grassland	30-40%
Woodland	5-40%
Brushy Cover	5-20%



INTERSPERSION OF COVER TYPES IS THE KEY TO GOOD QUAIL HABITAT

General - The bobwhite is one of the smallest (6-7 oz.), yet one of Nebraska's most important game birds. Like the pheasant, it is a bird of agricultural land. The greater the variety of cover types, the more ideal it is for quail.

Winter Loss - The most common winter loss in Nebraska is due to severe cold, below zero, for an extended period, and if their food source is buried beneath snow, quail will eventually starve. The means of combating this loss are to provide good protective cover from the cold and have the cover close to a food source that is not covered by snow.

Land Management Practices of benefit to the bobwhite quail are:

1. Crop rotations and good fertilization programs increase the amount and quality of quail foods produced.
2. Contour stripcropping provides interspersion of cover types.
3. Grass or grass-legume stands on drainage ditch banks and field borders (including headlands on the sloping ends of crop fields) provide nesting and roosting cover.
4. Woody cover in hedgerows, odd areas, and pond areas provide travel and escape cover.
5. Improved pastures and regulating grazing within the carrying capacity of the land increase nesting and roosting cover.
6. Control of fire and grazing in woodlots, in residues of crop fields, and along roadsides increases food and several kinds of cover.
7. Shrubby or herbaceous borders around woodlots provide food and escape cover. Shrub lespedeza, multiflora rose, conifers, Russianolive, and dogwoods are some plants that can be used.
8. Protected pond areas provide vitally needed water, cover, and sometimes food during drought periods.

Nesting - The bobwhite is a gregarious bird during most of the year, but as spring approaches the covey breaks up and the "bobwhite" call is heard. The bobwhite is monogamous. Two weeks to a month after the beginning of courtship, the mated pairs make their nest. In the southern range this is usually in late April; farther north it starts in May. Egg laying requires 2 to 3 weeks. The average clutch size is 14, but varies from 7 to 30 or more eggs. If the nest is destroyed (over 60 percent usually are), the bird will continue to reneest until a successful hatch is obtained. Often the cock will take over the first nest and the hen will reneest. The incubation period is 23 days. The eggs are white to light brown in color and smaller than those of a bantam chicken.

Even though quail begin nesting in May, the production season will run into September. Fifty to seventy percent of the pairs usually manage to hatch a clutch.

Three-fourths of the nests are generally located within 50 feet of roads, paths, or similar openings. The total loss for the 16 weeks of growing up is generally 25 to 40 percent. Mortality from October to early spring ranges from 30 to 60 percent and may attain 80 percent over severe winters. Subzero temperatures and snow or ice covering food supplies is likely to be disastrous.

Cover - Quail need primarily two kinds of cover, herbaceous and woody. Mixed grass and clover are preferred to alfalfa. The mixed stands are less dense. Grass-legume stands in rotations, along ditches, and field boundaries are of benefit.

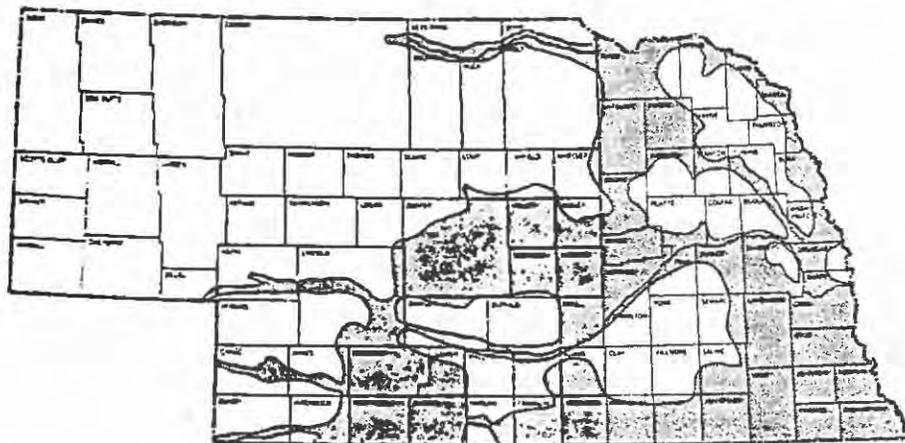
Shrubby cover such as provided by hedgerows, windbreaks, improved woods borders, and odd areas are helpful in providing a diversified land pattern. Wild plum thickets underlain by grasses, greenbrier and wild grape tangles, honeysuckle, and clump plantings of conifers provide needed escape cover. Cover should be of good quality, not grazed, and generally not burned. The amount is far less important than that it is adjacent to crop and grass fields.

Escape cover, winter cover, and fall and winter feeding are the functions served by woodlands.

Foods - The bobwhite is essentially a seed eating bird; therefore, croplands are important to the quail. Winter grains have good aftermath growth of weed seeds the summer after harvest. Grain fields and corn fields provide weed seeds nutritious to quail as well as waste grains. Where corn is grown for grain, it may make up 60 percent of the bobwhite's fall and winter food. Wheat, rye, soybeans, ragweed, beggarweed, sunflower seeds, oak acorns, switchgrass, grain sorghum, and vetch are all important foods for the bobwhite wherever they are found.

If food plants are inaccessible, establishment of hedgerows and other travel lanes or one-quarter acre food patches are suggested. Food patches should be long and narrow and adjacent to good cover.

Range - The daily movements of the bobwhite are relatively restricted; one-eighth to one-fourth mile is the daily range. The annual range rarely exceeds one mile. Greater movements are usually caused by destruction of the "home" habitat, food failure, or the spring and fall "shuffle."



BOBWHITE QUAIL RANGE IN NEBRASKA (GENERAL AREA OF HUNTABLE POPULATION)

Prepared by: Robert O. Koerner, Biologist, SCS, Lincoln, Nebraska
References: Nebraska Game and Parks Booklet "The Bobwhite Quail" and "American Game Birds of Field and Forest" by Frank C. Edminster, 1954. For additional information consult Section IV, Nebraska Technical Guide, Wildlife Upland Habitat Management, Code (645).

LAND MANAGEMENT FOR COTTONTAIL RABBITS - NEBRASKA



General - The cottontail rabbit is the most popular small game animal in the United States. The cottontail, like the pheasant, is primarily a product of agricultural lands. They thrive on agricultural lands where cropland, grassland, and woodland are about equally represented and well distributed. Some animals lend themselves naturally to management. The cottontail appears to be one of these. The cottontail will be more important as a game animal in Nebraska in the years to come.

Land Management Practices of benefit to cottontail rabbits are:

1. Establish and maintain grass or grass-legume stands on drainage ditch banks and field borders. Ladino clover with an adapted grass makes choice rabbit food.
2. Establish or maintain woody cover in hedgerows, fence rows, odd areas, and pond areas. "Living brush piles," small thicket-like plantings of fruiting-type shrubs, are ideal.
3. Do not graze or burn farm woodlots. Pile brush in woodland borders.
4. Establish farmstead and field windbreaks, or Christmas tree plantations. The combination of evergreens and grasses is very attractive.
5. Maintain cattail covered marshes and sloughs.

Range - The annual range of cottontails seldom exceeds 20 acres. Females seldom range more than 8 acres. The winter range seldom exceeds 11 and 6 acres for males and females, respectively. The daily range probably seldom exceeds 3 acres. It is obvious that cottontails occupy relatively small areas and that food and cover must be in comparative close proximity. For cottontails, one acre of grass or grass-legume mixture and one permanent cover area one-fourth acre in size and containing one or more thickets at least 1 rod square (or 100 yards of shrubby fence row) per 5 acres of farm land, would be ideal.

Nesting - The gestation period of the cottontail rabbit is approximately 1 month and a female may have as many as three to five litters during the breeding season. Four or five young per litter is average. They may be born any time of the year between February and September. Young are blind at birth, opening their eyes about the ninth day, and remain in the nest about 2 weeks.

The nest is a cup-shaped cavity on top of the ground, lined with grass and fur. Some preferred cover types for nesting are bluegrass, orchardgrass, fescue, and clover. The majority of the nests are found within 150 feet of a field's edge.

Less than 15 to 25 percent of the rabbits live longer than 1 year. Rabbit populations reach their peak in mid-summer.

Cover - Protected nesting cover and winter cover are primary limiting factors for this species in the Midwest agricultural areas. In the East, the interspersion of open lands, woodlands, and brush cover appears to be adequate. Brush piles and hollow logs left in protected woodlots, rock piles, small conifer clumps, and shrub thickets provide both winter and escape cover. It is possible to provide too many escape areas and make harvesting difficult. In good habitat 50 to 70 percent of the population may be taken annually.

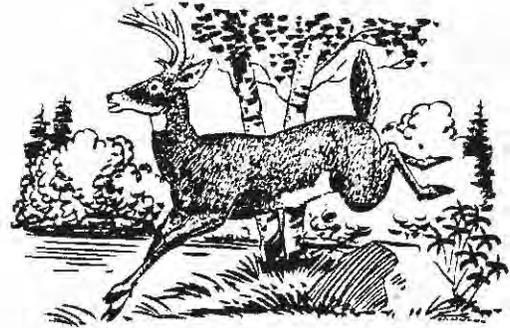
Food - In most areas food is not a problem. It would be easier to list the food plants the animal will not eat than those it will eat. Apple, chokecherry, autumnolive, birch, maple, willow, basswood, dogwood, rose, sumac, clovers, grasses, wheat, alfalfa, and soybeans are all favored foods.

Preventing Rabbit Damage in orchards, nurseries, or conifer plantations. If rabbits are especially numerous in these places and are likely to cause damage, plants can be protected by applying a coating of rubber based latex paint. This can be applied by brush or with a spray gun in the fall. Commercial repellants are also available at farm supply stores.

Rabbits are not rodents, but belong to the order Lagomorpha which also includes the true hares as well as the white-tailed and black-tailed jackrabbits. Young rabbits are born blind and hairless, while hares come into the world well furred and active. Hares use speed to escape enemies. Rabbits seek shelter in burrows or dense cover.

Prepared by: Robert O. Koerner, Biologist, SCS, Lincoln, Nebraska
References: "Cottontails in Michigan" by Paul Hickie, 1940; "The Cottontail Rabbit and Its Management in Ohio" by D. R. Atzenhofer and D. L. Leedy, 1947. Idaho Habitat Management for Rabbits (SCS) August 1976.
See Section IV, Technical Guide, Wildlife Upland Habitat Management, Code (645).

LAND MANAGEMENT FOR DEER - NEBRASKA



General - Species of deer in Nebraska include the white-tailed deer (*Odocoileus virginianus*) and the mule deer (*Odocoileus hemionus*). Densities of deer are dependent on quality of the habitat. The best habitat is along stream courses with the associated grassland, cropland, and river breaks. During the last 100 years or so, the deer numbers have fluctuated from abundant to near extinction and are now abundant. Today there are probably more deer within our boundaries than there were when the settlers began arriving in numbers in the 1850's.

Land Management Practices of benefit to deer are:

1. Protection of woodlands from grazing and uncontrolled fires.
2. Reseeding and renovation of range pastures.
3. Grazing range and pastures within carrying capacity.
4. Clear cutting of small areas in larger woodlands
5. Plant field windbreaks and hedgerows as well as woody cover in odd areas and around ponds or other areas to provide good resting sites and travel lanes.
6. Pond and pit construction will provide desired watering places.

Life History - Longevity records of captive deer have shown whitetails living as long as 19 years and mule deer 22 years. Although weight and antler size are related to age, both are highly variable and the only accurate aging is through examination of teeth.

At birth, female whitetails average 5½ pounds and males are about 2 pounds heavier. Mule deer are of similar size. The heaviest mule deer recorded in recent years, taken in Garden County in 1957, weighed 310 pounds hog-dressed, which would amount to about 378 pounds live weight. The record whitetail, killed in Cherry County the same year, weighed 287 pounds field dressed, or about 350 pounds live weight.

Rutting activity peaks in November, most fawns are born the following June. Over half of whitetail fawns mate the next fall.

Food and Cover - Natural stands of ponderosa pine, as found in the Pine Ridge Area, provide some of the best habitat and support high deer populations.

While woody cover provides the best deer habitat, it is certainly not essential. Grasslands are suitable particularly where topography aids in providing necessary concealment.

Deer eat a wide variety of forage foods; the leaves, needles, succulent stems, fruits and acorns from trees, shrubs, forbs, domestic crops and grasses. It is useful to classify the important deer foods into two groups, according to each food's quality to attract deer and sustain good physical condition. Proper classification reflects seasonal palatability and nutritional contents of the plant parts eaten. Choice foods attract deer and maintain vigorous health that keeps them in good flesh and reproductive condition. Fair foods are somehow deficient but usually are sufficient to maintain life through crucial periods of the year. In Nebraska plants are classified as follows:

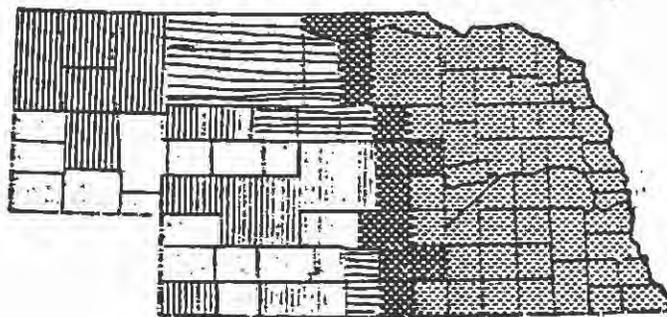
Choice Foods

Grasses and grain crops. The green foliage of native and introduced grasses, oats, rye, and wheat are attractive wherever available in late fall, winter, and early spring. The grain from corn, oats, rye, sorghum, and wheat are choice foods whenever they are available. Leaves and twigs of trees and shrubs, forbs, as well as apples and other fruits, are sought after.

Fair Foods

Dry grasses, tree leaves, woody stems of shrubs and vines, dried fruits, and berries, etc.

SPECIES RANGE IN NEBRASKA



	80-100% whitetail, 0-20% mule
	60-80% whitetail, 20-40% mule
	40-60% whitetail, 40-60% mule
	20-40% whitetail, 60-80% mule
	0-20% whitetail, 80-100% mule

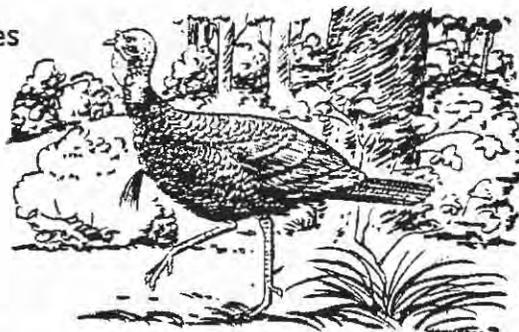
Prepared by Robert O. Koerner, Biologist, SCS, Lincoln, Nebraska
References: USDA-SCS Idaho Habitat Management Guides and Nebraska Game and Parks Commission booklet "The Deer of Nebraska"

LAND MANAGEMENT FOR WILD TURKEY - NEBRASKA

Good Turkey Range - Area of 10,000 - 20,000 Acres

Habitat Requirements

Pine Woodland	46%
Grassland	32%
Grain Crops	13%
Alfalfa	5%
Deciduous Woodlands	4%



General - The wild turkey is primarily a bird of the forest. Merriam's wild turkeys are primarily limited to the Pine Ridge in northwest Nebraska and the Niobrara River from south of Cody to north of Newport. These are the only areas providing significant amounts of ponderosa pine which, though not essential for survival of Merriam's turkeys, are a good indicator of the habitat that offers quality range.

Land Management Practices most important to the wild turkey are:

1. Control of fire and grazing in both forest and fields
2. Selective cutting in forests leaving poorer timber sites in relatively open stands and leaving an ample supply of food trees.
3. Reseeding and renovation of range and pastureland adjacent to and within forested areas.
4. Annual clipping and mowing hayland in late July or August.
5. Establishment of fruit and nut bearing trees and shrubs along roadsides and around openings.
6. Development of an adequate water supply -- pits, ponds, and springs

Nesting - As spring approaches, the winter flocks begin to break up, gobblers begin their calling and strutting, and finally collect their harem which averages four to six hens. Nests are well concealed in thickets, fallen tree tops, or at the base of bushes or trees. The hen usually covers the nest when she leaves. It takes about 2 weeks to lay the average clutch of 10 to 11 eggs. Clutches may vary from 8 to 17 eggs. Incubation takes 28 days and a hen will quickly desert her nest if disturbed. Nesting success is usually under 50 percent. By late summer the brood is usually reduced by 25 percent, but broods may combine and large flocks are often seen. Unsuccessful hens may also join the group. The family (hen and poults) stays together until the next spring. In late winter, flocks will form according to sexes until the breakup again comes during the "gobbling" season.

Cover - In good range, coniferous and hardwood forest should both be available within each 10,000 acres. Good habitat should have a clearing of one or two acres in every 100 acres. Clearings planted to grasses, clovers, or trefoil should be mowed annually in late July or August.

Foods - Oak acorns, seeds of ash, and pines are preferred foods. In some localities, seeds from maple, hazelnuts, elm and birch seeds, greenbrier and hawthorn are used in considerable quantity. Bluegrasses and clovers are used extensively during the summer. A good turkey range has an adequate supply of water. Pits, ponds, and spring development are therefore recommended practices.

Range - The daily cruising range of the wild turkey is about 2 miles. With a good interspersion of habitat types, hardwood openings, and conifers, turkeys may confine themselves to covering 400 to 1,000 acres daily. Poorer habitats or in areas where turkeys may fly from one ridge to another may result in a range of up to 8,000 acres or more. The size of the annual range depends on food supplies, cover, and weather.



WILD TURKEY RANGE AND DENSITIES IN NEBRASKA

Prepared by: Robert O. Koerner, Biologist, SCS, Lincoln, Nebraska

References: Nebraska Game and Parks Booklet, "The Wild Turkey in Nebraska" and "American Game Birds of Field and Forest" by Frank C. Edminster.

For additional information see Technical Guide, Section IV, Wildlife Upland Habitat Management, Code (645).

U S DEPARTMENT OF AGRICULTURE
Soil Conservation Service

Land management for MOURNING DOVES



General: The mourning dove, America's most important game bird, is the only native game bird that raises more than one brood a year. The dove is a distinct product of farmland and nests in every state except Alaska and Hawaii. In 1955 an estimated 19,000,000 were harvested in 28 states having open seasons.

Land management practices most helpful to mourning doves are:

1. Establishment of farmstead shelterbelts, windbreaks and Christmas tree plantations for nesting sites.
2. Development of ponds and pits or dugouts for watering areas.
3. Establish or maintain woody cover in hedgerows, odd areas, and pond areas.
4. Establish or maintain a border of coniferous trees around woodlots.

Range: These birds annually range from southern Canada and south to central Mexico, Cuba and Haiti.

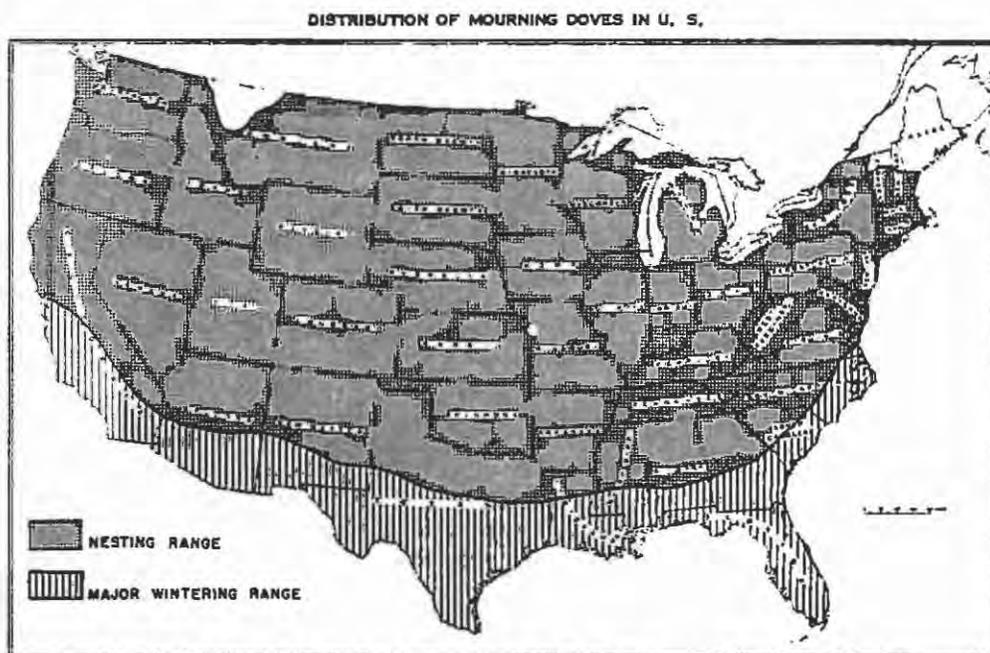
Nesting: The nesting territory is selected by the male who then attracts the female by his cooing. When the nesting site is selected, the male brings sticks to the female who constructs a rather flimsy nest. Generally two eggs (rarely three) are laid, two days apart. The eggs are hatched in two weeks and two weeks later the young leave the nest and the process begins again. Incubation is shared by both sexes, the male takes charge from morning until late afternoon and then the female takes over until the next morning. In northern states, most nesting begins in April and continues through August. Only half of the nests are successful due to effects of rough weather on the flimsy nests and to predation by jays, grackles, sparrows, starlings, crows, squirrels, cats and snakes.

The majority of the nests are in trees or shrubs. In the country, the average height above ground is between 15 and 20 feet. In town, nests are usually 10 feet higher. Red pine and Norway spruce were early season preferences in Iowa, while elms, box elder and soft maple were used more in the summer. Of the deciduous trees and shrubs in North Dakota shelterbelts where approximately 15 doves were produced to a mile or about one to an acre Chinese elm, American elm and Russian olive were the preferred species. Loblolly pine, short-leaf pine and red cedar contained 57% of the nests in North Carolina. In Alabama, 84% of the nests were located in pine trees. American elm and ponderosa pine were important in Nebraska.

Three to six row field windbreaks or farmstead windbreaks near small grain and mixed farming are more valuable as nesting sites than single rows located in pasture lands. The character of the tree is more important than the species. Broad surfaces provided by dense branches or crotches of sloping limbs are needed to hold the nest. Large trees are more desirable than small ones, and conifers are particularly important in the spring when winds are prevalent.

Foods: Seeds compose 98% of the mourning dove's diet. Agricultural crops in the form of waste grains and weed seeds compose the major source of food. At least 300 plant foods are utilized. Some of the major species are: corn, wheat, bristlegass, crabgrass, ragweed, pokeweed, buckwheat, turkey mullein, fiddleneck, hemp, croton, wild beans, timothy, and Korean lespedeza.

Water: Ponds and pits or other open surface waters provide water to meet the daily requirements of mourning doves.



After "The Mourning Dove in Alabama" by George C. Moore & A. M. Pearson, 1941.

Prepared by Hans G. Uhlig and Wade H. Hamor, SCS Biologists, from various sources, particularly Frank C. Edminster's "American Game Birds of Field and Forest," 1954.

Land management for TREE SQUIRRELS



General: The squirrel is generally considered the number two game mammal in the United States, ranking second only to the cottontail rabbit. Two species of tree squirrels are important to the hunter: The fox squirrel and the gray squirrel. During pioneer days the gray squirrel was found in the extensive forested areas of the east, while the fox squirrel was generally in the scattered woods of the prairies. Now the gray squirrel has extended its range to eastern North Dakota and Kansas and the fox squirrel from western Virginia to Texas, Colorado, western Kansas, Nebraska and The Dakotas.

The fox squirrel is largely an inhabitant of mature open hardwood woodlots, while the gray squirrel lives primarily in large relatively unbroken hardwood forests. In many areas both species may be found in the same tract of woods, though normally one predominates.

In large forest areas, a population of one gray squirrel per acre is very high, 1 per 2 acres is about average. In small woodlots, gray squirrel populations may go as high as 2 or 3 squirrels per acre. An average of only 13 per cent of the fall population is taken by hunters. Thus, a 40-acre woodlot might be expected to furnish 3 to 15 gray squirrels per year, depending on reproduction, past food supplies, weather, and other factors.

In Michigan woodlots, fox squirrel populations as high as 2 per wooded acre have been recorded. The average kill is one-third of the hunting season population.

Land management practices most important to tree squirrels are:

1. Control of fire and grazing in woodlots.
2. Managing woodlots and forests according to accepted forest management principles; practicing selective cutting; and leaving two or three good den trees per acre.
3. Establishing and maintaining farm shelterbelts, field windbreaks, and hedgerows.

Range: The daily cruising radius of fox squirrels seldom exceeds 300 yards, seasonal ranges may cover 10 acres, while the annual range is about 40 acres. However, fox squirrels will move several miles to occupy suitable vacant habitat. Gray squirrel daily movements are approximately the same as fox squirrels. In mountainous country there may be some movement from one forest type to another, depending upon food supplies.

Reproduction: The gestation period of squirrels is approximately six weeks. There are usually two peak periods of births: in late winter (February and early March) and in summer (late July and August). Either period may be skipped on occasion depending on food and weather conditions. In the average year only 20 to 30 per cent of the adult females have two litters. Litters average two or three young. Ears open at the latter half of the third week, eyes at the fifth week, weaning begins during the seventh week and continues until the young are ten to twelve weeks of age.

Nests are of two types: den trees and leaf nests. Den trees are the most important, affording the best protection throughout the year. There are two types of den; those used for reproduction, shelter or escape and those used for escape only. The latter consists of tree cavities that are too deep or too shallow or have entrances that are too large or are too damp. A depth of two to three feet from the den entrance is preferred. Preferably a den entrance should not be over 4" in diameter. Two or three good den trees per acre is recommended.

Following are recommendations for selecting den trees:

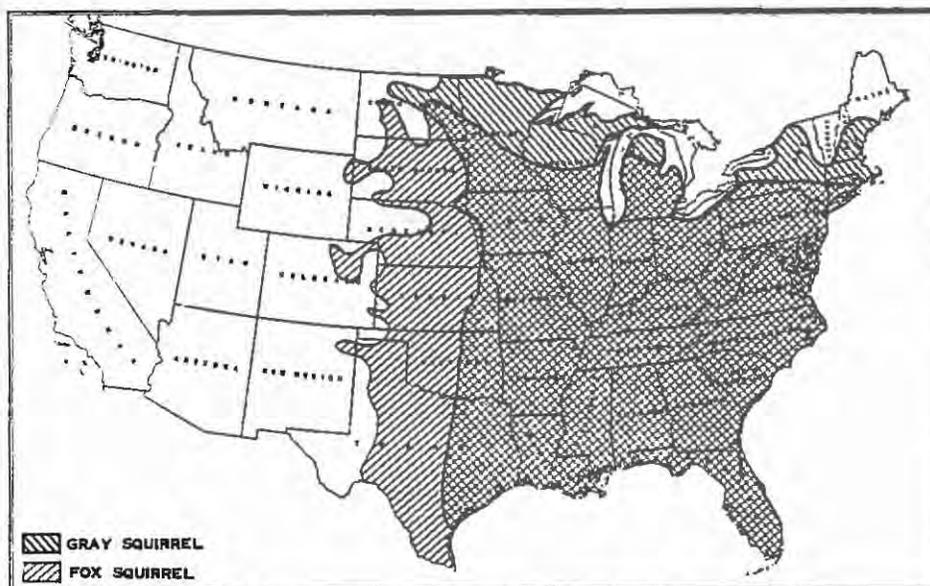
1. Select trees that will also provide food and have a durable heartwood, for example, white oak, black walnut, chestnut oak, red gum, black gum, maple or basswood.
2. Select a live tree at least 15" in diameter and with a den entrance at least 20' from the ground.
3. Select a tree that is being used, as indicated by the cutting of bark and wood around the den entrance.
4. Select den trees that are well distributed throughout the area.

Contrary to popular belief, good den trees are not always abundant, particularly in more extensive forests.

Leaf nests are built in almost any species or size of tree and no special management measures are needed. They contain few squirrel litters.

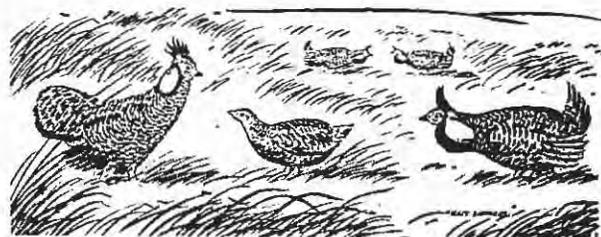
Food and Cover: Food and cover for tree squirrels is almost synonymous. The staple diet consists of mostly nuts and acorns, and in the case of the fox squirrel, corn. Favored foods are hickory nuts, oak acorns, walnuts, butternuts, beechnuts, pine seeds, maple seeds and hazelnuts. Squirrels generally prefer hickory nuts over white oak acorns and white oak acorns over red oak acorns. Seeds and buds of elms, maple, tulip poplar and fruit of Osage orange are also utilized. Trees in the woodland border or in woodland openings are generally better food producers because they receive more sunlight. In late summer and early fall succulent fruits such as blueberry, blackberry, apple, wild grape and wild cherry aid in filling out the menu. A squirrel will require about its own weight in food per week. (Average - 1 pound 11 ounces for fox squirrels, one pound 2 ounces for gray squirrels).

DISTRIBUTION OF GRAY AND FOX SQUIRRELS IN THE UNITED STATES



Prepared by Hans G. Uhlig, SCS Field Biologist, Fergus Falls, Minnesota

Land management for PRAIRIE CHICKENS



General: Although a prairie chicken area must be measured in thousands of acres (four sections is about the smallest) only part of it needs to be under specific management. Grassland is the key to prairie chicken management. Most prairie chickens in the Midwest are on native grasslands, but bluegrass and redtop are also important and probably will support just as dense populations. For best production, an area should not be more than 25 percent wooded and the wooded tracts should be in scattered blocks. Tall fence rows or windbreaks around every field are generally undesirable. The bird does not, however, require true prairie. Intensive land use is generally incompatible with its needs.

Land Management practices most important in sustaining good living conditions for prairie chickens are:

1. Maintain at least 40 percent of the land total in grassland. This grassland should be in parcels of 20 to several hundred acres.
2. Over-grazing must be avoided but partial hay harvests or grazing within carrying capacity are not especially detrimental.
3. Maintain a network of marshes, swales, or other wet areas for use as winter cover.
4. Crop fields should not be grazed by livestock after the harvest.
5. Where wet areas are scarce or water is inadequate during dry seasons, ponds or pits may be constructed where needed for watering livestock or for other uses. Ponds should be fenced to exclude livestock, with an area at least 40 feet wide around the ponds included in the fenced area. Uncontrolled burning should be avoided, and controlled burning limited to places where it is needed to control plant succession. Any burning should be done in the winter or very early spring before the nesting season. Elsewhere grass should be managed by grazing or mowing. Nesting cover should be moderately dense; unmowed until after hatching (about July 1) if it is hay, or moderately grazed if it is in pasture.

Range: Prairie chickens have a greater tendency to move than do other upland game birds. Females are more prone to migrate than the males. Sometimes it may be a move of 5 to 10 miles. However, the varied land use pattern brought about by farming has distributed food supplies more generally and the need no longer exists for extensive travels. Therefore the usual range is no more than one to three miles.

Nesting: Nesting begins in April or early May. The area selected for nesting is almost always in grass cover. Pastures, hayfields, native grass areas and marsh edges are all satisfactory. Woods clearings and other brushy areas are sometimes selected for nesting sites. Nesting cover is the most important cover type required. On nesting grounds there should be a tree-free sweep of at least one-half mile in one direction, preferably in both. The cover should be grassland with some slight mixtures of broad-leaved plants and sedges. Medium dense stands of midgrasses like bluegrass, redtop, timothy and quackgrass are best. Low, poorly drained sites are best.

Eggs are laid at the rate of almost one a day until the clutch of 11 or 12 is completed. Incubation takes 23 or 24 days. Eggs are varied shades of olive or tan with varied size spots of brown or reddish brown. The height of the hatching period is from late May to mid-June, although some hatching may occur later. At about 8 to 12 weeks of age the broods begin to break up. By this time there has been some mortality from exposure, accident and predation. By early fall the birds start flocking; those from a single brood may be in one or more flocks. In September the flocks tend to be separated according to sex, with the adult and young males in groups segregated from young and old hens.

Booming ground cover: Courtship activity of prairie chickens involves "booming" in which cocks dance and make "booming" sounds with air sacs at the sides of the throat. A booming ground is often a rise of land; the area used may be from 150 to 500 feet in diameter. These areas are generally in sod, on low ground or slightly rolling land. Two common characteristics are:

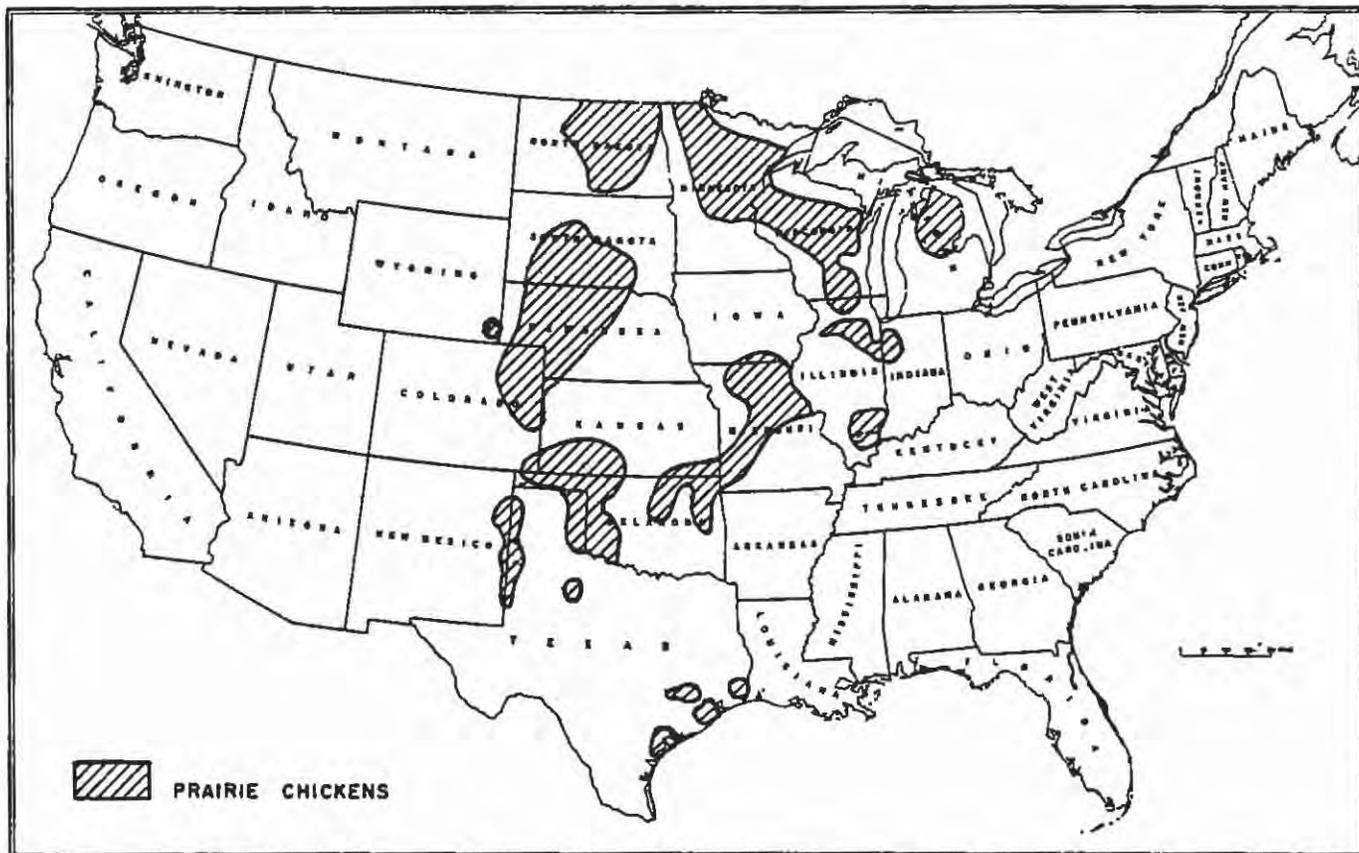
1. Open exposed places with wide horizons.
2. Short cover on grazed or mowed meadows or where grass has been flattened.

Coarse weeds in booming grounds should be removed. The hens begin coming to the booming grounds in March. At first their visits are short and their arrival greeted by great activity by all cocks. By early April hens visit the booming grounds regularly and stay long. Booming ground activity is greater in the morning than in the evening. Participation in fall displays on the booming grounds is not nearly as great as in the spring and the vigor of the booming is indifferent. Most fall booming is in October.

Roosting cover: In summer, reed canary and some coarse sedges are excellent. Quackgrass and timothy stands are better than bluegrass. In the winter, brush patches and edges of woods are often used. Burrowing in deep snow is common. Clumps of cherry, aspen and willow are often used for loafing cover.

Food: Winter feeding would be beneficial where grain and corn is unavailable. Food patches are recommended at a rate of 4 or 5 per township, not closer than 4 miles apart and near familiar concentration spots of the prairie chickens. One acre of standing unpicked corn will feed about 30 prairie chickens through the winter. Patches should be in the open, 100 yards or more from well traveled roads. A chicken needs 1.5 to 2.0 pounds of corn per week. Grains and soybeans are readily eaten. Buckwheat is also preferred. Small patches of food near booming grounds might be useful in the spring. Some important prairie chicken foods are corn, oats, buckwheat, knotweed, wild rose, wheat, clover, oak acorns, foxtail millet, ragweeds, dogwood fruit and hawthorn.

DISTRIBUTION OF PRAIRIE CHICKENS IN U. S.



From "Distribution of American Gallinaceous Game Birds," Circular 34, Fish & Wildlife Service, U. S. Dept. of Interior, 1955.

Prepared by Hans G. Uhlig and Wade H. Hamor, SCS Biologists, from "A Guide to Prairie Chicken Management" by F. N. Hammerstrom, Jr. et al, Bulletin #15 Wisconsin Conservation Department, Madison, 1957 and "American Game Birds of Field and Forest" by Frank C. Edminster, 1954.

U S DEPARTMENT OF AGRICULTURE

Soil Conservation Service

Land management for SHARP-TAILED GROUSE



General: The prairie sharp-tail is found in south central Canada, the northern Great Plains and western Lake States in the United States. It has extended its range eastward into northern Michigan and southern Ontario and has disappeared from Iowa and Illinois.

The key to sharp-tailed grouse habitat is grassland. However, sharp-tails demand woodland and brush for their existence and will tolerate a higher percent of forest or woodland than prairie chickens. In the Lake States the sharp-tails are entirely dependent on herbaceous openings as caused by burning, logging, abandoned farm clearings, frost pockets and large open bogs and marshes. Therefore, its habitat in the Lake States is the openings, low brush and scattered thickets of early stages of forest succession. In the Plains States the sharp-tail is dependent on the preservation of shrubby and wooded stream bottoms, draws and hillsides and proper grasslands range management. The minimum practical size for a sharp-tail area will range from one square mile in forest area under good conditions to four square miles in plains area under good conditions. Under poor conditions one needs five times as much land in either case.

Land management practices most important to improving living conditions for the prairie sharp-tailed grouse are:

1. Proper livestock grazing of range and pasture lands.
2. Maintaining and planting shrubs and trees where woody cover is desired.
3. Cutting back woodland borders to allow natural succession to grass and brush.
4. Periodic controlled burning (once every 5 to 10 years depending on the rapidity of woody regrowth) of sites unsuitable for growing commercial timber. Burning should be done in early spring when the weather is quiet and the ground moderately dry and before the sharp-tails are nesting.
5. Maintain up to 3/4 of the total land area in properly managed grasslands or similar herbaceous vegetation such as sedges, cordgrasses, and marsh associated vegetation.

Range: The sharp-tailed grouse, like the prairie chicken, is a much more extensive traveler than other upland game birds, and moves as much as 2 or 3 miles daily. Seasonal movements up to 10 miles are common.

Dancing grounds: The courtship activity of the sharp-tail is an impressive performance. The dancing ground is almost always located on grassland or herbaceous cover and situated on hills, ridges or other high ground whenever possible. Like the prairie chickens, the same communal courtship grounds are used year after year by the males. Their activity manages to keep the grass flattened on the dancing ground so that open ground with scattered grass tufts is maintained. Dancing grounds may be up to one acre in size and it is important that good grass vegetation surrounds the dancing ground proper. The termination of the use of dancing grounds usually is due to range deterioration or forest growth. The male courtship activity on the dancing grounds takes place from March (sometimes February) to June. The peak dancing activity is in April when the number of males on the dancing grounds is consistent and at a maximum. Males visit the dancing grounds in the evening during the spring also and on mornings in the fall. They do not use the dancing grounds as consistently during spring evenings as prairie chickens use their booming grounds at this time. Sharp-tails use their courting grounds more consistently in the fall than do the prairie chicken, however. Like the prairie chicken, the greatest male courting activity occurs from 45 minutes before sunrise until 2 or 3 hours after sunrise. Females frequenting the dancing grounds reach a peak during April. For almost a two week period in April, the number of females on the dancing grounds equals the number of males.

Nesting: A majority of the hens seek out their nesting places during the last half of April. They usually nest within one mile of the dancing grounds in good grass cover in well managed or unused grassland or grass openings in brushland. Sometimes nests are located in grain stubble and alfalfa. The typical clutch is 12 eggs (it may vary from 5 to 17) and the incubation period is 21 days. The eggs are olive to dark buff brown and usually unmarked (marked eggs have scattered dark brown spots). The peak of the hatch usually occurs in mid-June and in average years about 50% of the nests are successful. Renesting attempts are made into June. At 10 to 12 weeks of age the young show some independence from the parent. At this time, the brood size averages six young. The summer brood territory is rarely more than one-half mile across. When chicks are young they prefer the cover of lightly grazed grasslands with scattered low shrubs and brushy draws or sparse tall grass cover mixed with shrubs.

Cover: The idealized square mile in the Lake States would have a minimum of 40 acres (6% of the area) of herbaceous cover of very low or poor sparse grass, with scattered large patches of heavier grass, willow, blueberry, or fern. This would be near the center of the section and furnish a dancing ground site, roosting and loafing cover and a feeding area.

Three hundred twenty acres (50% of the area) surrounding this area should be 80% dense grasses and 20% woody cover. The woody cover should be of varying height with scattered pincherry, juneberry, or paper birch trees with occasional clumps of trees, preferably aspen, from .1 acre to 1 or 2 acres in size.

Two hundred eighty acres (44%) surrounding the above area should be woodland with a series of small essentially open clearings averaging 10 acres in size that occupy about 1/3 of the area. The woodland should be second growth timber with crowns occupying about 50% of the space.

There is an interesting relationship of cover density to seasonal use by sharp-tails that runs contrary to usual game bird habits. In the winter the usual habitat of most animals shrinks, not so with the sharp-tail in the forested states. Summer is the season of the most restricted habitat and winter the time of greatest freedom of cover choice (this is not true in the plains areas). The dense foliage of summer limits the sharp-tail to the more open areas. When winter removes the foliage from the hardwoods much of the denser brush on the woodland edge becomes open enough to satisfy this unique bird.

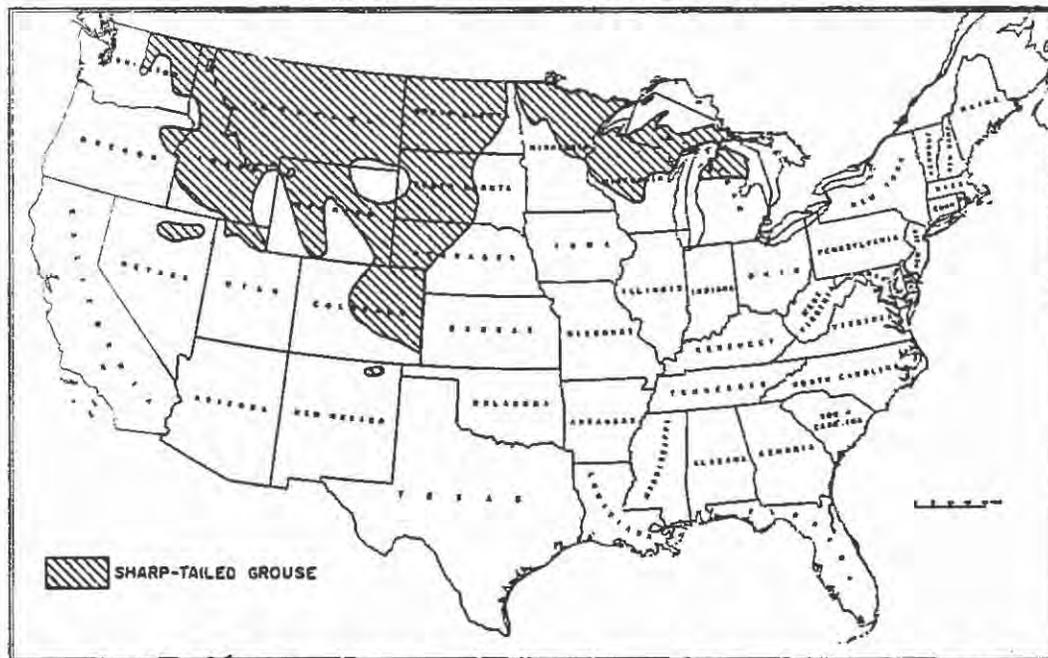
The use of fire as a tool in land management for sharp-tails is a good one provided one has experience and local prejudice has been overcome. As far as managing sharp-tails in forested areas is concerned, it appears that controlled burning is the only tool that is inexpensive enough to use on a large enough scale to be significant. The alternative is to rely wholly on the accidental bounty of the lumbering business or nature's own forest fires, but where sharp-tail hunting is important the alternative is not enough.

In the Plains States grazing control is the key to the problem of improving sharp-tail cover. Proper range management that assures peak forage production and the maintenance of the best forage producing native grass species will provide adequate nesting, rearing and roosting cover. This grazing pressure will maintain the trees and shrubs that are present in stream bottoms and draws and side-hill draws. Virtually all of the elm, willow, boxelder, plum, chokecherry, buffaloberry and ash has been eliminated by overgrazing in many sections of the present sharp-tail range. Management should be directed toward maintaining what remains and replacement by planting. Sharp-tails prefer nesting in grasslands that are unutilized or lightly used. Quite often range deterioration causes them to nest in grain stubble, hayland and alfalfa.

Food: Sharp-tails do not depend on cultivated crops at any time of the year. Their use of cultivated crops is usually due to its availability, deterioration of their wintering grounds, or preference for grains. The food of sharp-tails in the winter is predominantly woody buds and tiny twigs; in spring it is mainly greens, sprouts, weed seeds and waste grain; in summer their main foods are flowers, fruits, insects, and greens; and in the fall their main food is weed seeds, fruits, waste grain and greens.

Some important sharp-tail foods are: buds, twigs or leaves of birch, willow, poplar, and Prunus species, and fruit, flowers, buds, seeds, or leaves of wild rose, yellow goatsbeard, prickly lettuce, poison ivy, hazelnut, clovers, and wild grasses. Wild rose hips are probably the most basic sharp-tail food.

DISTRIBUTION OF SHARP-TAILED GROUSE IN U. S.



From "Distribution of American Gallinaceous Game Birds," Circular 34, Fish & Wildlife Service, U. S. Dept. of Interior, 1955.

Prepared by Hans G. Uhlig and Wade R. Hamor, SCS Biologists, from several sources including publications of Michigan, Wisconsin and Kansas.

Land management for NON-GAME BIRDS



General: The non-game birds considered here are songbirds, marsh birds, woodpeckers, hawks and owls. The bobwhite quail and mourning dove are included even though they are game birds in some states.

These birds are attracted to farms, ranches and small holdings by the application of soil and water conservation practices. In addition to helping control insects and small rodents, birds offer many hours of recreation to people who enjoy seeing them about their homes.

Land Management practices of benefit to non-game birds are:

1. Protection of marshes, ponds, woodlands, streambanks and odd areas from livestock.
2. Management to provide shrubby fencerows as opposed to "clean" fencerows.
3. Prevention of overgrazing of pastures.
4. Use of stripcropping and crop rotations.
5. Construction of ponds.
6. Special management of the areas listed below.

Hedgerows: The low woody vegetation of hedgerows is the desired habitat of many songbirds. Multiflora rose (thorny or thornless), bush honeysuckle, autumn olive, highbush cranberry or any of several other shrubs make effective hedgerows along field borders, around gullies or farm ponds. These plants attract the catbird, cardinal, mockingbird, cedar waxwing, brown thrasher, indigo bunting, mourning dove and others.

Hedgerows can be established by planting seedlings by hand or with a tree planter, or by the "plow-perch" method. That is, in summer or early fall plow a six foot strip where a hedgerow is wanted. Set fence posts in a straight or staggered line at about 20-foot intervals down the center of the plowed strip. String wire or binder twine between them for perches. Fruit eating birds will plant their choice foods including wild cherries, blackberries, dogwood, elder, mulberries and many others. These "plow-perch" plantings grow almost as fast as the other kinds.

Fencerows: When allowed to develop naturally, fencerows in many states grow into shrubby borders and can be maintained as such by cutting out elm, ash or other tall trees as they appear. Shrub borders harbor many beneficial insects and small mammals and are of much more value to the farmer from this standpoint than grassy fencerows. Shrubby fencerows are used by such birds as quail, cardinal, goldfinch, mockingbird and chipping sparrow.

Headlands: This term is used to identify the grassy strip at the end of a cultivated field where the farmer turns his machinery. Ground nesting birds as the meadowlark, marsh hawk, song and field sparrows, bobwhite quail, and some warblers feed and nest in them. Headlands, 15-20 feet wide, may be established by direct seeding or by leaving the area unplowed when converting a meadow to the production of grain crops.

Roadsides, streambanks and ditchbanks: These sites are much used by the birds listed for hedgerows and headlands. Ground nesters use them if they are in grass, whereas the tree and shrub nesters occupy them if woody cover is dominant. Grazing, mowing, spraying or burning of these areas should be avoided except as needed to control unwanted plants.

Odd areas: Corners of spacious lawns, field corners, gullies and the fenced area of ponds planted to clumps of trees, shrubs and vines are attractive to birds. To be of most use, the clumps should cover an area not less than ten feet square. Cedars, spruce, pine, Russian olive, autumn olive, honeysuckle, multiflora rose, wild grape and bittersweet are some of the plants useful in these locations. Clumps can be established by the "plow-perch" method, by allowing these restricted areas to develop naturally, or by direct planting with seedlings.

Mature woodlands: Tall trees are nesting places for the great horned owl, red-tailed hawk, bald eagle, Baltimore oriole, scarlet tanager, and others. Dead trees invite flickers, redheaded woodpeckers, sapsuckers, bluebirds, house wrens, and screech owls which nest in hollow trunks or limbs. To provide for these species leave dead trees in

the woodland or kill two or three tall, unwanted trees per acre. Killing is best done by "ringing" the trunk--that is, cutting the cambium layer in a strip two or three inches wide around the tree at breast height. Grasses and shrubs will appear in the area formerly shaded by the canopy and will attract birds other than the kinds noted above.

Woodland clearings: Dense, mature woodlands seldom harbor many small birds. To encourage more use it is necessary to increase food production and the variety of plants within the wooded area. To do this, select trees as wild cherry, hackberry, oak, beech or hickory and apply the orchardist's method for producing more fruit. Measure the diameter of the fruit tree in inches at 4½ feet above ground, multiply the diameter by 3, substitute feet for inches. This gives the length of each side of a square centered on the selected tree. Remove all trees within the square except the one to be favored. Example: The selected tree is 10 inches in diameter at 4½ feet above ground. Multiply 10 x 3 = 30 inches. Substitute feet for inches. This makes the length of each side of the square 30 feet. Center the tree in this square and remove all other trees. A surprising number of shrubs, grasses and new birds will appear.

Wild food patches: A small field can be managed to attract such seed-eating birds as snow buntings and redpolls (in northern states), goldfinches, tree sparrows, mourning doves, and juncos. No planting is necessary. Lay the field out in five strips, the width of each is not so important, but probably should not be less than five or greater than 30 feet. Each year plow a single strip in sequence such as 1-3-5-2-4 or 2-4-1-3-5. By repeating the sequence after the fifth year, shrub invasions are halted and strips of mixed vegetation are continually available to the birds. Favorite bird foods as bristle-grass, barnyardgrass, panic grasses, lambsquarter, ragweed and smartweed will spring up the first year. One can expect a mixture of grasses, oxeye daisies, asters, goldenrods, blackeyesusans, milkweeds, and others to vegetate the plowed areas by the third year.

Planted food patches: Food patches planted for songbirds will attract the seedeaters. The size may range from 100 to 2000 square feet or more. Pure stands of corn, grain, sorghum, millets, or sunflowers produce the most food, but a mixture of these attracts a greater variety of birds. The bristlegrasses and ragweeds which accompany cultivation are nutritious bird foods. All cultivation should be done on the contour to avoid soil erosion.

Wetlands: Many kinds of birds, from wild swans to tiny marsh wrens, are attracted to wetlands. The kinds and numbers depend on the size and location of the wet area, its degree of wetness and the plant and other animal life present. There are several kinds of wetlands:

1. Ponds. A dam constructed across a drainageway offers the best means of creating a wetland habitat. Ponds so created attract mourning doves, snipes, killdeers, herons and a number of others. The fenced area surrounding ponds can be developed by growing clumps of trees, shrubs and vines in the corners and along the fence. Woody plantings closer than 30 feet to the water will interfere with fishing. Keep them well back from the shoreline.
2. Pits. These are sometimes called "dugouts" and are constructed by digging in land having a high water table (one foot or less below the ground surface) or in a relatively flat drainageway where runoff will keep the pit filled with water. The environs of pits can be developed in much the same way as ponds to attract songbirds.
3. Marshes. Natural and man-made marshes support a myriad of plant and animal life. A marsh can be built on a couple acres of fairly flat land where soils are tight enough to hold water or the water supply is sufficient to compensate for limited seepage. The construction of a dam or dike is usually necessary. The simple marsh will range in depth from one inch to three feet or more. A more elaborate marsh may have a depth of several feet at one end with most of the remainder covered by one or more inches of water. The deep end is suited to swimming, boating and fire protection while the shallow area will grow marsh vegetation. Vegetation may become so dense as to eliminate all open water in a shallow marsh. It is important to have some open water areas scattered about the marsh. These can be created during the early construction stage by digging pits to provide minimum sized water areas of 100 square feet from two to four feet deep. Two to five such areas per acre of marsh are desirable. The spoil should be piled where there is no danger of its sliding back into the excavation.

Native marsh plants will ordinarily invade the new area making planting unnecessary. Circling the marsh with a row of shrubs or planting clumps of trees and shrubs as described above adds to its beauty and usefulness.

A greater degree of management is possible if a water-level control device is installed in the dam. By fluctuating the water level the owner can reduce unwanted vegetation or encourage desirable plants.

Artificial measures: Bird houses may be constructed and located within a developed area. These do not take the place of good habitat; they merely entice birds to places where they can be more easily seen. Among the birds known to use bird houses are the bluebird, chickadee, flicker, house wren, martin, screech owl, sparrow hawk, tree swallow, some warblers and the woodduck.

Land management for MUSKRATS



General: The muskrat is the nation's greatest fur resource. Its harvest is six or seven times that of any other species of fur animal. This 2 or 3 pound animal occurs throughout the greater part of the continent, from Bering Strait and the southern half of Alaska to the Mexican border.

Land management practices most helpful to muskrats are:

1. Protect marshes, sloughs and ponds from grazing.
2. Build water control structures at the outlet of marshes having a reliable water supply. Controlling water levels makes it possible to grow preferred muskrat food plants and to make them available to muskrats in the winter.
3. Construct level ditches in shallow marshes on which water levels cannot be controlled. Level ditching is another method of making sure that food will be available for muskrats in the winter. Spoil banks also furnish excellent places for dens. Ditching makes trapping easy; most of it can be done from a boat.
4. Practice controlled burning of marsh vegetation in early spring. Occasional burning keeps dead vegetation from gradually "filling" the marsh. It also makes trapping easier.
5. Stabilize streambanks by protecting them from grazing, establishing grass on them, and building mechanical structures where necessary.

Range: Muskrats do not forage more than 100 yards from home, but occasionally will go one-fourth mile up or down stream. Movement more than half a mile is probably due to deterioration of the home range or high population pressures.

Breeding: Although at times muskrats are highly polygamous, they eventually pair off and share in building or repairing the house, thereby displaying a tendency toward monogamy. Mating begins in late March and the first young are born in late April or early May. Two or three, and sometimes four, litters are produced annually with an average of 6 per litter.

At birth the young weigh less than an ounce, are blind, almost naked and helpless. At 14-16 days, however, their eyes open, they have developed fur, they are beginning to nibble on green succulent vegetation, and are able to swim and dive. They are weaned at about 4 weeks.

Habitat: The muskrat is seldom seen far from water. Its habitat may be in streams, rivers, canals, ponds, lakes, swamps, or marshes. Their homes may be in a bank burrow or in a house constructed of fibrous root masses or stems of aquatic plants growing on the area. A bank den is about 6 inches wide and 8 inches high. It is reached by one or more tunnels 5 or 6 inches in diameter and 10 to 50 feet long, with the entrance under water. Houses built of vegetation may vary from 1 1/2 feet to 4 feet in height; the entrance is under water. Nesting or dwelling houses are generally elliptical as compared with the smaller (1-1 1/2' high) more circular "feeding shelters". A "push up" or "breather" is another construction built in the northern states as soon as the ice forms in late fall. Muskrats build these by cutting holes in the ice 4 or 5 inches across and pushing roots, waterweeds, and other submergent vegetation through the openings. A 12-18 inch mass of vegetation is formed on the ice above the hole and a cavity is formed on the inside which the muskrats use as a shelter, breather, or feeding station. When the ice thaws they collapse.

The three essentials required to sustain a muskrat population are:

1. An abundance of aquatic vegetation for food and cover.
2. Sufficient fresh or slightly saline water for swimming and proper sanitation.
3. A suitable type of soil in which to dig canals, underground tunnels, and runways.

Marshes with about 80% vegetation and 20% open water are the best. Control of water levels is very important since muskrats are affected more by rapid changes in water levels than by changes in type of marsh vegetation. Sudden high water levels in the spring result in drowning of young; prolonged low water levels in the summer can stop breeding and lower the rate of survival. However, a temporary draw down to expose the soil during the first half of the growing season will promote the growth of cattails and bulrushes, and is important where food is scarce or has been destroyed by an over-population of muskrats. A good summer water level is 6 to 20 inches. In the winter, the water level should be raised to 3 feet in northern states, to 2 feet in central states and to 1 foot or more where freezing occurs only occasionally.

Establishing level ditches 4 to 5 feet deep will improve a shallow marsh by providing sufficient depth to allow the muskrats to find food during the winter. It also tends to concentrate the 'rats for harvest. Other methods of increasing population are blasting openings in heavy vegetation, and controlled burning. Burning, however, should never be attempted when the area is completely dry (at least 3" of water), on windy days, or over more than one-third of the area at one time. While the beneficial effects of marsh burning appear to out-weigh any unfavorable ones, the owner should always consider the value the marsh has for winter game bird cover. Burning indirectly controls insects, provides open water areas for muskrats and waterfowl, and prevents elevation of the marsh through accumulation of dead vegetation.

Principal predators of muskrats are raccoons, minks and foxes.

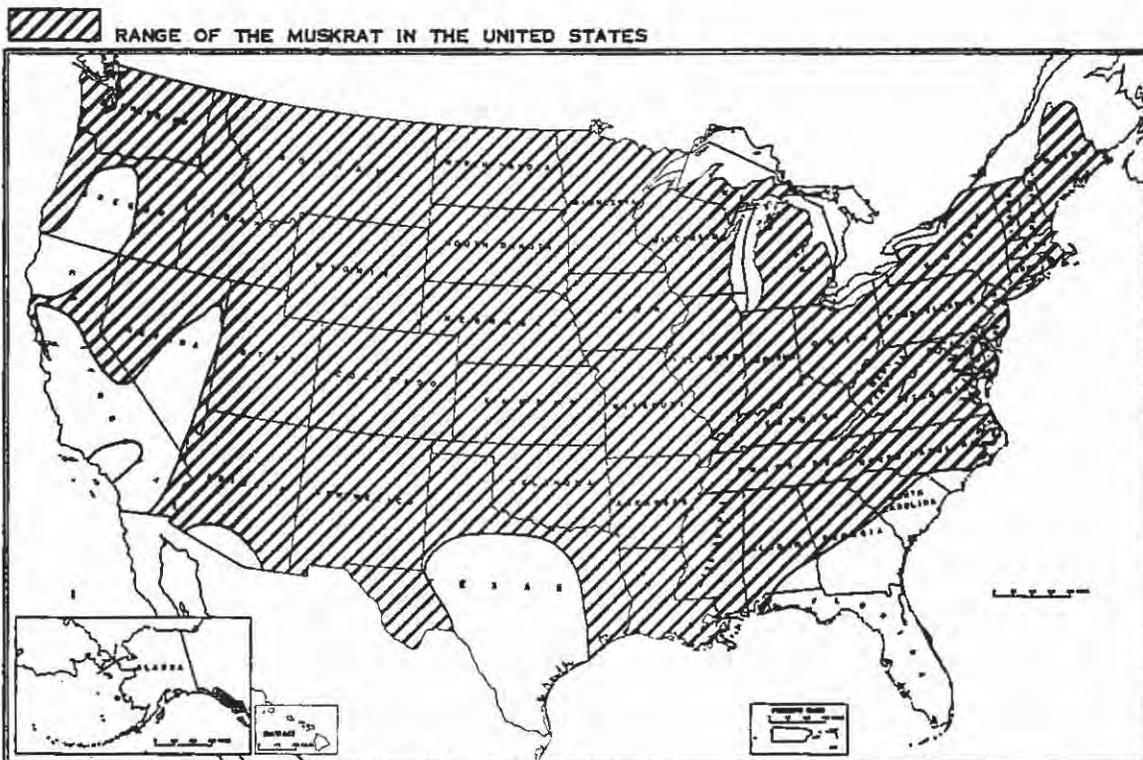
Harvesting: Muskrats cannot be "stockpiled". The harvest must be taken each year or it will be lost. Unless the population is very low, it is safe to harvest two-thirds of the population or about 2.5 animals per house or burrow.

An arbitrary count of five muskrats to a large house or bank den is frequently used to estimate populations. A density of 2.5 dwelling houses per acre calls for intensive trapping to prevent "eat-outs". Another sign is when the food around several houses is grazed for 30 to 40 feet, particularly if these areas meet.

Foods: Cattails, bulrushes, burreed, rice cutgrass, and arrowhead are preferred foods. Other foods eaten are sedges, pondweeds, waterlily, panicgrass, and corn. There is minor use of animal foods such as fish, fresh water mussels, insects, crayfish, and snails, but the percentage is very low.

Controlling muskrat damage to earth fills of ponds and reservoirs:

1. Deepen the edges around the pond so they are steeper than the slope of the earth fill. Muskrats seek out the steepest bank they can find for their burrow.
2. Construct a 10-foot wide berm, or flat shelf, on the water side of the fill. It should be 6 inches higher than the normal water level.
3. In older ponds and reservoirs, where extensive muskrat damage has occurred, install 4 x 8 foot sheets of asbestos-cement on the water side of the fill. Place them vertically so that 2 feet is below, and 2 feet is above the normal water line. Provide 6 inches of earth cover over the buried sheet. These sheets will prevent further damage at a reasonable cost, and will remain effective for several years.



Prepared by Hans G. Uhlig and Wallace L. Anderson, SCS Biologists, from "Muskrat Production and Management" Circular 18, Fish and Wildlife Service, by Herbert L. Dozier, 1953, and other sources.

Land management for DUCKS



General: Ducks nest and rear their young in the northern part of North America, about 80 percent in Canada and Alaska. The remaining 20 percent are produced in the northern United States, especially in western Minnesota and in North Dakota and South Dakota. Wood ducks breed principally in the hardwood forest areas of eastern North America, from Florida and Texas to New Brunswick and Minnesota. There is a small population on the West Coast. Ducks winter in the southern part of the continent, mostly below the 36th parallel.

Ducks require food, cover, and water for their welfare, just as do other forms of wildlife. Land management for ducks is made more difficult by two factors: (1) the need for water areas, and (2) the migratory habits of waterfowl. Maintenance of the breeding areas in the north and the wintering areas in the south are both required to perpetuate the species.

There are two main groups of ducks: (1) The surface feeding ducks. These feed in shallow water by tipping, sit high in the water with the tail feathers pointing upward, rise from the water with a strong upward bound, and have a color patch (speculum) on the wing that is generally highly colored or iridescent. Some of the species making up this group are the mallard, black duck, gadwall, baldpate, pintail, blue-winged and green-winged teal, shoveller, and wood duck. A total of 16 species are found in North America. (2) The diving ducks. They feed by diving, sit low in the water with the tail pointing downward, paddle along the surface before clearing the water on take-off, and have a color patch on the wing that is not bright and that lacks iridescence. There are 20 forms found regularly on this continent. Among the diving ducks are the canvasback, redhead, scaup and ring-neck.

Land management practices of benefit to ducks are:

1. Maintain and improve existing wetland areas, and establish new ones. Those over one acre in size are especially desirable.
2. Place loafing sites (rock piles, bales of hay or straw, floating logs or rafts) in shallow water of potholes, ponds, dugouts and other water areas at the rate of 4 or 5 per acre.
3. Maintain a border of grass 40 to 300 feet wide around marshes, sloughs, potholes, ponds and other water areas. Control fire and grazing on it. Protect nests by avoiding mowing or grazing until after July 15. Grass only moderately after that. Use herbicides wherever possible to control unwanted plants.
4. Establish feeding areas in which waterfowl food crops can be grown and then flooded to make them available for ducks.
5. Build water control structures at the outlet of marshes having a reliable water supply. Regulate water levels to provide desired food plants and desired ratio of cover to open water.
6. Establish ponds on sites providing the greatest length of shallow shoreline and the greatest number of coves. Maintain a good grass cover and a constant water level wherever possible.
7. Improve pits and dugouts for ducks by providing a gently sloping shoreline on at least two sides. Maintain good grass cover and as constant a water supply as possible.
8. Construct nest boxes for wood ducks adjacent to ponds, streams or sloughs having woods and shrubby cover nearby.
9. Prevent silt deposit in ponds, pits, marshes, and sloughs by establishment of such soil conservation practices as grass waterways, strip cropping, diversions, and proper crop rotations.

Range: Home range in the northern breeding areas vary with the species, ranging from 2 1/2 miles for the canvasback, 1 1/2 miles for the mallard, down to 1 mile for the blue-winged teal. The approximate acreages of the home ranges for these species are 1300, 700, and 250 acres respectively. Mallards generally winter in the extreme southern states, but some ducks such as the blue-winged teal occasionally migrate as far south as central Chile and Brazil.

Nesting: Some ducks return to the northern breeding grounds in early April, with main flights arriving during the latter part of the month. Mallards and pintails arrive first, followed by scaups, with blue-winged teal last. Many birds pair off before they return to the breeding grounds. Very often they will return to the area where the hen had previously nested, or in the case of yearlings, where the hen was hatched. Studies in the Waubay area of South Dakota indicate that early arrivals generally prefer potholes larger than 2 acres. This was particularly true for blue-winged teal and gadwall. In fact, the distribution of breeding pairs indicates that most birds, about 94%, prefer areas larger than one acre. The smaller, apparently less desirable, areas increase in importance as the breeding populations of a species increases.

Species vary in time of nesting, but by the middle of June approximately 60% of the nests have been started. Clutch sizes vary from 6 to 15, but the average number of eggs laid is about ten. The incubation period for blue-winged teal and shovellers is 21 or 22 days, while birds that lay larger eggs, such as the canvasback, redhead and mallard may vary from 22 to 29 days. The location of the nest also varies with species; the average distance for blue-winged teal was 41 yards from the water's edge. Generally 80 percent of the surface feeding ducks will nest within 100 yards of water. Diving ducks usually nest in wet, boggy places, bordering the edges of marshes, ponds, and sloughs, and the nests are often barely above the level of the water. Habitual tree nesters are the woodduck, golden eye, bufflehead, and hooded merganser. Ducks readily re-nest if their first nest is destroyed.

Cover: Breeding pairs use potholes with very sparse cover or with no vegetation at all. Potholes with excessively dense vegetation are used very little. On the other hand, a certain amount of cover is of value as wind shelter in cold, blustery weather. Intensive land use, involving the plowing and burning of the entire pothole often improves it for use by breeding pairs by removing excess plant cover. Hardstem bulrush is by far the preferred cover for diving duck nesting.

Broods generally are found on larger open water areas. The selection of brood rearing habitat depends on the availability of a means of escape from predators. This may be furnished by cover sufficient to conceal the brood or by open water of sufficient size and depth so that broods can dive to escape their enemies. Broods are seldom found on potholes less than 1 acre in size or with less than 5" of water. Areas with no cover are used by broods only if they are at least 20" deep and 5 acres in size. Ducks have been rated in order of decreasing demand for deep water and increasing demand for escape cover: (1) canvasback (2) lesser scaup (3) ruddy duck (4) redhead (5) baldpate (5) gadwall (7) shoveller (8) green-winged teal (9) blue-winged teal (10) mallard and (11) pintail. Thus canvasback broods preferred deep water and demanded less escape cover, while mallard broods preferred more escape cover and demanded less deep water.

Creating the maximum amount of edge between marsh vegetation and open water is a practical method of improving many marshes. Areas overgrown with cattails with no open water may be burned over in the spring prior to the arrival of the ducks. Openings 30' x 30' may be created by spraying cattails with herbicides. Areas surrounded by vegetation may be opened from the shoreline to the open water either by the above methods or by use of dragline or dynamite. Strips 30' wide are recommended. Raising the water level will also drown out many of the cattails. The more edge effect produced the more desirable the marsh becomes for waterfowl. Possibly as much as 50 percent of the shoreline vegetation may be removed.

The importance of loafing spots is generally not sufficiently appreciated. Small islands, knolls, sand-bars, open margins, or exposed mud-flats are valuable for this purpose. Floating logs or rafts firmly anchored to the bottom are used by ducks as loafing, sunning, sleeping, and preening spots. Rock piles and old bales of hay or straw in the shallower portions of a marsh may also serve the same purpose.

Food: In general, lack of food is not thought to be a limiting factor in waterfowl management during the production season. Abundant high quality food, however, is essential on the wintering grounds so that healthy birds in good breeding condition will return to the production areas in the spring. Good food is also important in holding ducks in places where a long harvesting season is desired.

Feeding areas may be developed by diking relatively level land and installing a water control structure that will permit sufficient drainage for crop production. Duck foods like corn, browntop or other millets, or buckwheat are grown in the diked field. When the duck hunting season arrives, the diked field is flooded to a depth of 6 to 12 inches. This is done by releasing water from a nearby impoundment at a higher elevation, or by pumping from streams, canals, ponds or wells.

The duck food plants must be left in a natural condition before flooding; they must not be cut, knocked down, or tampered with in any way.

Ducks should be harvested from feeding areas only in the morning. The birds should be allowed to feed undisturbed during the afternoon and evening.

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