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FEEDING WILDLIFE IN WINTER



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UNITED STATES DEPARTMENT OF THE INTERIOR
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Conservation Bulletin 13

FEEDING WILDLIFE IN WINTER

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WILDLIFE NEEDS man's help in winter; this fact has long been recognized. The sheaf of grain that in some European countries is raised on a pole for the birds at Christmas time symbolizes man's response to the needs of wildlife; but something more than a symbol, something more than an offering at a single season, is required. Winter feeding, to be really helpful, should be well planned and sustained. Food should be readily accessible before it is needed, and the supply should never fail. Methods of winter feeding for wildlife that actual experience has proved to be valuable are discussed in this bulletin, and it is hoped that an increasing use of these methods will aid in conserving interesting and useful species of wildlife.

FEEDING WILDLIFE IN WINTER

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NEED FOR WINTER FEEDING

WINTER IS A critical period for many species of wildlife. Coverts then grow smaller in area and, without foliage, afford less protection. Available food supplies also diminish in both quantity and quality. The species of wildlife that hibernate or migrate do



FIGURE 1.—Cover and food scanty; winter feeding needed.

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not suffer from these changes, but by midwinter the upland game birds, many songbirds, some small mammals, and, more rarely, big-game mammals are often crowded into restricted patches of cover and forced to subsist on scanty and undependable foods (fig. 1).

NOTE.—This bulletin supersedes Farmers' Bulletin 1783, issued in 1937 by the U. S. Department of Agriculture—a contribution of the Bureau of Biological Survey, which was consolidated in 1940 with the Bureau of Fisheries to form the Fish and Wildlife Service, U. S. Department of the Interior.

As a result, starvation may kill these creatures (fig. 2) or so weaken them that they become easy victims of predatory animals or more susceptible to cold, disease, and other misfortunes that do not menace well-nourished individuals. Well-fed game birds, for instance, rarely, if ever, die from exposure to cold, even in the most severe winter weather, and if food is abundant in and near good cover they have little to fear from natural enemies. Food, which is always a limiting factor



FIGURE 2.—Journey's end. (New York Conservation Commission photograph.)

in determining the distribution and abundance of wildlife, becomes of the utmost importance, therefore, in times of excessive cold, sleet, deep snows, and blizzards, especially for birds. Yet many coverts are seriously deficient in available winter foods, and in such cases man can come to the rescue with winter feeding. Nature's lack offers a challenge that he should be quick to accept. His aid can frequently be an individual matter, but organized feeding campaigns often produce more lasting benefits.

ORGANIZING A WINTER FEEDING CAMPAIGN

All winter feeding campaigns require work and effort, and regardless of the type of organization, preparations should be made well before feeding becomes necessary, as the test of the efficiency of winter feeding comes when roads are drifted, traffic paralyzed, and all ordinary transportation tied up. Well-planned organization will facilitate feeding activities at such times. In the past, much winter feeding has been ineffective because bad weather had not been anticipated far enough in advance or because preparations had lagged. Feeding operations should be under way before the usual critical period arrives. In some instances, liberally provisioned caches handy to feeding stations should be made far in advance of the ordinary storm periods.

A town or city game association sponsoring winter feeding may well form a definite organization to raise funds, solicit labor, and in general

obtain the cooperation of hunters, Boy Scouts, women's clubs, businessmen's associations, the local press, outing-goods stores, grain-elevator operators, feed-mill proprietors, rural mail carriers, railway section workers, and others.

Having obtained such cooperation, the organization should delegate certain individuals who are well acquainted with local farmers to make arrangements for wholesale, systematic feeding, because any feeding campaign to be successful must have the cooperation of the resident farmers. Farm boys and men are best equipped to feed wild game in winter, not only because of their place of residence but also because of their general interest in wildlife and their intimate knowledge of the many forms. They do most of the winter feeding, in most cases simply for the enjoyment and occasional sport they derive from having the birds on their properties.

Although in many cases it is not necessary to pay farm owners either for services or for grain to be used in feeding birds, there can be no question that reasonable reimbursement for the grain, at least, will go far toward establishing better feeling between farmers and sportsmen.¹ When arrangements are made to leave standing or shocked corn or to feed threshed grain, payment certainly should be made. If hunters make the production of game profitable for the farmer, even in a small way, it is reasonable to suppose that he will be willing to leave a half-acre thicket here and there for cover and food and that he will take an interest in increasing his game stock. If, however, hunters are unwilling to assume some of the cost of production, farmer-sportsman controversies may be accentuated and the game birds, left without cover and short of food, will continue to decrease in numbers.

At present game birds and animals often constitute a liability rather than an asset on farms, as their very presence subjects the farmer to annoying and sometimes destructive trespass by hunters and where winter concentrations of game birds occur, the birds may eat more grain than the individual farmer can afford to spare, even though he is willing to donate a reasonable supply. Where these concentrations are of semimigratory species, which may have left the property before the advent of the hunting season, there is often real cause for complaint. It is useless, under such circumstances, to urge farmers to feed game for the implied purpose of furnishing sport to strangers, and arrangement for reimbursement must be made; the sooner the better.

Sportsmen's organizations are generally willing to purchase grain for the birds. Farmers invariably take a great interest in feeding the ordinary numbers of game birds found on their properties and are glad to assist in promoting their welfare. In unusual cases, however, where the burden becomes severe, the game commission, sportsmen's clubs, or humane societies can be approached for assistance.

In some communities winter feeding contests are practicable if given sufficient publicity through local papers. These contests may be sponsored by State conservation departments and supervised by game protectors or wardens, or they may be carried on by 4-H clubs, Smith-Hughes groups, or in schools. Awards should be made on the basis of the methods of winter feeding employed and the extent and effectiveness of the contestants' feeding activities. Such competition is most effective when organized on a large scale. Contests have a

¹ See U. S. Department of Agriculture Farmers' Bulletin 1759, Game Management on the Farm.

broad educational value but are less likely to produce permanent results than are personal interviews, the direct purchase of materials and services, and definite local organization.

Game wardens assigned to this kind of duty create good will and respect, thus frequently obtaining better local cooperation in other phases of their work. Rural mail carriers have at times been instructed to assist in feeding game along country roads. Section crews on railroads also sometimes carry food to localities difficult of access, if the food is furnished. Other ways of getting the work done may be found in many communities, and all possibilities should be kept in mind.

TREATMENT OF PREDATORS

Hawks and owls are often seen in winter coverts that shelter game and rodents. Without further evidence, however, their mere presence should not lead to the assumption that they are seriously depleting the game species. Where there are good coverts and food is plentiful, birds suffer little winter loss from predators. With the exception of the large, rare goshawk and the smaller Cooper's hawk, predaceous birds ordinarily need not be eliminated from the vicinity of feeding stations. Indeed, such forms of wildlife add a great deal of animation to the wintry scene, giving pleasure to the nonshooting public, the importance of which hunters should be willing to concede. There is no excuse for slaughtering snowy owls, red-tailed hawks, screech owls, and similar species of beneficial tendency. Where such slaughter does occur in the name of sport or for its reputed advancement, those interested in nature in general are fully justified in seeking to prevent it. It is well to recall that birds of prey destroy mice that otherwise might easily eat more than enough grain to feed a covey of quail through a storm period.

UPLAND GAME AND OTHER LAND BIRDS

Because of so many adverse factors, the supply of game birds is being reduced faster than it is being replenished by natural means. Measures to facilitate replenishment are essential, and every effort to correct environmental deficiencies should be made. Winter feeding is one of the most practicable measures, and it is urgent that interested persons, whether on farms or in towns and cities, provide adequate

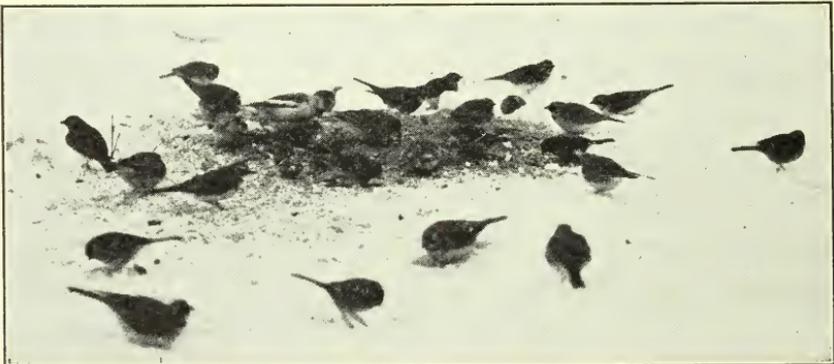


FIGURE 3.—Winter feeding of small birds.

winter feeding in their communities. Most starvation of game birds is cumulative, the result of short rations over considerable periods rather than for a few days only. Consequently the situation will not be much relieved unless feeding also is carried on over rather extended periods. Intermittent feeding accomplishes some good at certain times, but it is not so effective on the whole as systematic feeding.

Food for many valuable small winter birds is provided incidentally by winter feeding activities for game birds. Persons generally interested in nature, however, may well pay particular attention to small birds, especially to the tree-inhabiting species, including downy woodpeckers, nuthatches, and creepers, which by means of suet and other food, can frequently be attracted to dooryards and orchards that they would not otherwise visit. Chaff, screenings, table scraps, or other waste thrown on the ground or snow (fig. 3) will feed many ground-loving species; or scratch feed or other grains or seeds may be provided at little expense.

NATURAL WINTER FOODS AND THEIR SHORTAGE

The chief natural winter foods of upland game and other land birds are weed seeds, dried fruits and berries, and to some extent buds and persistent green foliage. Where plenty of aspen, birch, and alder are available, the ruffed grouse and other birds that eat many buds find subsistence throughout the winter. Herbage for birds is scarce in winter, but partridgeberry is a kind that stays green, and white clover and chickweed, also relished, stand up well against the cold in protected places; wintergreen, hardy, but also of harsher texture, is frequently eaten. Acorns, beechnuts, and hazelnuts are valuable as long as they last and some will remain until spring unless the wildlife population is so great as to consume them earlier. Juniper, greenbrier, chokeberry, sumac, holly, Virginia creeper, sour gum, bearberry, privet, cranberrybush, and snowberry are fruits that hang throughout the winter. Seeds most available at that season include those of the coniferous trees, hophornbeam, birch, alder, partridge-pea, black locust, boxelder, and ragweed.

By and large, however, the combined supply of these foods available to the birds in winter is decidedly deficient on the ordinary farm, and many farms in intensively cultivated sections are virtually barren of any natural food that would be of use to wildlife.

Among weed seeds, those of ragweed are of great importance to birds in stubble fields, pastures, and fallow lands; but the supply is generally limited, and frequently the seeds are buried under snow. The same is true of the seeds of several other weeds: by midwinter the supply is usually buried or exhausted, especially in sections that are intensively farmed. This winter food supply for the birds can be made more abundant, however, if harvesting machines are set to leave long, high stubble and more of the weeds and if stubble fields that are near coverts are left unplowed over winter.

Some weeds that are of the utmost importance in carrying the birds through the winter are considered pests by the farmer, but he should remember that by their destruction of insects during the crop seasons birds will repay him for any consideration he gives them in winter. Furthermore, in spring and summer the surplus weeds are ordinarily removed by cultivation. Leaving weeds in suitable places causes

the farmer little, if any, extra work and may save the lives of many birds.

Dried fruits, mast, and berries are scarce on most farms. Furthermore, they are frequently covered up, are out of reach, or are distant from good protective cover. For the benefit of wildlife it is desirable to have extensive hedgerows of wild fruit- and seed-producing plants. Buds are a staple winter food for ruffed and sharp-tailed grouse, and green foliage seems to be important for Hungarian partridges. Wherever possible, however, buds and foliage should be supplemented by grains of proved utility instead of placing entire reliance on an uncertain abundance of persistent berries and fruits.

FEEDING STATIONS

All-winter feed patches and permanent shelters where grain can be placed make the best winter feeding stations for birds, but in emergencies, feeding can be done wherever birds are found, including railroad rights-of-way, hard-packed roads, haystacks, pits dug in the snow, or any natural windbreak or shelter. The important thing is to have the feed where the birds will find it.

Feeding stations should be so placed as to afford easy access to good protective cover (fig. 4). If established for quail, the station should



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FIGURE 4.—Feeding station accessible from good cover; ring-necked pheasants and bobwhites feeding. (Minnesota Conservation Commission photograph.)

probably never be more than 75 yards from protective cover, and even then a strip of connecting cover or a series of patches at intervals is desirable. Pheasants, prairie chickens, and sharp-tailed grouse will no doubt range farther for food. Hungarian partridges are like quail in being closely localized.

In areas where quail are abundant, one feeding station to every 40 acres is desirable; otherwise, a station may be established near the thicket or wood that a covey is known to use. The same applies to Hungarian partridges.

For ring-necked pheasants and sharp-tailed grouse, one effective station to the square mile is sufficient for wholesale feeding.

Prairie chickens may be accommodated by one good feeding station to every 5 or 10 sections—that is, every 5 or 10 square miles—although under stress these birds cover even larger areas in their search for food.

Wild turkeys also will come from a considerable distance, but it is best to provide feed in all the permanent winter headquarters that they are known to frequent.

Little information can be furnished on the effective intervals at which to place feeding stations for ruffed grouse. Although these birds subsist well on buds, berries, fruits, and other natural foods, they relish grains also.

One permanent, well-attended feeding station to a farm is a good goal for upland birds in general. Farmers who wish to make sure of holding their own stocks of birds or to attract additional wild breeders to their property from outside will probably find, however, that several feeding stations to a farm are needed. Establishing good coverts and giving adequate attention to their development constitute definite steps toward game-bird increase.²

Stations should be located in areas that are sheltered from drifting snow, wind, and sleet. They should not constitute traps, where birds can be cornered by cats, dogs, goshawks, or other enemies; nor should they place the birds at any disadvantage. Hence they should not obstruct flight in any direction. It is safer for the birds if openings are left from which they can escape in case of attack.

Best results will be obtained by placing shelters in natural game coverts, rather than by attempting to entice game into barnyards or too far into the open. In any event it is inadvisable to feed domestic poultry and game together or on the same ground, as some diseases to which barnyard fowls and game birds are subject are interchangeable.

PERMANENT FEED PATCHES

The simpler and more natural the feeding station and the less attention it requires, the better. Food for permanent feed patches that are to be effective throughout most of the winter should generally consist of standing, shocked, or sheaf grains. As compared with other types of stations, such patches have the decided advantage of requiring little attention.

STANDING AND SHOCKED CORN

There is no more effective provision for winter feeding than leaving standing or shocked corn in fields near cover. The size of an all-winter patch of corn depends, of course, on the number of birds expected and the quantity of grain that will be consumed by rabbits, squirrels, and mice. A quarter to a half acre is probably the minimum size. Town and city sportsmen may purchase (and, if necessary, fence) blocks of shocked or standing corn for winter feed patches. For quail such patches should adjoin ungrazed wood lots; for pheasants they should preferably be near a tamarack swamp or swale, and for prairie chickens, close to marshes. If there is no good cover near, brush-heap shelters may be provided. An ample number of these

² See U. S. Department of Agriculture Farmers' Bulletin 1719, Improving the Farm Environment for Wild Life; Circular 412, Groups of Plants Valuable for Wildlife Utilization and Erosion Control; and U. S. Department of the Interior Conservation Bulletin 7, Plants Useful in Upland Wildlife Management.

winter-feeding stations in each community would make a material difference in game-bird survival.

Standing corn.—In sections where corn matures, standing, unhusked corn is perhaps the ideal source of supply of winter food for game birds. It is most satisfactory for prairie chickens, sharp-tailed grouse, and ring-necked pheasants. It provides food at all common snow levels, the uppermost ears becoming available to the birds as the snow deepens. In patches of considerable size, ears may be at all elevations from 6 inches to 5 feet, so that some are within reach even when snow is deep. When there is little snow or when no ears are near the ground, the stalks may be broken over. Light grazing of standing corn by cattle will cause many kernels to fall to the ground where the game can get them. Overgrazing, however, should be avoided, and where heavy grazing is necessary, the farmer should temporarily fence off a corner of the field to keep the stock out and



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FIGURE 5.—Well-opened corn shock; prairie chickens feeding. (Wisconsin Conservation Department photograph.)

preserve the corn as cover and food for the birds. The corner nearest thicket, woodland, or swamp is ordinarily the most suitable. Sportsmen and individual hunters are often glad to provide labor and fencing materials for this purpose. Fields of standing corn, even though they have been harvested, often contain here and there nubbins, or poorly developed ears, or even good ears that have been missed. Such fields are of considerable service to game birds if left over winter.

Shocked corn.—Shocked corn is possibly most effective for bobwhites, other quails, and Hungarian partridges. It is generally advisable to have the shocks within 70 yards of woodland, grape tangles, raspberry thickets, or other cover, although game birds vary in the degree of reluctance to leave such protection. Hungarian partridges often take feed far from any considerable cover, whereas quail keep close to it. If the shocks are opened up, tepee fashion (fig. 5), the birds can scurry inside in the event of danger from goshawks or other large enemies and can also obtain ears that would

otherwise be out of reach. Moreover, if the shocks are not opened, the birds may exhaust the supply of outside ears and thus be without food even in the midst of plenty. At such times, squirrels dragging out the ears may incidentally save the lives of quail, which glean what the rodents drop. In sleet storms or blizzards shocks may become heavily coated with ice or snow, and if so, they must be cleared and loosened. It is important to check up on the situation regularly and particularly after storms.

BUCKWHEAT

Buckwheat has well-known value for game, especially prairie chickens and sharp-tailed grouse, which use it from early in the fall until late in the spring. It is better adapted than corn for use in northerly latitudes. Because it is resistant to fire in the summer, it is a useful planting for fire lanes in brush and forest country, where it can be expected to feed a great variety of wildlife. When buckwheat is left standing for the birds, it is well also to have a good supply of sheaves stacked up against the time when the uncut grain will be buried by snow. The patches left for the birds should probably be larger than corn patches left for the same purpose, as buckwheat seems to be even more attractive than corn and the patches will ordinarily be used longer. Buckwheat leaves also may be eaten during the growing season.

WHEAT, RYE, AND BARLEY

Sometimes it is possible, even late in the season, for sportsmen to buy standing wheat, rye, or barley very reasonably; and in any year, of course, arrangements can be made in advance to have strips of grain adjacent to cover left uncut. A few sheaves of wheat set up in long stubble, which serves as moderately good approach cover, will be used by game birds and by many species of songbirds as well. Rye is useful on sandy soil and in regions subject to frosts. It will volunteer the second year if the land is merely disked. Barley is accepted, but not especially relished, by most game birds. For this very reason, however, its use may be advantageous, as drain on the feed patch will be less until other foods have been exhausted, after which the patch provides an available food supply.

MILO, KAFIR, AND OTHER SORGHUMS

Milo, kafir, shallu (Egyptian wheat), and other sorghums are especially suitable for bobwhites in the more southern localities and for scaled quail in the agricultural districts of the southwestern United States.

SUNFLOWERS

Blackbirds, goldfinches, crossbills, cardinals, and other small birds are especially fond of sunflower seeds. The gathered sunflower heads may be put out as needed, and the stalks, with a few heads attached, may be left for cover.

SOYBEANS

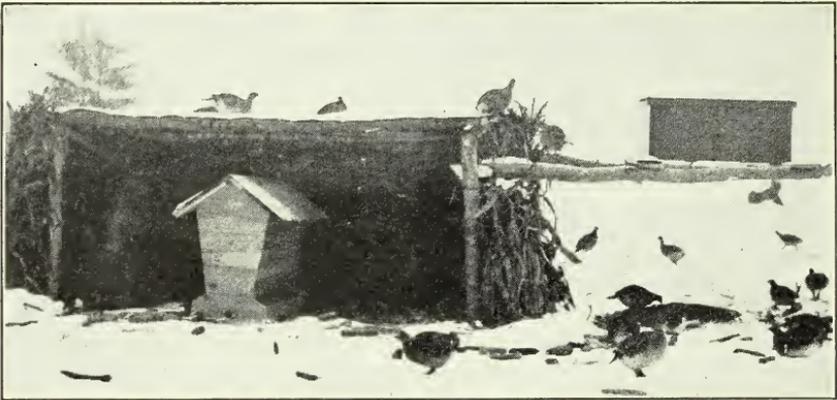
Soybeans are a delicacy to quail and most other upland game birds. They are also valuable in increasing soil fertility. Practical measures for making them available include planting in fallow fields, in outside corn rows, and next to frequented coverts.

MISCELLANEOUS CROPS

In the Northern States, millet, popcorn, various peas, and other crops are adapted for bird-feed patches; in the Southern States, cow-peas, sesame (benne), peanuts, lespedezas, and chufas. Clover seed is sometimes eaten by birds where a second crop of hay is left. Winter wheat will serve as green food if the snow is shoveled away. In general, experience and local farming practices are the best guides as to what supplemental foods to plant, purchase, or leave. If in doubt, it is better to use a variety than to depend on any one crop.

PERMANENT SHELTERS

Permanent feeding stations are effective over long periods if properly handled. Many types, requiring more or less attention, have been successfully used. The basis of most of them is some form of shelter into which grain on the cob or in the head is thrown or in which shelled grain is placed in a food hopper. The shelter may be as simple or elaborate as desired: a lean-to against a tree; cornstalks thrown over a brush heap; straw, stalks, or brush piled over an ordinary A-type brood coop; tepees; tar-paper shacks; fishing shanties hauled up on land; and many others. It is not so much the type of shelter that



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FIGURE 6.—Lean-to with food hopper; prairie chickens and sharp-tailed grouse feeding. (Wisconsin Conservation Department photograph.)

counts as its location and the care and constancy with which food is supplied. Birds do not forget places where food is abundant and will return to them in emergency if the supply is dependable. Large, roomy brush heaps with straw piled over them are especially effective for quail and probably will serve also for Hungarian partridges. Three-sided lean-tos (fig. 6) sheltering automatic wooden hoppers have proved successful in feeding prairie chickens and sharp-tailed grouse in Wisconsin and are suitable for pheasants and, in fact, for almost any species. The hopper can be of such size as to serve for short or long periods.

A simple wire-basket feeder that may be employed for making ear corn available to pheasants and other birds is illustrated in figure 7. Stakes or poles about 1 inch thick are used for the framework and ordinary 2-inch-mesh chicken wire for the basket. The ends of the basket are attached by lacing the frayed ends to those of the basket proper.

The stakes are run through and between the loops in such manner as to fasten the basket securely to the supporting uprights. To make the feeder rigid, the uprights should be wired or nailed together securely. It is a simple matter to adapt the device for feeding in varying depths of snow by merely adjusting the uprights, if they are wired instead of nailed.

Feeding shelters for small birds may constitute attractive features of the lawn or orchard; they may be elaborate or simple, as taste and time dictate. A rough board shelter on a window sill or in some quiet place protected by shrubbery and trees will attract juncos, tree sparrows, crossbills, pine grosbeaks, cardinals, titmice, blue jays, creepers, woodpeckers, redpolls, and other winter birds, depending on the region and the location of the station. Shelters may be provided with such food as apples, grains, birdseed, suet, nuts, raisins, and bread. Suet tacked or tied on posts or trees is attractive to the tree birds in winter and will keep fresh for weeks.

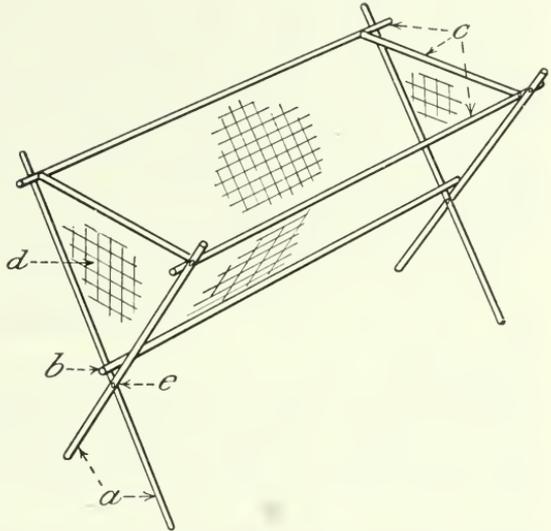


FIGURE 7.—Wire basket for feeding ear corn to pheasants: *a*, Uprights; *b*, bottom supporting pole; *c*, horizontal supports; *d*, 2-inch-mesh chicken wire; *e*, nail.

PROVIDING GRIT

Game birds have been observed to congregate on roads just after they have been cleared by snow plows, apparently for the purpose of picking up the sand and gravel thus exposed. This indicates that they may sometimes find it difficult to obtain ample supplies of grit in winter. In protracted snowy periods, therefore, it is well to provide them with coarse sand, oystershell, ground limestone, or other mineral substances similarly used by poultry.

EMERGENCY FEEDING

Though permanent all-winter feed patches and regularly tended shelters provide the best means of feeding birds in winter, in emergencies almost any kind of feeding will substantially aid wildlife for short periods. It should be ascertained, however, that only temporary and not permanent feeding is needed. A common tendency is to consider feeding ample if grain is carried out once or twice a winter, but in most cases food shortages extend over weeks or even months. Then, too, unless stations are so placed as to be protected from winds and drifting snow, the grain put out in the morning may be covered and unavailable later. It is altogether inadvisable, wasteful, and ineffective to scatter loose grain upon soft snow. Feeding stations should not be established in such a way as to encourage the birds to congregate on main-

traveled highways, where they are subjected to mortality from fast-moving traffic and from poachers.

Pits in the snow, with chunks of ice, crust, or even soft snow thrown up around them, are good windbreaks for open-field birds, including Hungarian partridges, snow buntings, longspurs, horned larks, and redpolls. Grain thrown on the ground on the sheltered side of these barriers is easily visible to the birds, but the supply must be renewed repeatedly, as it is likely to become drifted over.

Natural windbreaks, such as those formed by trees, shrubbery, fallen logs, and stumps, southerly exposed hillsides that blow bare, and other areas not covered by snow may be taken advantage of in distributing shelled grains. A variety of species may be fed under grapevine tangles and in various other places that afford shelter.

Airplanes have sometimes been used to drop bags of grain, which burst in falling, into coverts that otherwise could have been reached only with great difficulty, as in mountainous country inhabited by wild turkeys.

Convenient cheap foods for day-to-day or emergency use include screenings from mills, threshing machines, combines, or elevators, haymow chaff, food-products-manufacturing wastes, and dry or fatty table scraps that are more or less resistant to freezing. Ordinarily these should be supplemented with grain.

SHEAF GRAINS

For use in feeding game birds it is occasionally possible to obtain sheaves of wheat, buckwheat, oats, or other grains stored in barns for late threshing. Such sheaves can be set upright in the snow or hung by wire or cord from limbs of trees so that the birds can reach them by jumping.

EAR CORN

Ear corn may be used in any of several ways; it may be hung on wire fences or from branches, impaled on nails driven through



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FIGURE 8.—Impaled ear corn at a lean-to station; ring-necked pheasants feeding. (Wisconsin Conservation Department photograph.)

boards resting on sticks (fig. 8), put in wire-basket feeders (fig. 7), thrown loose in protected places, or even set up in the snow. The ears can be picked up easily and moved or stored, and they do not sink out of sight in snow so rapidly as loose grain, so that not much of the corn is wasted.

STRAW STACKS

Straw stacks frequently afford sheltered places bare of snow where ear corn, loose grain, haymow chaff, or screenings may be placed to

good advantage. Some straw stacks also contain enough waste grain and weed seeds to make it worthwhile to open them up from time to time to expose a fresh supply.

MANURE SPREADING

In some sections the daily spreading of manure on snowy fields is common enough to be an important factor in attracting game birds throughout the winter, as the manure contains enough undigested grain and seeds to afford some food for small birds as well as for pheasants, quail, and Hungarian partridges. Throwing a little threshed grain on the manure after it has been spread on the fields is particularly efficacious, since on such a surface the whole grain is more visible to the birds and does not quickly sink out of sight.

WATERFOWL

Feeding of upland game birds is designed to bring them through periods of famine. Waterfowl are seldom confronted with such an emergency, owing to their great mobility, which normally permits them to seek new feeding areas, even at a distance. Extensive artificial feeding early in the season tends to hold the birds and prevent their normal migration. Late in the season, however, after the migratory instinct has ceased to be active, abnormally severe weather sometimes suddenly cuts off the natural food supply and makes artificial feeding imperative. Again, in regions where there is much shooting of waterfowl, it is desirable also for individuals, organizations, or conservation officials to resort to artificial feeding in order to conserve adequate stocks of ducks and geese.

Waterfowl quickly learn where they are protected and will flock in to water areas of but a few acres in response to protection and a good supply of corn or wheat. Such a feeding program must be undertaken only on refuges where no shooting of any kind is permitted, because "baiting" in connection with shooting is a violation of the law. In sanctuary areas, however, feeding may serve to remove waterfowl, at least temporarily, from the gauntlet of the guns. Waterfowl feeding areas are most effective when a considerable number are developed in the same locality, perhaps through the cooperation of Audubon societies and other agencies interested in preserving ducks for the ducks' own sake rather than for the pleasure of having a shot at them.

Corn and wheat are usually the best artificial feeding staples and are fed by being scattered on water that is from a few inches to 2 feet deep for shoal-water species and up to 10 feet deep for diving ducks. Rice, barley, or other grains and most vegetables are readily taken and may serve as a welcome substitute for corn or wheat.

SMALL MAMMALS

COTTONTAIL RABBITS

The cottontail probably furnishes more Americans with hunting and has less done in its behalf than any other game species. Hundreds of thousands of cottontails are trapped every year in the Midwest and released to restock Eastern States, and certain States are experimenting with the production of the cottontail in captivity. Such a

popular animal certainly should be given the benefit of definite plans for winter feeding. The best feeds for it are browse, first-quality hay (alfalfa, clover, or timothy), and grain. These should be placed only where it is desirable that the rabbits should feed.

Good browse, such as the nonpoisonous sumacs, oak pigweed, and various garden weeds, will carry cottontails through the winter without hay or grain, if present in sufficient quantity. Browse may be of almost any tree, including oak, maple, poplar, birch, apple, cherry, and ornamental shade trees. Additional browse can be furnished in brush heaps built of newly cut trees. The twigs and buds are greedily eaten, and the brush heap provides good shelter from the elements and security from winged enemies as well. To provide numerous such brush heaps of fresh branches is one of the most practicable of all food-management measures for cottontails. Arrangements can often be made to utilize for this purpose the trimmings from pruning operations, both in towns and orchards. If the brush heaps are supplied with straw or hay, well packed in under the heap, a shelter of unusual value is created.

Cottontails eat hay in quantity. Sound alfalfa is the most palatable, but almost any cultivated hay is acceptable. Some kinds of marsh hay are eaten occasionally, but considerable selection of the stems taken is evident, and the bulk of the hay is rejected. Haymow chaff is always attractive to the cottontail, which picks out small leaves and perhaps some seed from the mixture to feed on. Grains of many kinds also are eaten. Corn and oats are especially relished.

An important consideration in feeding cottontails is adequate distribution of the food, as these animals seldom concentrate. They localize individually to a surprising degree, so that it is desirable to have the feeding stations numerous and widely distributed. Stations should be close to woodland, thickets, hedges, brush heaps, or other cover, but away from orchards and dooryards.

SNOWSHOE HARES

Although the snowshoe hare is a woodland species and obtains most of its sustenance from bark and buds, it also relishes alfalfa hay and grain, oats in particular. Hay or grain feeding is necessary, however, only where the supply of browse is inadequate. Ordinarily, fresh brush heaps will fully cover the needs of snowshoe hares, and a restocking program might well be preceded by provision of brush heaps of fresh-cut branches, not only to provide food and shelter but to help localize the animals in the vicinity where planted.

SQUIRRELS

Squirrels are quite roving and because of their habit of storing food against a time of need are in less immediate danger in severe weather and famine than are many other game species. Under severe conditions of temporary food shortage, due to mast failure, or during prolonged periods of inclement weather, however, emergency feeding may at times be of prime importance in maintaining breeding stocks over crucial periods and in helping to hold squirrel populations to more uniform levels.

Squirrels may be fed by the same methods described for upland game birds. A suitable food mixture includes rolled oats, peanuts, sunflower

seeds, and some kind of hard-shelled nut, such as the hickory nut, black walnut, or butternut.

From the long-time point of view nothing is of greater importance to squirrels than the planting of oak and nut trees. Provision for such planting may often be made through cooperation with city and county park boards or roadside planting commissions.

BIG GAME

When big game is involved the problem of winter feeding is far more complex than when it is a question of upland game and other land birds, waterfowl, and small mammals. The latter usually rely for sustenance upon quickly renewable sources of food, such as annual plants and their seeds, whereas big game must depend for its browse largely on perennial species of vegetation that require several years to mature.

RANGE DETERIORATION AND ITS CAUSES

Under strictly natural conditions, game-mammal populations are usually well adjusted to the available browse and range; if not, the undesirable animal surplus is removed by various natural agencies, so that increase is held in sufficient check to prevent outrunning the food supply. Special conditions sometimes arise, however, largely as the direct or indirect result of environmental manipulation and abuse by man, that permit the mammals either to increase beyond the replenishment capacity of the range or to so deplete the range as to lower greatly its game-carrying capacity. In such instances, winter feeding becomes essential during the interval required for adjustment of the environment. Unfortunately, restoration of the range is usually difficult, inasmuch as the whole plant succession may have changed in the deterioration process. Complete restoration may require several decades, or, where the abuse has been great, it may never be achieved.

Most big-game species in the United States tend to concentrate in fairly restricted wintering places. Elk in the West move into the valleys. Deer in mountainous country seek out sheltered areas with good browse. Throughout the Northern and Eastern States the white-tailed deer and the moose habitually "yard up" in favorable cedar swamps or in good hardwood browse. By restriction of the winter range, such localization of animals rapidly depletes the concentration area of desirable vegetation, especially if there is overcrowding. Exhaustion of the food supply may come at a time of deep snow, so that the animals are not able to move elsewhere; and in many instances, even though change to new ground might be physically feasible, there is no better place available. The situation may thus become serious and a considerable part of the population succumb to starvation or attendant disorders arising from weakened condition. Progressive loss of weight reduces constitutional vigor, and when animals have lost 20 or 25 percent of their weight through starvation, they must receive prompt assistance or die.

FOOD-EMERGENCY DANGER SIGNALS

As a general thing, the following four factors largely account for the development of big-game food shortage, sometimes operating singly,

more often in combination: (1) Grazing by domestic livestock, adversely affecting deer and elk; (2) appropriating valley hay lands for agricultural purposes, adversely affecting elk; (3) progressive lumbering of cedar and other high-grade browse trees, adversely affecting deer and moose over wide areas; and (4) excessive removal of such natural enemies as the cougar, timber wolf, and lynx, without substituting compensatory methods for the removal of aged and surplus big-game animals.

It may readily be appreciated that the correction of these conditions will rarely be simple and may involve a considerable expenditure of money. It is also to be realized that two separate problems are presented for solution in each such instance of food failure: (1) The problem of emergency feeding, by which the animals may be tided over winter; and (2) the more difficult matter of so restoring the range that emergency feeding will no longer be necessary. Beyond the discussion of causes already given, this bulletin must confine itself largely to the first problem, emergency feeding.

Most situations of this kind, fortunately, do not appear in a single winter but result from causes that have been operating for several years. Consequently, there are numerous danger signals that the game manager can read well in advance of the actual emergency. One of these is the establishment of a "deer line" in woodland tracts, that is, the disappearance of the lower vegetation up to a level that deer can reach by standing on their hind legs, a common method of obtaining browse feed. By the time the deer line has been formed, the range is already far deteriorated. It is important, therefore, to note the beginning of this overgrazed condition, and keen observers will be able to detect an incipient deer line. Another indication of range deterioration is the eating of certain relatively unpalatable species of browse in quantity. In the Southwest, the extensive browsing of pinon and juniper usually indicates food shortage, and in the North, severe damage to balsam, beech, and some other species indicates a similar condition.

EMERGENCY FOODS AND FEEDING

HAY AND GRAIN

Good-quality alfalfa hay is the best single emergency big-game feed that is ordinarily available in quantity. The animals relish this hay and on it are able to maintain themselves in good weight. Where alfalfa is not available or is too costly some other high-grade hay, such as clover or native upland hay, may be used.

Great care should be taken to avoid if possible the use of hay of poor quality. If that is the only kind obtainable, it should be supplemented with such grains as are available without too great cost. Recent experiments by the New York Conservation Department with white-tailed deer conclusively demonstrate that eastern deer cannot maintain themselves on a diet of ordinary marsh hay, sometimes called beaver meadow hay. Deer eat this hay only reluctantly, even when it is green. A good test to apply to the hay is whether domestic livestock will do well on it alone without supplementary grain feeding. If cattle will not thrive on the hay, there is no reason to expect that deer or elk will do so. There is danger also that rough, coarse feeds will induce necrotic stomatitis and lead to serious losses from that disease.

In feeding hay to deer or elk it is desirable to place it up above the snow and to establish a number of feeding places rather than to pile it all in one large heap. The objective should be to avoid drawing large numbers of the hungry animals to any one feeding site, where trampling, bunting, and fighting might be encouraged, with resultant injuries to does and fawns. Unless the hay can be kept from under the feet of the animals, considerable wastage will result. Too much should not be fed at one time.

An inexpensive feeding rack (illustrated in fig. 9) may be made of a series of poles, about 2 inches in diameter, set up in the form of saw-

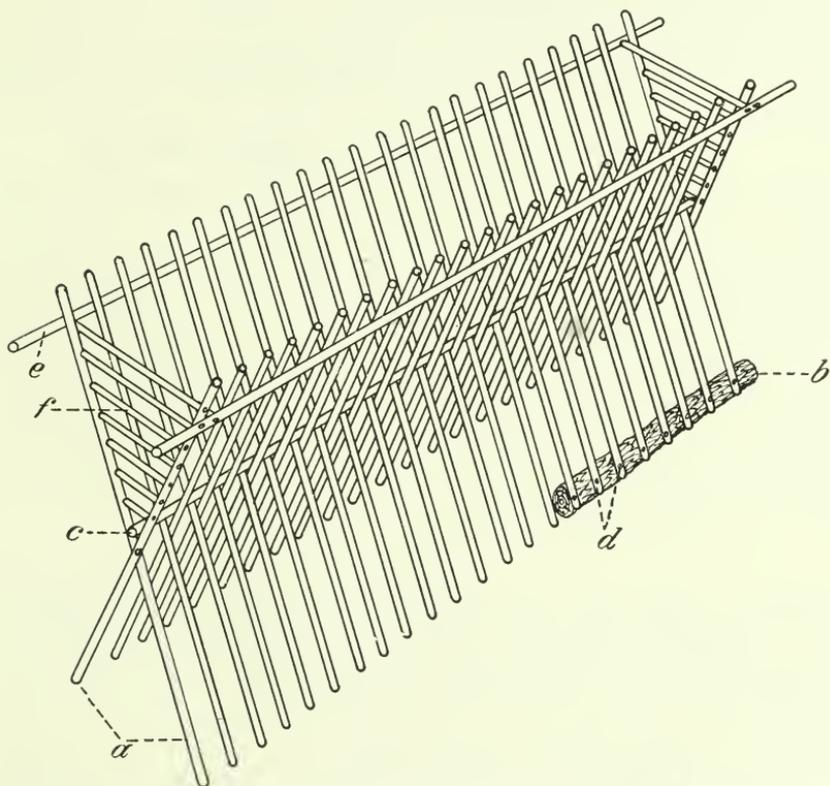


FIGURE 9.—Pole rack for emergency feeding of deer: *a*, Uprights (2-inch poles); *b*, ground log for anchorage; *c*, cross pole to which uprights are nailed; *d*, nails; *e*, horizontal top support; *f*, end poles.

bucks. To insure good anchorage the poles should be driven into the ground. If this is not feasible because of frozen earth or for some other reason, they should be nailed near the ground level to an anchorage log. The uprights should be spaced 4 to 6 inches apart. If they are placed closer the animals are likely to get their feet caught and may be severely injured. The racks should be kept full of hay so that deer will not be tempted to thrust their heads between the poles in the sides.

Hay may be stacked for future use, but in such cases the stacks must be fenced to prevent consumption of the hay in advance of the emergency.

BROWSE FROM FELLED TREES

The most natural feed for big game in winter is browse. Where it is practicable to provide a sufficient quantity of good browse by felling

such trees as white cedar, birch, aspen, maple, cherry, or hemlock, the browse will be relished by the animals and will keep them in thrifty condition. As a surprising quantity of browse is consumed by wild ruminants in cold weather, the supply made available should be rather larger than might be thought necessary.

Care should be taken not to use trees that are more valuable for other purposes and not to waste the forest growth. Trees selected for cutting should be overmature or defective, and proper provision for their utilization should be planned. It is sometimes possible to center wood-cutting and farm-logging operations in areas in which the deer need feeding, thus furnishing browse at relatively little expense. If this is done, it is of course of the utmost importance to see that the brush is not burned as it is piled, as is sometimes done on areas managed primarily for forestry, but only after the deer-feeding emergency has passed.

DEER-FOOD CONCENTRATES FOR INACCESSIBLE LOCALITIES

To overcome the hay-transportation difficulty presented in mountainous sections, New York State has developed a concentrated deer food, consisting of 45 parts of cane molasses, 55 parts of ground soybeans, and 50 parts of chopped alfalfa (parts by weight), mixed in 25-pound hard cakes, stored in tin, and taken into the vicinity of the deer yards in fall, even though not utilized until midwinter.³ These cakes withstand weathering, are very palatable, and maintain the deer in good condition in localities where the feeding of hay would be attended with insuperable difficulties. Concentrates of this type have their place in game management under present-day conditions, but are, of course, strictly emergency rations. Concentrates to meet the requirements of other species can no doubt be prepared.

FACILITATING BROWSE REPRODUCTION

Many of the emergencies necessitating deer feeding in the Northern and Eastern States occur in areas of extensive mature forest growth, where available browse is at a minimum. Emergency feeding in such circumstances may aggravate the situation from year to year by increasing the deer herd, especially the number of superannuated does in States having a one-buck law. Obviously it is desirable to take such measures as will bring the age composition of the herd more nearly to its normal condition, but in addition it is quite essential to "manufacture" new browsing areas for the remaining herd. There are three major methods by which the reproduction of suitable species of browse can be facilitated—(1) clean-cutting patches of mature woodland, (2) burning patches of mature woodland, and (3) reforestation. The method to be used in a given place will depend on local conditions.

CLEAN-CUTTING PATCHES OF MATURE WOODLAND

Where mature hardwoods extend over large areas, patches of the woodland may be cut off clean, perhaps a 5- or 10-acre patch in every 40 acres in selected parts of the range. By restricting the cutting to places where the wood and logs can be utilized, it can generally be accomplished at moderate cost and without waste. Clean-cut patches

³ Details of preparation technique are available in New York State Conservation Department and New York State College of Agriculture Bulletin 1, Food Preferences and Requirements of the White-tailed Deer in New York State, January 1935.

of hardwood usually spring up quickly to sprouts or brush, which not only are of immense value to deer but also find favor with ruffed grouse and other woodland birds. How many and what size patches should be cut will depend on the seriousness of the browse situation, but enough should be cut to make certain that browse reproduction will be more than sufficient for the planned increase of the deer.

REFORESTATION

The practice of reforestation with valuable big-game food trees is not yet widely followed in the United States, but it is one that must receive greater attention if serious future environmental complications are to be avoided. Forest planting programs, for example, that have as their objective the establishment of a single species of pine or a small group of species over extensive areas, inevitably will produce a stand in which the deer population will be held permanently to small numbers or in which food shortages will become of annual occurrence. Variety in the forest growth is essential to the welfare of deer. Consequently, if deer are a consideration, it is absolutely necessary to avoid the solid planting of extensive areas to one species of tree. This can be done by omitting from the solid-planting program a 40-acre patch in each quarter section and planting some of these patches to deer-food species. The size of the patches may vary with the locality and the local factors.

Where some such provision for deer is not effected, deer damage to pine reproduction is likely to increase unduly, especially to such species as Norway pine, which the deer find reasonably palatable. In fact, such damage in reforestation units where adequate consideration has not been given to the food requirements of deer may lead the inexperienced observer to the conclusion that game management and forestry are incompatible land uses. This conclusion is not suggested, however, where the reforestation methods employed retain some semblance to those of nature.

White cedar is recommended above almost all other species as a deer-food tree, wherever soil, climate, and moisture are suitable. This common tree, sometimes called arborvitae, is commercially valuable for fence posts, shingles, and excelsior, so that its inclusion in reforestation programs is quite justifiable aside from its value to game. It is also a particularly graceful tree and cannot but add beauty and variety. It is readily established, grows in moist soils of varying acidity, and is thoroughly adapted to use in a number of the Northern and Eastern States.

In planning the game range so as to avoid the necessity of annual emergency feeding, provision should also be made to include an ample supply of noncommercial trees, sometimes unfortunately called "weed trees." Aspens, birches, pin cherries, dogwoods, serviceberries, ironwood, wild plum, crab apple and a great many other trees are valuable game-food species. The policy of systematically eliminating these species by thinning operations is a direct contributing cause to the necessity of winter feeding of deer and is a further cause for abnormal damage to plantations of pines.

PLANNING FOR THE FUTURE

When a winter-feeding campaign has been successfully carried out one year, it is important that preparations be made for an even more

effective one the following year. After satisfactory sites for winter-feeding stations have been decided upon the value of the stations may be enhanced in many cases by improving the adjacent cover. For example, stations that may be rather openly situated can be made more serviceable by planting a patch of sweetclover for cover, by fencing-in a corner of a pasture or grazed wood lot, or by planting shrubs or trees. The farmer or sportsman who has carried on active winter feeding in severe weather appreciates the scarcity of adequate game coverts.

With farming and other industrial operations constantly encroaching on its former domain, wildlife, a valuable natural resource, needs all the assistance man can lend if it is to be preserved. The provision of food during periods of stress, particularly in winter, is an important aid; yet it will be realized that as compared with cover restoration it is but a small contribution to the welfare of the various species. Winter feeding, therefore, should be considered as but one part, possibly a minor one, of a larger program of year-round assistance to wildlife that involves many other factors also, including cover restoration, protection from natural enemies, and adjustment of the total kill to the available supply.

