

without which there would be no wildlife.

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## TREES AND FOOD FROM ACORNS

ALBERT A. DOWNS

Acorns are more valuable than many persons realize. From them, obviously enough, come oak trees. From them also (because they are rich in carbohydrate, fat, and vitamins) come feed for hogs, deer, turkeys, and squirrels, and food for humans.

Oaks produce good crops of acorns once in 3 or 4 years, on an average—unlike the red maple and the birches, which have good crops of seed almost every year, and the longleaf pine, the beech, and some other trees, which yield seed only at long intervals.

We do not know why yields vary from year to year, but weather is probably an important factor. Late frosts may kill flowers before fertilization and even the fruit when it is in the young, tender stage. Possibly oaks need more than one growing season to build up food reserves for a large crop of fruit; oaks of the white oak group (white, post, and chestnut oaks) ripen their acorns in one season, but oaks of the red oak group (northern red, scarlet, and black oaks) need 2 years to ripen their seed.

The number of acorns produced by different trees appears to depend only on the size of the crown of the tree. Because the size of the tree crown and the diameter of the trunk are correlated, diameter, which is easier to measure, is used as a guide to the productive capacity of a tree. From a 7-year study of five species of oak in northern Georgia and western North Carolina, we found that scarlet oak was the best producer, and that acorn production decreased in the larger diameters of

the white oak and the northern red oak.

The production of acorns varies not only from year to year but from tree to tree of the same sizes in the same year. In 1942, a 27-inch scarlet oak produced approximately 46,000 acorns; other scarlet oaks nearby of the same size produced a fraction of that number. Very likely some trees are good producers by heredity, and some are poor producers.

In most years, oaks, except the chestnut oak, produce more small aborted acorns than well-developed ones. These small, undeveloped seeds, often unrecognizable as such, may be the result of early insect damage or bad weather.

It would seem that plenty of seed would be available to reproduce oak woodland. But that is not so. Only a small percentage of the acorns ever have the chance to germinate and grow. Studies show that at the time of seed fall 24 percent were damaged by squirrels and birds and 30 percent by insect larvae. Only 46 percent were sound. In years of small crops, the proportion damaged by insects, squirrels, and birds is greater, and in years of large crops it is less. On the ground, insects destroy many more of the sound seed, and deer, turkeys, squirrels, chipmunks, and mice feed on them.

In one place where deer were especially numerous—one deer for about 30 acres—the entire crop was eaten, except in the heavy crop years. In another area where the deer population was estimated at one deer on 2,000 acres, many acorns were eaten, but a fair surplus was left from good crops. In general, when game is plentiful, few

or no seed are left to germinate except in heavy crop years.

One system of managing oak forests for timber products is by growing the trees in even-aged stands. When the trees are mature and ready to cut, there may be no small trees established, in which case the area must be reproduced by sprouts or seed.

If superior seedling reproduction is wanted, two points must be kept in mind. First, acorns, unlike pine seed, are heavy and not dispersed far from the parent tree. Thus, the number of acorns to the acre is not significant unless they are well distributed. Second, excessive drying due to long exposure to sun and wind kills acorns.

In a good seed year, 8 to 10 trees an acre, 17 inches in diameter at breast height, would produce 1,500 to 2,000 sound acorns above those destroyed by insects and animals. With 50 percent germination, there would be 500 to 1,000 seedlings to the acre. But even with the best spacing of those seed trees, some of the seedlings would be crowded under parent trees and die. Better than that, leaving 20 trees to the acre, 12 to 16 inches in diameter, would provide the same number of acorns but they would have wider distribution and more protection from drying because of shade and the cover provided by fallen leaves. This is only one method of managing oak forests and represents the minimum as far as the seed requirements are concerned. Other methods leave larger numbers of trees to the acre for growth and seed production, giving better distribution of seed and more favorable moisture conditions.

Acorns are important in the feed of deer, squirrels, and turkeys in autumn and early winter. In deciding how much game an area can support, game managers need to know the amount of food available annually. The part supplied by acorns can be computed from the table if the number of oaks to the acre, by diameter classes, is known. In the southern Appalachians, oak stands that have been cut rather heavily in the

POUNDS OF ACORNS PRODUCED IN AN AVERAGE YEAR FOR TREES OF DIFFERENT SIZES AND SPECIES

Diameter of trunk 4½ feet from ground	Chest- nut oak	White oak	North- ern red oak	Black oak	Scarlet oak
10.....	0.9	0.7	0.4	1.1	2.5
12.....	3.0	1.4	2.2	1.7	3.9
14.....	5.0	2.8	5.7	2.3	5.6
16.....	6.0	4.5	10.0	2.8	8.0
18.....	8.1	6.7	14.5	3.4	12.1
22.....	9.8	11.3	17.1	4.6	17.5
26.....	10.5	13.1	13.8	5.8	18.3
30.....	10.8	12.5	10.0	7.0	18.3

past annually produce from 100 to 150 pounds of acorns an acre.

Experimental work has shown that the nutritive value of acorns for fattening hogs is fairly high. If the acorn ration is held down to one-fourth of the food eaten, acorns are in no way harmful for fattening pigs. Excessive quantities may cause constipation, soft pork, or growth below normal. As a further precaution, the protein content of the meal mixture should be increased somewhat while feeding acorn rations, because they are high in carbohydrates but low in proteins. During the finishing-off period, acorns may be withheld, in order to correct any tendency toward soft pork.

Any farmer knowing the sizes and numbers of oaks in his wood lot can determine from the table the amount of acorns he can expect annually for hog feed. If this kind of feed is worth a cent a pound, the average oak wood lot is worth \$1.50 a year for each acre just for the hog feed it produces. That is about half as much as can be expected from the wood lot in timber values. In small wood lots, farmers can know their trees as individuals and weed out the poor producers when any cutting is done. In that way the yield of acorns per acre can be increased. Aside from heredity, trees with well-developed, healthy crowns are likely to produce the most acorns.

The use of acorns as food for humans is not uncommon. The Indians in California grind the acorn kernels to a fine meal or flour and leach out the bitterness with warm water. The meal is then dried and stored to be used later as a cooked mush or baked bread. In the Eastern States, the white oak and chestnut oak acorns had been used similarly by Indians. Generally, the acorns of the white oak group are sweeter than those of the black oak group, and the acorns of the swamp chestnut oak are said to be especially sweet and edible. In Europe many species of acorns are eaten, and in times of food scarcity boiled acorns are

used as a substitute for bread. In Spain, acorns of the Gramont oak are regarded as superior to chestnuts.

For those interested in hunting, a good crop of acorns can attract deer, turkeys, and squirrels.

It is possible that someone with ingenuity may discover a new method of preparing acorns for human consumption—maybe even a delicacy.

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## MANAGING UTAH'S BIG-GAME CROP

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Fifteen persons of every hundred men, women, and children in Utah bought a license to hunt big game in 1948. One deer was killed by each 10 individuals in the State—all told, more than 64,000 deer and 750 elk. The management of big game, the recreation that hunting provides, and the services connected with it form a truly important business. A visitor to Utah in late October—the time of the hunting season, the time of a general exodus to the mountains from city, town, farm, and ranch in car, truck, buckboard, wagon, and pack outfit—feels in the air how general and how enthusiastic is the response there to hunting.

It was not always so. Deer have been much more abundant in recent years than at any time since white men first visited the area. We do not know exactly how all the factors and forces operated that were responsible for producing this wildlife resource, but we do know its history, which is the story of early depletion and of man's efforts and success in restoring the herds to numbers exceeding even those that the pioneers found.

The restoration of numbers has not

meant the end of the big-game problem, nevertheless. Instead, situations have developed where the animals have become too abundant for their own good and have come in conflict with ranching and livestock grazing. New, almost revolutionary, programs have therefore become necessary to guarantee a continuation on a permanent basis of both the herds of big game and the production of suitable forage on the ranges.

THE FIRST WRITTEN RECORD of the native animals and plants in the territory that is now Utah is contained in the report known as *Father Escalante's Journal*, the story of the travels of a small party led by two Franciscan friars that left Santa Fé on July 29, 1776, and returned there January 1, 1777, without having reached their objective of Monterey, in California. The party spent September and October of 1776 in the Utah country.

Father Escalante told of killing a buffalo near the present Colorado-Utah border, taking large trout with a bow and arrow in Utah streams, and seeing many grouse, waterfowl, and