

WILD ANIMAL DAMAGE TO NEW ENGLAND FORESTS

COMMITTEE REPORT¹

New England Section, Society of American Foresters

Deer are plentiful enough in Connecticut, Rhode Island and parts of Massachusetts to do serious damage to forests by browsing. The porcupine is the most important animal damaging forests in the states north of southern Massachusetts. It clips branches and girdles the trees. Budding and cutting by rabbits, budding by red squirrels and grosbeaks and girdling by mice are much less important over the region as a whole. Cases showing the seriousness of each animal's work and control measures are given in this report, which, although prepared for a specific region has more than local interest and application.

THE OBJECT of this Committee appointed in April, 1930, was to bring together as much information as possible on damage to New England forests by deer, the rodents and birds.

Early in the work it was apparent that an exhaustive study was impossible. The damage is very variable both geographically and periodically. So it was only possible for the Committee to determine where the work of a particular species is important, how and to what species of trees damage is done, how serious the damage becomes under extreme conditions and what control measures can be recommended.

The Committee members each submitted reports on damage in their respective regions. In addition, very helpful information was given by H. I. Baldwin, K. E. Barraclough, H. O. Cook, J. H. Foster, C. S. Herr, A. W. Hurford, and H. B. Peirson. We are also indebted to the several state fish and game commissions for information on game laws, status of deer populations and the like.

The study was instituted because the damage done by deer in some sections had become a serious problem and it was thought worth while to find out how widespread it is. To complete the study for the region all animals and birds doing important damage to forests were included.

DEER

From a range practically restricted to the three northernmost states thirty years ago, this animal has increased and is now fairly plentiful in practically all rural New England. Over this whole range it is, potentially at least, an animal capable of damage to the forest, but it is only where it is very plentiful that this becomes important. In Pennsylvania where some wooded areas are practically stripped of everything eatable within reach of deer, the population was estimated as one deer to five or six acres. European experience has shown that not more than one can be kept on forty acres without damage to the forest (2). In New England, dam-

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age is reported as important only in Rhode Island, central and northern Connecticut and a few sections of Massachusetts.

The most important damage takes the form of browsing on the buds, leaves and tender shoots at heights below six feet and usually below four feet. In plantations of small trees the leaders are most often nipped off. In Connecticut seventy-five per cent of the trees damaged showed this type of injury. Barking of small trees while the velvet is being rubbed from the antlers is much less important than browsing although one small plantation was reported as completely ruined in this way and another was fifty per cent injured. The tree is more often deformed than killed. Deer are also said to pull newly planted trees from the ground.

All native species, coniferous and hardwood, and most exotics commonly used in the region are eaten, but tastes seem to vary between regions. In northeastern Connecticut white pine was eighty-one per cent damaged in one plantation row while the adjacent row of red pine showed only nine per cent of trees injured. In Pennsylvania Scotch pine was avoided while in southeastern Massachusetts it suffered six or seven times as much as white and red pines. The only conifer reported as immune is white spruce but this may be due to the comparatively small amounts planted. Conifers known to be eaten are white, red, pitch, Scotch and jack pine, hemlock, Norway spruce, Douglas fir and red cedar. No hardwood seems to be ignored and white ash is especially liked.

Although some browsing on tender

branch tips takes place in summer, the real damage occurs in fall and winter. Most of it takes place when snow covers the ground and severe winters result in heaviest damage.

The effect on the individual tree varies widely with the degree of attack. An occasional leader nipped from a spruce has little effect while, in severe cases, growth of white pine may be almost arrested and the tree made a bunch of clipped branches.

The worst cases of stand damage in New England come from Connecticut where six observers give the following figures of the per cent of trees damaged in plantations of suitable heights:

Southeastern section.....	5 per cent
Northeastern section.....	20 per cent
Northwestern section.....	31 per cent

There is no important damage in southwestern Connecticut. In southeastern Massachusetts, on a game preserve, sixty to seventy per cent of two million Scotch pine were estimated as killed by deer. In the southwestern part of the state a Norway spruce plantation near old orchards has been completely ruined. Of course, small patches are occasionally badly browsed where deer yard for the winter, but over all of the country north of central Massachusetts damage was reported as either light or negligible.

In Europe deer damage is controlled by fencing, by repellents and metal guards placed on leaders and, of course, through regulating the number by hunting. The first three methods are not usable here because of the prohibitive cost, although they might have use on game preserves where it is especially desirable to establish plantations. But,

for widespread control, the state game laws must be depended on. That these are effective seems to be indicated by the comparative immunity from damage in the sections where hunting is allowed. The following table summarizes the New England open seasons on deer:

State	Season length
Connecticut _____	none
Maine _____	30-46 days
Massachusetts _____	6-12 days
New Hampshire _____	30-46 days
Rhode Island _____	none
Vermont _____	*10 days

*No open season in Franklin County.

One deer is the legal limit in all four states with an open season. Vermont has the only buck law. Deer damaging crops may be killed at any time in all states except Massachusetts but forest trees are not mentioned in any case as a crop. Damages for injury to crops are paid in all states except Maine and Connecticut. Deer killed while damaging crops become the property of the landowner, but in Connecticut and Rhode Island many more are thought to be killed illegally than under permits.

Any attempt to correlate damage with

number of deer must be based on estimates for the regions concerned but obtaining reliable figures on the deer populations of the New England states is exceedingly difficult. No census has ever been made to show definitely how many deer are to be found and, almost without exception, no one would even hazard a guess. The only figures available are those kindly given the Committee by various state fish and game commissions on the kill of deer during the open seasons and, in Connecticut and Rhode Island, on those taken under permits. But these figures on the kill do not indicate the real deer populations. Open seasons vary both between states and between years. Hunters are more plentiful or hunting conditions more favorable in some sections than in others.

Any worthwhile estimate based on kill figures must consider the ratio of these to the total population. It was assumed that the percentage increase in kills over the last five years was the same as that for the total population.

TABLE 1.

ESTIMATED DEER POPULATION

State	Approximate deer range square miles	Annual kill	Annual kill per square mile	Per cent Annual increase above kill	State population 1931	Deer per square mile 1931
Maine _____	27,500	11,700 ¹	.36	4	58,500	2.1
Massachusetts _____	6,200	2,200 ²	.32	5	11,500	1.9
New Hampshire _____	9,000	1,600 ²	.17	0	6,400	.71
Vermont _____	7,200	1,530 ²	.18	9	10,200	1.4
Connecticut _____	2,500	310 ³ and ⁴	.12	-	---	---
Rhode Island _____	625	100+P	.16	-	---	---

¹1929 figure (most accurate to date).

²figure for 1930 from curve of last 5 years.

³killed on permits (damaging crops)

⁴killed by automobiles

Natural increase was taken as 25 per cent (9). Then, subtracting the yearly increase per cent from that for natural increase gave the per cent of summer population killed. And this figure divided by the per cent left after the hunting season ($100 +$ yearly increase) gave the ratio to post-season population. And from the kill taken for 1929 from a five-year curve the 1931 populations were calculated. Table 1 gives the results.

Table 1 shows that, although deer are gradually increasing in the region as a whole where there is an open season, the number is still far below the point of danger to forests. While no real comparison can be made between Connecticut and Rhode Island and the other group, it is significant that only the deer killed while damaging crops or by automobiles and reported in these two is practically as great per square mile as through hunting in New Hampshire or Vermont, and one-third those killed in Maine. While we have no real estimate of deer population in these two states it is evidently much denser than in those to the north. It would seem that it will be necessary to reduce the number of deer in these two states to somewhere near the right densities. If this is not done, provision should be made to include young forest growth as a crop from which damages for browsing can be collected or for which the animals doing the damage can be killed.

PORCUPINE

This animal is found over all of New England north of southern Massachusetts and not including Cape Cod. It

undoubtedly does more damage than any other animal to forests within its range.

Its habits of feeding on bark and its effective armor of quills make it independent of other animals and it increases rapidly as a result. Although bounties have been paid in the past in some of the states, most of these have been out of force for some time and the porcupine colonies have become a real factor in forest protection. The injury is most prevalent in the sections where ledges and rocks give cover. But the animal is not as particular as we might wish in this respect and, where food is available, an old building, hollow tree or log or a drain beneath a road is perfectly acceptable as quarters.

The animal is important over the Vermont mountains, all of rural New Hampshire, especially the northern part. It is said to be held down in Maine by a bounty. Massachusetts has plenty of them in the hills. The abundance in specific cases gives an idea of their ability to do damage. E. S. Bryant tells of Vermonter who, during a bounty period, visited old lumber camps sleeping daytimes and killing "porkies" nights. When the harvest fell off to ten per night he moved to another camp. A town fire warden located in central Vermont recently wrote a member of the Committee, "I think there should be some measure taken to diminish the number of hedgehogs, they are killing more trees in this town than the fire, the pests don't only trim and kill hemlocks, but gnaw girdles on spruce, beech, birch and maple trees. This gnawing bark from maple (which is our sugar maple) is something new for

hedgehogs, they didn't use to, but the cutting of so much softwood and the large numbers of them are causing many sugar orchards to be ruined." A recent examination, by the Vermont Department of Agriculture, Bureau of Insect Control, of about 200 acres of red and Scotch pine plantations scattered over the west half of the state, showed porcupine damage to 20 per cent of the Scotch pine only. Damage seemed to be confined to larger plantations. In a section near Keene, N. H., Professor Struthers of Syracuse University reports that within a radius of two miles there were at least twelve colonies with fifty or more animals each and many smaller groups of a half dozen or more. In this locality Struthers trapped fifteen from one den within a week and killed nineteen by entering another den. One landowner in the town trapped over one hundred animals from his land during the winter of 1917 and paid part of his taxes with porcupine noses strung on a wire. No trapping followed for ten years when Struthers took forty-two animals during three weeks trapping and estimated that there were about twenty-five more. An area of about two hundred acres in the Harvard Forest where porcupines were particularly bad yielded thirteen animals in 1929, four in 1930, and nine in 1931.

Wherever the porcupine is found, fall and winter seasons find it living on the bark of trees. All stages of work from a sampling bite to stripping of the tree from base to tip are usually found close to the dens. The animal will bark any species of tree observed, but there seems to be a more or less

definite taste in a given locality. In some places hemlock is preferred; in another hardwoods of all species are attacked and at Petersham European larch is especially relished. In this last case the animals for a distance of at least a mile from each plantation feed in it making well-beaten trails between the dens and the food supply. The animals roam more or less between dens but, unless some delicacy calls them to a distance, most of the feeding is close to the den so that dead and dying trees there are the rule. No tree from a seedling to a veteran is immune and the point of damage may be anywhere from the ground to the tip. Novel damage reported from both New Hampshire and Vermont is that of gnawing the ground wires on lookout telephones.

The effect of damage on the individual tree varies within wide limits. Cutting off branches may be severe enough to ruin the tree. Single removals of a patch of bark would often heal successfully if left alone. But the porky often returns to the same tree year after year and the callus tissue at the edge of the wound is apparently greatly enjoyed. The result is eventual girdling.

Damage to stands, too, is very variable. In extreme cases the whole stand over several acres is ruined. Foster reports a five-acre stand of pine near Keene, N. H., stripped of bark from the ground to the tips. And several acres of young hardwood ruined along a rocky ridge is not an uncommon sight anywhere within the animal's range.

The rate at which girdling takes place is surprising. Experiments with penned-up animals in Arizona (4) showed that the young ones would eat an area of

bark equal to their own superficial surface in three days. In six days one thirteen-and-a-half pound animal took three hundred square inches of bark from seventy-one seedlings and five larger trees.

Control of the porcupine is comparatively easy but expensive. The U. S. Biological Survey has developed a method of poisoning them with a salt and strychnine mixture placed in hollow wooden blocks nailed up in trees where the animals feed (3). But poisoning of any sort is illegal in all the New England states. Hunting during the winter is ineffective because the animals are usually denned up during the day. Trapping is effective, but, where the distribution is general over a considerable area, the cost is high. Massachusetts under a recently enacted law prohibits the use of steel traps except within fifty yards of cultivated land. Maine has the only bounty law now in effect and it is reported to be working well. The enactment of such a law covering other states or counties where the damage is serious would certainly be an effective means of reducing it. Since the porcupine is a recluse as far as other animals are concerned, reducing its numbers cannot influence other animal populations. The effectiveness of a bounty under the present Massachusetts trapping law is questionable.

RABBITS

Both the cottontail rabbit and the white hare included under this common name sometimes cause damage to forests. They live on the bark and buds of small, woody vegetation during win-

ter, but are seldom numerous enough to cause serious damage. In southern Connecticut rabbits do more damage than any other animal. One case is reported from Martha's Vineyard where three acres of red and Scotch pine had every tree topped. Each state has an open season ranging from forty-six to one-hundred-fifty-one days and a daily bag limit varying from three in Connecticut to an unlimited one in Maine. We believe present hunting regulations will keep them from becoming a serious forest pest.

RED SQUIRREL

The red squirrel is found all over New England and, although the damage it does is inconspicuous, it is nevertheless important. Severe damage has been found in Connecticut, Massachusetts and southern New Hampshire and probably exists over all of New England. During periods of deep snow when the squirrel cannot get its usual food, it feeds on the buds of Scotch pine, Norway spruce, European larch and white pine. In Scotch pine the big buds are cut off; the green contents are eaten and the bud scales scattered on the snow. In white pine the injury is somewhat similar except that a small section of the branch or leader is usually taken off. With Norway spruce and European larch a twig tip from two to ten inches long is cut off and carried to a convenient resting place where the lateral buds can be eaten out as well as the terminal ones. The terminal bud of the spruce leader is rifled and left in place. Trees only a few feet tall are

attacked and the upper limit is unknown.

The effect on the tree varies with the species. In Scotch pine adventitious buds below the cut send out numerous branchlets forming a dense "broom." The branchlets are often repeatedly budded and the tree becomes hopeless for timber production. White pine is affected much the same but recovers somewhat better. Norway spruce leaders are replaced by the nearest lateral left untouched but the clipping of branches is often so severe that the growth in small plantations is kept almost at a standstill. On the individual tree half of the buds may be removed per winter.

Damage is, of course, most severe in small areas surrounded by woods, stone walls, apple trees, etc. In small plantings damage is uniform over the whole area often including eighty per cent of the trees. In plantations of several acres the borders to a distance of a few hundred feet are the only parts damaged. This is usually confined to the sides bordered by a favorable squirrel habitat (8).

The question of whether squirrels are beneficial in their habits of storing and eating fruits and seeds is not easily settled. They undoubtedly do bury nuts and seeds that later produce trees. But the amount of seed they consume is also important. Hatt (5) found that a pair of squirrels in captivity ate the seeds from eighty-six white pine cones in a day and from four-hundred-and-twenty-two in a week. Add to this the fact that in Petersham over sixty red squirrels were killed one fall in an old pine-hemlock stand of about twenty acres

and the effect on anything but an exceptionally heavy seed crop is apparent. The squirrel population in this lot was not heavy enough to be called unusual.

Control of squirrels by poisoning is, of course, prevented by law. Trapping them with bait is easy. One of the controls suggested by Hatt (4) is that of feeding them near the plantation during the fall and winter so they will not go to the trees for food.

MICE

During occasional periods of overpopulation, mice sometimes girdle young plantations especially those of Scotch pine. One case is also reported from New Hampshire where ninety-five per cent of fifteen thousand four-year white pines were girdled. In Massachusetts a Scotch pine planting of one acre showed fifty-one per cent attacked and twenty-five per cent killed (7). Most serious damage occurs during winters of deep snow and in old field plantations although one case was reported on cut-over land.

A control measure useful prior to planting old fields is the burning of grass and weeds that afford food and shelter for mice. Traps can, of course, be used on small areas. Poisoned baits are effective. Probably the most effective control agencies are the foxes, owls, hawks, weasels, and others, that feed largely on mice.

GROSBEAKS

The pine grosbeak is the only bird known to appreciably harm forest trees in the region and its effect is not very

important. While it feeds on the buds of hardwoods as well as some conifers such as European larch, it cannot cut the buds from slender branches that will not support its weight and so, on most species of older trees, there appears to be little effect on growth. There was one case reported from Connecticut in which ten per cent of a young white pine stand was damaged. Also, in southwestern Massachusetts where Scotch pine has been planted on the Granville state forest, the grosbeaks now come in flocks and bud the plantations.

SUMMARY

1. Deer do considerable damage especially to young plantations in Rhode Island, Central and Northern Connecticut and a few sections of Massachusetts. The most important form of injury is browsing although small plantings have been ruined by rubbing of the antlers. All native species and most exotics seem to be eaten. In the four northern states with open seasons ranging from six to forty-six days deer are kept below an estimated 2.1 per square mile. The kill per square mile under permits and by automobiles in Connecticut and Rhode Island nearly equals that by hunters in Vermont and New Hampshire so the deer population must be very dense in those states. The number should be brought within reasonable limits or damages should be allowed for destruction of forest crops.

2. The porcupine inhabits all of New England north of southern Massachusetts not including Cape Cod. The animal eats the bark of all species of trees

in the region usually girdling the tree and either killing or ruining it. Damage varies in intensity up to the complete loss of several acres of timber in a place. Control could be easily accomplished by poisoning but this is forbidden in all New England. Trapping is effective but expensive. A bounty is said to be working well in Maine and offers good possibilities in the other states.

3. Both the cottontail rabbit and the white hare do some damage to forests and in southern Connecticut are the worst animal pest. They are also important on Martha's Vineyard. Hunting can, in general, be depended on to keep their numbers within bounds.

4. During periods of deep snow the red squirrel eats the buds of Scotch and white pine, Norway spruce and European larch causing loss of growth and sometimes so much forking that the tree is useless. Severe damage has been found in Connecticut, Massachusetts and southern New Hampshire and in some cases the growth of small stands is held almost at a standstill by the budding. Shooting and trapping are effective controls and feeding during winter is suggested.

5. During periods of overpopulation mice occasionally girdle young plantations especially of Scotch pine. The damage is apt to occur sporadically anywhere in the region. Burning of grass and weeds before planting open land and the encouragement of predators are the best controls usable.

6. The pine grosbeak lives on tree buds during winter but the damage is slight in practically all cases. The bird cannot feed on the tips of slender

twigs and enough buds are usually left to carry on normal growth.

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