UNIVERSITY OF MISSOURI COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATION
E. A. TROWBRIDGE, *Director*

CIRCULAR 321 Columbia, Mo. APRIL, 1948

Rodent Control in Orchards

T. J. TALBERT

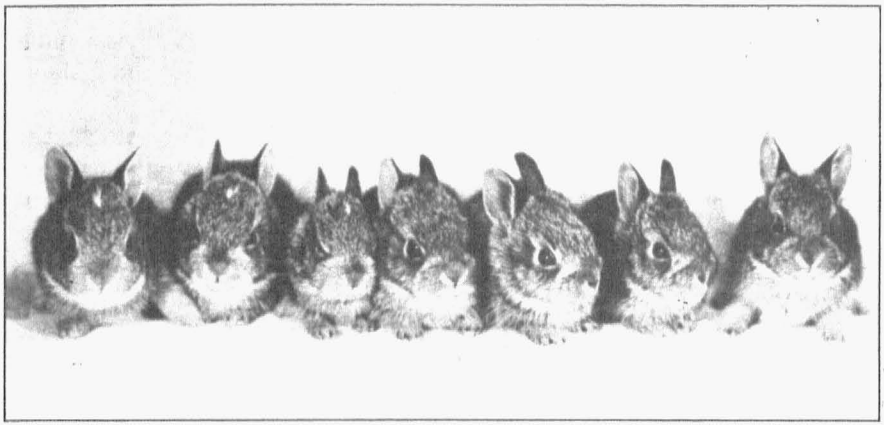

Fig. 1.—Where rabbits are numerous. young fruit trees need protection in fall and winter.

During fall, winter and early spring in Missouri, young fruit trees are subject to injury by field mice and rabbits. Generally the damage is great enough to warrant protection of all young fruit trees the first few years after transplanting. In fact, protecting fruit trees from mouse and rabbit injury should be made a regular orchard practice every fall, just as spraying is done to prevent injury by insect pests and diseases.

WHAT TO DO

Chief methods of protection are: (1) Placing mechanical protectors around the tree trunks; (2) cleaning sod and weeds away from the trees and mounding 3 to 5 inches high with soil, cinders or gravel; and (3) killing the mice with poison bait.

Still other practices frequently used are: (1) Fencing, (2) shooting, (3) repellents, (4) trapping, (5) encouraging natural enemies of

rodents, (6) some pruning of trees in the fall and leaving the branches on the ground till spring as food for rabbits and mice, and (7) clearing out brush and brier thickets near orchards.

Injury may occur in both sod and clean cultivated orchards. Damage is most common, however, in plantings where the sod system of soil management is practiced. It is far better to prevent tree girdling and injury than to try to save the trees by bridge grafting or cutting back after damage is done. The employment of both major and supplementary practices against the rodents is likely to give the best results.

PROTECTION AGAINST MICE

Both field mice and pine mice are found in Missouri. They build surface runways beneath the ground cover and feed mainly just above or below the surface of the ground.

In mature or bearing orchards, maintained in sod or mulch, the proper use of poison bait is usually the most effective mouse control. Young trees, however, which are cultivated and trunk wrapped against injury by rabbits may not need protection by the poison bait treatment. For both young and old orchards much can be accomplished in controlling field mice by clearing away grass, weeds and litter for a distance of 12 to 18 inches from the base of each tree. This is a good practice even though poisoned bait also is used. Mounding the soil from about 3 to 5 inches around the tree trunk in the fall tends to lessen mouse injury, prevent cold damage to the base of tree trunks, and give water drainage away from the trees. In early spring it is well to remove the mounds and level the soil.

During late fall each year an inspection should be made, especially in sod or mulched orchards, to determine whether mice are present. Under the grass or vegetative cover in the orchard, when mice are present, runways on top of the ground will be found. Small openings extending to runways underneath the soil are also present. If freshly used holes and runways are found, where there is evidence indicating the presence of mice, it is time to prepare for poison baiting.

Preparation and Use of Poison Bait.—The suggestions which follow on the preparation and use of poisoned bait for mice are adapted from material supplied by the Division of Predator and Rodent Control, U. S. Department of the Interior, Washington, D. C.

Small ripe apples about 1½ inches in diameter are selected and cut into eight equal pieces. Peeling and coring are not needed. Place 3 to 5 quarts of the cut bait in a clean dry pail or can. Then measure *one level teaspoonful* of zinc phosphide for each quart of cut bait. Dust

this poison over the sliced apples and stir or shake until the bait is uniformly covered. It is then ready for use. One quart of bait will treat about ⅓ to 1 acre of orchard ground. In preparation and use prepare fresh bait daily.

Application.—To place the bait use a pointed stiff wire or ice pick. Each piece should, for best results, be placed only in surface runways, mole burrows, holes, and under grass and weeds. The ground cover should be examined for runways at about 12-foot intervals. Within the area of runways 3 to 4 placements should be sufficient. One apple slice at each baiting spot is ample. Distribution should cover the orchard, row by row. Thoroughness in the use of the poisoned bait is very important.

Timing.—Baiting should follow harvest, when cool weather has caused mice to complete their migration. The best time ranges from mid-October to late November. Mice are most active from late forenoon until mid-afternoon. Forenoon baiting, therefore, is preferred. Windy, rainy and cold days are to be avoided. Injury to fruit trees rarely occurs in orchards inspected each year and handled according to their needs.

Precaution.—Reliable persons only should be entrusted with the preparation of the poison bait. After mixing and at the end of each day, wash thoroughly all utensils in which bait was handled. *Do not handle poisoned bait with bare hands.* The zinc phosphide should be taken from airtight containers. It loses its effectiveness rapidly on exposure. Follow directions carefully.

Sources of Zinc Phosphide.—This chemical may be obtained through commercial concerns making a specialty of handling spray chemicals used by orchardists and from the U. S. Fish and Wild Life Service, Experiment Station Annex, Lafayette, Indiana.

VALUE OF WRAPPERS AGAINST FIELD MICE

Tree trunk wrappers properly placed and maintained give good protection against field mice. But if wire wrappers are used they must have meshes small enough to keep the mice out. Wrappers are all right for trees from planting time until they are 8 years old. After that they may not need trunk wrappers; but mice are likely to injure the crown roots of older trees.

APPLE ORCHARDS NEED YEARLY INSPECTION

Since mice may do injury to fruit trees, especially apple trees, at all ages of growth, yearly inspections for the prevalence of mice is important. Mice generally do more injury in mature orchards than

in young plantings. In bearing orchards maintained in sod or a ground cover of mulch material, the poisoned bait method is suggested if needed. However, the clearing away of litter near the tree trunks and mounding as stated above may prove helpful in mouse control. Small-mesh wire guards placed down in the ground 4 to 5 inches and properly maintained may also prove effective in mouse control.

USE WRAPPERS AGAINST RABBITS

The only safe way to prevent rabbits from gnawing the bark of the trunks of young fruit trees is to wrap the base of the tree trunks from the ground to a height of about 18 to 20 inches or the space between the ground and the lowest branches. Where the branches are less than 18 inches above the soil the wrappers should include both trunk and branches to a height of about 20 to 24 inches. Various kinds of wrapping material may be used. Some of the most common are one-inch mesh poultry wire, galvanized window screen wire, hardware cloth, galvanized wire netting having 3 or 4 meshes to the inch, old newspapers, and gunny sacks torn in strips 6 to 8 inches wide. Wood-veneer wrappers, patented wire wrappers, especially prepared paper and building paper may also be used effectively.

All wraps should extend into the soil about 3 to 5 inches because mice may do most of their damage just below the ground surface. The protectors or wraps should be examined in both fall and spring to determine effectiveness, make adjustments and repairs, and to prevent injury to the tree trunks. Where the ends of cloth or paper wraps in the soil have rotted away, the string ties should be loosened and the soil removed slightly from the base of the tree trunks. The wraps may then be pushed beneath the soil surface again. The soil around the base of the trunk is made level after the wraps have been put in place.

Also Effective Against Borers and Sun-Scald.—Paper, gunny sack, hardware cloth and wood-veneer wrappers are also good protectors against injury by borers and sun-scald. This is particularly true for apple and pear trees. The wraps may not be entirely effective against the peach tree borer of peach trees but they should reduce borer injury materially. It is common knowledge that stone fruit trees (peach, cherry, and plum) are damaged considerably less by rabbits than pome fruit trees (apple, pear and quince). All may need protection, however, when rabbits are numerous during winters when snow may cover the ground for about 10 days or more.

Wraps May Remain on Tree Trunks.—The various kinds of wraps may remain on the tree trunks during both winter and summer for two or three years or longer, without doing injury to the tree trunks. In fact, the Missouri Agricultural Experiment Station has not found harmful insects or diseases under the wraps on tree trunks. It is true, however, that the exclusion of light tends to cause the bark to become lighter in color. Neither has the removal of wraps during the different seasons of the year and exposure to sunlight and air caused damage.

Fig. 2.—Gunny sacks make effective wraps if put on carefully and securely tied.

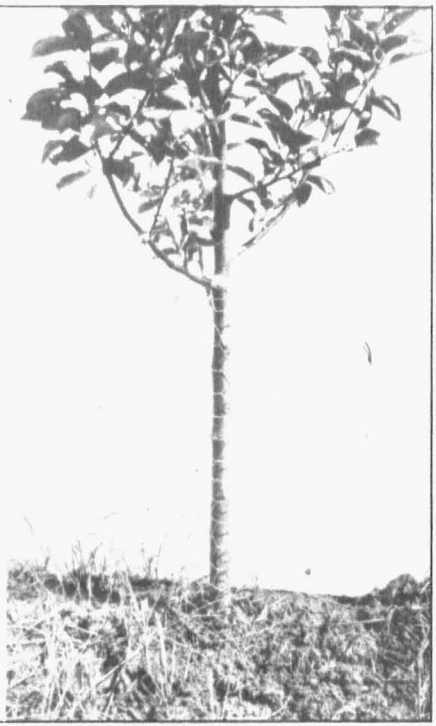

Fig. 3.—Hardware cloth or fine-mesh poultry netting may be used.

Furthermore, as pointed out above, there is a distinct advantage to be obtained by leaving the wraps in place for the first two or three years following planting. This is true because protection against both sun-scald and borer attack is obtained. Trees of all kinds are weakened in the process of transplanting and as a result are much more susceptible to sun-scald and borer attack before becoming well-established.

WRAPS AND WRAPPING

Wire Wraps.—The wire used ranges in height from about 18 to 24 inches. It is cut into strips from about 14 to 20 inches wide. The wraps are bent into cylinders, adjusted around the tree trunks and pushed into the soil about 3 to 5 inches by means of a spade or shovel. The laps of wire are then fastened by pushing cut ends through meshes and bending the ends over, forming a loop or hook.

Fig. 4.—Here the trunk of a 2-year-old apple tree has been wrapped with old newspapers to prevent rabbit injury.

When the tree trunks are enclosed in the cylinder-shaped protectors, the rim may be a few inches distant from the tree trunk all the way around. Trunk growth expansion may take place, therefore, without making adjustments of the wraps for a few years. Inspections should be made from year to year and after about 5 to 7 years, the wraps may be removed unless there appears to be further need for them.

Gunny Sacks as Wrappers.—Gunny sack wrappers are usually made by tearing gunny sacks into strips about 6 to 8 inches wide. To wrap the tree begin at the bottom allowing the wrap to fit closely down into the soil 3 to 5 inches and wind the strip spirally around the trunk and upward to a height of 18 or 20 inches. One tie at the top with a cloth string is sufficient. A better wrap is usually obtained if a little pressure is employed in the wrapping process, making the strips fit closely to the tree trunk. There is no danger of field mice being able to make nests about the tree trunk from the gunny sack material if the strips are wrapped snugly and tied securely at the top.

Newspapers as Wrappers.—Old newspapers are frequently used as protectors against rabbits. The paper strips consisting of two thicknesses should be 18 to 24 inches high and about the same number of inches in width. The paper may also be cut into strips as suggested

for gunny sack material and wrapped around the trunks and tied in a similar manner. Allow the paper to come down into the soil 3 to 5 inches and wrap it snugly around the tree trunk, causing the paper to fold over and around the tree trunk in a smooth and closely fitting manner. Three ties with cloth string, one at the top, one in the middle, and one at the bottom are sufficient to hold the paper wrap securely. Other kinds of paper are also sometimes used, but tarred paper should not be used as it may do injury to the bark of tree trunks.

Wood-Veneer Wrappers.—Wood-veneer wrappers are bent into a cylinder-shape, placed around the tree trunks and pushed into the soil in the same manner as the other wraps. Ties are made at the top, in the middle and at the bottom.

REPELLENT WASHES

Not Always Effective.—Avoid repellent washes like blood from a hog or rabbit, whitewash, diluted lime-sulphur solution, home-made and laundry soap suds, coal tar, gas tar, axle grease, paint, various oils, and similar substances. Some of these materials may damage the trees and none will save the trees when rabbits and mice are numerous and hungry.

Injurious Repellent Washes.—Investigations have shown that such substances as paint, coal tar, gas tar, axle grease, concentrated oils and combinations of such materials may do serious injury to the bark and underlying growing layer of tree trunks and even cause trees to die. A great many factors may be involved in the amount or degree of injury which may be done to the trunks of fruit trees. Most of these substances vary greatly in their chemical composition or makeup. The vigor of the trees may cause a difference, and the season of the year or time of application as well as the method of application or the quantity applied may explain the great variations in the severity of damage done to fruit trees. To be on the safe side, therefore, the grower should not use such substances, as there are others which may be used with good results without danger of harm.

Safe Repellent Washes.—If a repellent and poisonous wash is desired, use whitewash, soapsuds or dormant strength lime-sulphur and add lead arsenate at the rate of about 1 pound to 10 gallons. These washes may be applied with a sprayer which facilitates the work. Greater concentrations may be used and the repellent applied by means of an ordinary paint brush. There is no danger of these washes doing injury to the tree trunks, no matter when or how applied.

Poisonous Whitewash.—A thick, heavy whitewash made according to the so-called Government formula has been employed with more or less success on fruit trees to prevent sun scald, attack by rabbits, field

mice, and fruit tree borers. The ingredients and method of preparation are as follows:

Stone lime	½ bushel	Spanish whiting (plaster of Paris)	½ pound
Salt	1 peck	Glue	1 pound
Ground rice	3 pounds	Lead arsenate	1 pound for each 10 gallons of whitewash
Water	5 gallons		

First slake the lime with warm water and then strain it through a fine sieve or strainer. Dissolve the salt in warm water, boil the rice flour to a thin paste, and dissolve the glue in boiling water. Mix the ingredients in the following order and stir well: Pour the salt solution into the lime, then the rice paste, and next stir in, boiling hot, the Spanish whiting and glue, and finally add 5 gallons of hot water. Stir thoroughly and let it stand for a few days. It should be applied hot with a brush and the trunks of the trees should be kept covered during both winter and summer.

PRUNED BRANCHES PREVENT INJURY

When the apple trees reach an age of from eight to ten years they are not likely to be seriously injured by rabbits. The same holds true with other fruit trees such as peaches, cherries and plums when they attain an age of five or six years. To minimize the liability of injury, however, the grower should continue to keep the trees wrapped which may grow near fence rows, ravines or other quarters of the rabbit.

For the parts of the bearing orchard located more distant from the haunts frequented by the common cotton-tail rabbits serious injury may often be prevented by commencing the regular pruning work shortly after the leaves begin to drop in the fall, leaving on the ground near the trees the branches removed. These furnish food for both rabbits and field mice and they may be fonder of the tender bark on the pruned branches and shoots than that on the tree trunks, which is thicker and tougher. As a result the rabbits and mice do little or no injury to trees eight or more years old when a sufficient supply of fresh pruned branches may be found on the ground nearby.

SUPPLEMENTARY PRACTICES

Encourage Hunters.—During the fall and early winter hunters may be encouraged to destroy the rabbits. They may often lessen the injury to a great extent. Where the work of hunters is very thorough, practically all of the rabbits may be destroyed although they are likely at any time to come into the orchard from distant woodland thickets and other places which furnish food and protection

from their natural enemies. Hunters should, however, be warned to guard against starting fires in dead grass and weeds and injuring the trees with gunshot wounds.

Destroy Harbors.—Rabbits may also be largely prevented from doing serious injury to fruit trees by burning or otherwise destroying near orchards, as completely as possible, harbors along fence rows, ravines, in wood lots and rank growing bunch grass on waste land. The destruction of such harbors may prevent depredation by rabbits and mice and at the same time mean much to the fruit grower by enabling him to combat insects and diseases more effectively.

Fencing.—To prevent injury by rabbits, comparatively small plots of trees, brambles, heeled-in nursery stock and vegetables are often enclosed by fences. One-inch mesh poultry wire, screen wire, lattice fence material, board fences and still other materials are used.

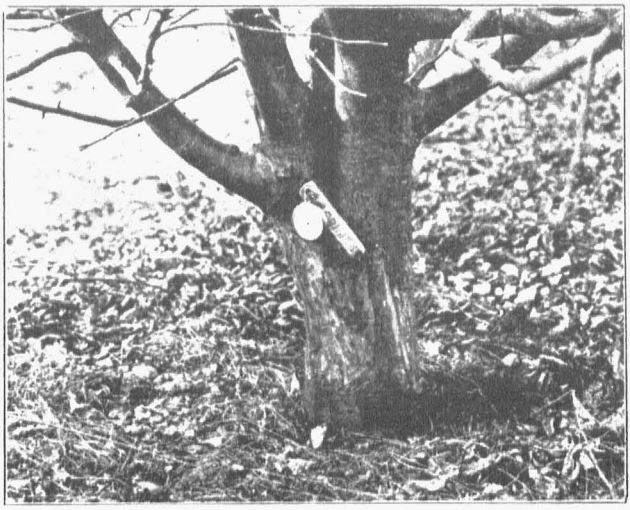

Fig. 5.—A 12-year-old apple tree girdled by rabbits. Enough of the cambium layer, or growing wood, was left that the tree lived without bridge grafting. The injuries were painted with grafting wax and they were practically healed over by the end of the next growing season.

TREATMENT OF INJURED TREES

Where rabbits or field mice have gnawed the bark of the tree trunks practically all the way round but have not peeled it to the wood except in spots here and there, bridge grafting as a rule is not needed. An application of grafting wax or even para-wax applied thoroughly to the damaged areas, will generally prevent drying and assist in healing the wounds.

If the injury occurs in winter the wounds should be protected by a coat of grafting wax preferably to prevent drying of injured tissues. If bridge grafting is required it should be done in the spring as soon as the bark will peel freely. During the growing season, if grafting is needed, the operation should be performed as soon after the injuries as possible. See section on Bridge Grafting in Missouri Experiment Station Circular 320.

CUTTING BACK DAMAGED OR WEAK TREES

Young fruit trees up to two years of growth in the orchard with trunks damaged seriously by hail, rabbits, or due to other causes fail to make a satisfactory growth the first and second year after planting, may be cut back to stumps about 4 inches high. Sprouts should rise from the remaining portion of the stem and continue growth in a satisfactory way. One good sprout starting above the graft or bud union should be allowed to grow to take the place of the top or part removed.

The best season for cutting back is early in the spring just as growth is starting or shortly before. The mortality of cut-back trees has increased as the season advanced up to the first of June. Moreover, the later the cutting back in the spring, the less likely the tree is to produce satisfactory sprouts to continue the growth of the tree.

In comparison to normal or untreated trees, no material difference has been noted in the age of coming into bearing between untreated trees, trees cut back at planting time, and after one to two years' growth in the orchard. Trees cut back after 3 or 4 years' growth in the orchard, however, may be delayed in coming into bearing as much as two or more years.

The main or scaffold branches in cut-back trees start much nearer the ground. In most instances well placed branches push out at heights from 14 to 18 inches above ground and spread out at a much wider angle than branches from trees not cut back. The branches are better placed up and down the main stem of the tree trunk, enabling the pruner to select without difficulty the branches desired for a well-shaped and well-balanced head.

The response from the cutting back treatment on all kinds of young fruit trees is, in general, quite similar. The common shade trees also show the same effect in vigor of growth and character of branching as that described for young fruit trees.

Therefore, badly injured or stunted trees up to an age of about two years, if cut-back, generally make a much more vigorous growth and develop into more profitable trees than similar ones not so treated.

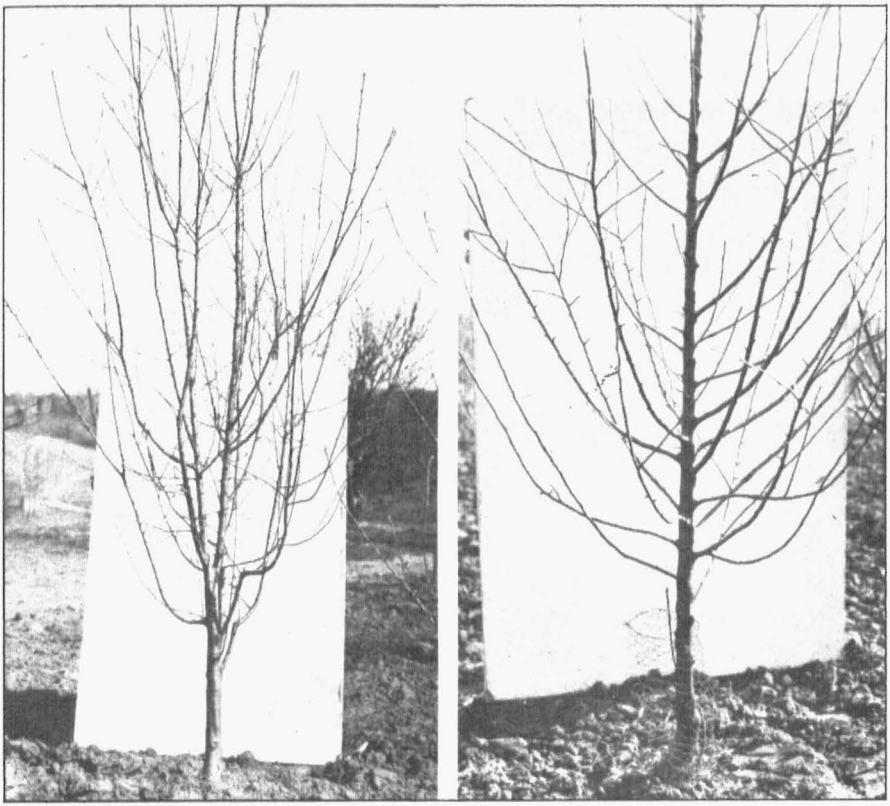

Fig. 6.—(Left) Typical 4-year-old apple tree, not cut back. (Right) Typical cut-back tree after two years' growth from a stump about 4 inches high. The tree was planted as a 1-year-old and was cut back after two seasons' growth in the orchard.