

RABBITS

Integrated Pest Management for Home Gardeners and Landscape Professionals

Rabbits are a type of wildlife many people enjoy, but they also are an animal that can be very destructive to gardens and landscaped areas. Eight species of rabbits are found in California. Three of these species—the black-tailed hare or jackrabbit, *Lepus californicus*, (Fig. 1), the desert cottontail, *Sylvilagus audubonii*, (Fig. 2), and the brush rabbit, *S. bachmani*, (Fig. 3)—are widespread and cause the majority of problems. Because of its greater size and abundance, the jackrabbit is the most destructive.

IDENTIFICATION

The jackrabbit is about as large as a house cat, weighing 3 to 7 pounds with a body length of 17 to 21 inches. It has a grayish-brown body, long black-tipped ears, relatively long front legs, and even longer hind legs. The top of its tail is black.

The desert cottontail rabbit and brush rabbit are distinguished from jackrabbits by their smaller size and shorter ears. The desert cottontail is 12 to 15 inches long, weighs $1\frac{1}{2}$ to $2\frac{3}{4}$ pounds, and has pale gray fur with yellow tints. The brush rabbit is slightly smaller at 11 to 13 inches long; it weighs $1\frac{1}{4}$ to $1\frac{4}{5}$ pounds and has brown fur.

A good sign that rabbits are present is coarse, circular fecal droppings, or pellets, found scattered over an area. Pellet size varies roughly with the body size of the species. Jackrabbit pellets are about $\frac{1}{2}$ inch in diameter, whereas pellets of the cottontail are closer to $\frac{1}{4}$ inch.

BIOLOGY AND BEHAVIOR

Jackrabbits

You'll usually find jackrabbits in open or semi-open areas of California's valleys and foothills but seldom in dense brush or woodlands. Within their preferred habitats, jackrabbits are quite adaptable and inhabit areas around the fringes of urban and suburban developments, green belts, golf courses, parks, airports, and agricultural lands. They make a depression in the soil, called a "form," beneath a bush or other vegetation and use it for hiding and resting during the day. Jackrabbits depend on speed and dodging to elude predators. In California an average density of about $1\frac{1}{5}$ jackrabbits per acre is typical, but during periods of high reproduction, this number can increase.

The breeding season for jackrabbits runs from late January through August, although breeding is possible during any month of the year where winters are mild. Litters average between 2 to 3 young, and jackrabbits can have as many as 5 to 6 litters per year. Young jackrabbits are born fully furred and with their eyes open. Within a day they can move about quite rapidly.

The food habits of jackrabbits vary, depending on location and the availability of appropriate plants. Rabbits prefer to eat succulent, green vegetation, with grasses and herbaceous plants making up the bulk of their diet. In some areas rabbits eat the leaves, bark, or seeds of woody shrubs. Feeding usually begins during the evening hours and continues throughout the night into the early morning. Jackrabbits can survive without a supply of drinking water.



Figure 1. Adult black-tailed jackrabbit.



Figure 2. Desert cottontail rabbit in front of its burrow.



Figure 3. Young brush rabbits.

If food and other necessary resources are available in one place, jackrabbits exhibit no major daily movements. If food sources and areas for shelter are separated, jackrabbits will move between these areas in the morning and evening. Daily travel of 1 to 2 miles between areas is common. During dry periods, roundtrips of up to 10 miles have been observed. These travels are

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habitually made on the same trails every day, producing noticeable paths through herbaceous vegetation.

Desert Cottontail and Brush Rabbits

Unlike jackrabbits, desert cottontail and brush rabbits generally inhabit places with dense cover such as brushy areas, wooded areas with some underbrush, or areas with piles of rocks or debris. You also might find them living beneath slightly raised sheds or other buildings where there is an opening at the base. They also will use abandoned structures and sometimes cultivated fields for cover. These rabbits use open areas more at night and dense cover more during the day. The brush rabbit, however, seldom feeds more than a few feet from its cover.

Most cottontails and brush rabbits have a home range of up to 10 to 15 acres. A good habitat, such as a park with a clump of low-growing junipers about 30 feet wide, can harbor 10 to 15 cottontails, but normal density is considerably less—an average of 1 rabbit per acre. In urban areas with few predators the populations will be considerably more. Cottontails and brush rabbits aren't territorial but maintain home ranges that overlap broadly with other individuals of all age and sex classes. Cottontails and brush rabbits don't exhibit the same magnitude of daily travel as seen in jackrabbits, although they do make habitual use of travel lanes within their home range.

The breeding season for both cottontails and brush rabbits begins in December and ends in June. The average litter size is usually 3 to 4 young, and there can be up to 6 litters per year. These rabbits give birth in a shallow depression on the ground. The newborn rabbits, which are nearly furless and have closed eyes, remain in the nest for several weeks.

The food habits of cottontails and brush rabbits vary with the location and time of year. Cottontails feed seasonally on grasses, sedges, herbaceous plants, willows, oaks, blackberries, and wild roses.

Brush rabbits prefer clover and also feed on the stems and berries of woody plants such as blackberries.

DAMAGE

Rabbits can be very destructive in gardens and landscaped places. This is particularly true where wild or uncultivated lands border residential zones, parks, greenbelts, or other landscaped places. Open lands such as uncultivated, wild areas provide resting and hiding cover during the day within easy travel distances to prime, irrigated food sources. A partial list of crops and plants rabbits damage includes:

- Vegetables—beans, beet, broccoli, carrot, lettuce, and peas;
- Tree and berry crops—almond, apple, blackberry, cherry, citrus, pistachio, plum, raspberry, and strawberry;
- Herbs—cilantro and parsley; and
- Ornamental plants—various flowers, shrubs, trees, and turf.

Rabbits also gnaw and cut plastic irrigation lines, especially small diameter tubes. You can protect these by hanging them out of the reach of rabbits or by encasing them in regular $\frac{3}{4}$ -inch PVC pipe.

Most rabbit damage is close to the ground, except where snow allows rabbits to reach higher portions of plants. Rabbits use their incisors to make a characteristic diagonal, 45° cut when clipping off woody twigs, buds from saplings, or flower heads. At first you might confuse a rabbit's twig clipping with deer browsing. However, you easily can identify deer damage on woody plants if it occurs above a height that rabbits can reach—about 2 feet—and by carefully examining the damaged twigs. Deer have no upper front teeth and must twist and pull when browsing, leaving a ragged break on the branch. Rabbits clip twigs off cleanly, as if with a knife.

Rabbits tend to gnaw the smooth, thin bark from young trees. The rough bark of older trees discourages gnawing, although old damage and gnaw marks

often are present on old bark along with fresh patches of gnawing in areas of younger growth. Gnawing can completely girdle, or remove a ring of outer and inner bark from, a tree; clipping can remove the terminal shoot and lateral branches from plants. Damage by cottontails and brush rabbits often is concentrated in areas near escape cover. Jackrabbits, however, will feed far into open areas and can eat 1/2 to 1 pound of green vegetation each day.

Rabbits can be carriers of tularemia, or rabbit fever. This disease is relatively rare in humans, but you can contract it by handling an infected rabbit with bare hands or by eating insufficiently cooked rabbit meat.

LEGAL STATUS

The California Fish and Game Code classifies jackrabbits, cottontails, and brush rabbits as game mammals. Under this code and a 2007 legal opinion, the owner or tenant of a property or an employee working on that person's behalf can control jackrabbits, cottontails, and brush rabbits anytime or in any legal manner if the rabbits are damaging crops, landscaping, ornamental plants, or gardens.

No license is required for the owner or tenant to take rabbits doing damage. A trapping license from the California Department of Fish and Game is required when trapping rabbits for hire or profit. When using firearms to take rabbits, nonlead ammunition must be used in areas within the historic California condor range; check with your local game warden for more information on these areas, and always check local ordinances before using firearms. It is illegal to sell the meat or fur of rabbits taken as pests.

MANAGEMENT

A number of methods are available for reducing rabbit damage, but physical exclusion, trapping, and—to a lesser degree—repellents are better choices for protecting garden and home areas. In cases where these methods aren't practical, contact your local farm advi-

sor or agricultural commissioner for more information. There are also professional pest control companies that will trap rabbits.

Exclusion

Fencing. Probably the most long-term, effective way to protect plantings from rabbit damage is to build a fence. Poultry netting (chicken wire) supported by light stakes will provide adequate control, although the mesh size should be no larger than 1 inch in order to exclude young rabbits. Use 48-inch-tall wire, and bury the bottom at least 6 to 10 inches into the ground. Bending a few inches of the fence bottom outwardly will further deter rabbits from digging beneath it (Fig. 4).

If you don't bury the bottom of the wire fence, you'll need to stake the bottom edge to deter rabbits from passing beneath it. Use tight-fitting gates with sills to keep rabbits from digging below the bottom rails. Keep gates closed as much as possible, because rabbits can be active day or night. Inspect the fence regularly to make sure rabbits or other animals haven't dug beneath it.

You can use reusable fence panels instead of a wire fence. Construct a wood lath or PVC frame 24 to 30 inches high. You can vary the length of the panels to match the size of the garden or area you want to protect. Attach 1-inch mesh wire to the frame, then wire the panels to lightweight, temporary fence posts. The low panels allow easy access for gardening, and you can move them when needed.

Cottontails and brush rabbits won't jump a 2-foot fence. Jackrabbits ordinarily won't jump a 2-foot fence unless a dog chases them, or they become otherwise frightened. Discourage jumping by increasing the above-ground height to 3 feet. In snow areas, a higher fence might be necessary. Remember, once a rabbit gets into the fenced area, it might not be able to get out.

Electric netting, a type of electric fence, also is suitable for rabbit control. It is designed for ease of installation and

frequent repositioning. Electric netting is intended for temporary use at any one site, making it ideal for seasonal gardens. Because of the many variables affecting the selection of a power source and operation of an electric fence, it is best to consult a reputable dealer for specific details regarding its use.

Trunk Guards. In some cases protecting individual plants might be more practical than excluding rabbits from an entire area (Fig. 5). Poultry netting with a 1-inch mesh and that is 18 to 24 inches wide is ideal for cutting into strips 18 to 20 inches long and forming into cylinders for placement around the trunks of young trees, shrubs, or vines. Bury the bottom of the cylinders 2 to 3 inches, and brace them away from the trunk, so rabbits can't press against the cylinder and nibble through the mesh. Inspect these barriers regularly, and be sure to keep the area inside the barriers clean of leaves, weeds, and other debris to eliminate feeding sites for small rodents. Commercial tree trunk protectors also are available.

Trapping

Cottontail and brush rabbits are relatively easy to trap; however, jackrabbits are very difficult to capture, because they are reluctant to enter a confining space.

Live trapping of cottontails and brush rabbits isn't recommended, because it creates the dilemma of what to do with the trapped animal. Rabbits can carry certain diseases and are considered agricultural pests. According to California Fish and Game Code, it is illegal to release them in other areas without a written permit. Handling a live rabbit also creates the possible hazard of disease transmission to the trapper.

You can trap cottontails and brush rabbits with a Conibear trap (No. 110), which kills the animal outright. Place the trap inside a covered box constructed from $\frac{3}{4}$ -inch exterior plywood with a 4-inch wide entrance (Fig. 6). To further reduce hazards to children, pets, and poultry, position the trap back

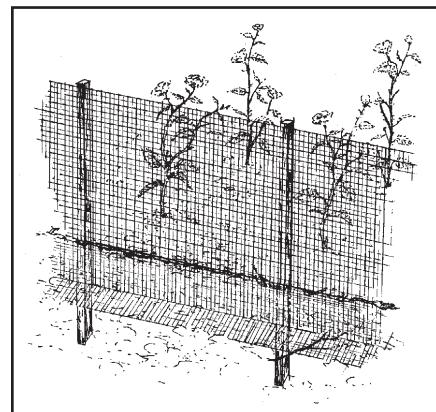


Figure 4. Bury a rabbit fence at least 6 to 10 inches and turn the bottom portion of the fence outward to prevent rabbits from digging beneath it.



Figure 5. Tree exclusion cylinders.

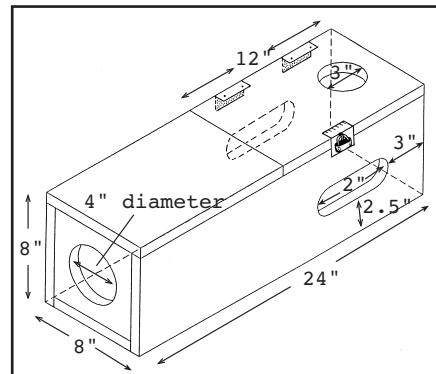


Figure 6. Box for use with Conibear trap (No. 110).

from the entrance. Slots at the back end of the box help in positioning the trap as does the hinged lid. The hole cut in the top of the hinged portion and covered with $\frac{1}{4}$ -inch mesh hardware cloth serves as a means to check the trap or

bait. Other kill-type traps, such as a tunnel trap, also are available.

Place traps near cover where the rabbits feed or rest. For bait, use whatever the rabbits are feeding on, or use carrots, cabbage, fresh green vegetables, or apples. Place the bait at the back of the trap. Placing some just outside the trap is helpful too. Check traps daily to replenish bait or remove the catch.

Repellents

Various chemical repellents can reduce or prevent rabbit damage. They are most useful when you apply them to trees, vines, or ornamentals. These products work by creating an unpleasant odor, taste, or stickiness. Research has shown that repellents with putrescent whole-egg solids can reduce rabbit browsing.

Apply repellents before damage occurs, and reapply them frequently, especially after a rain, heavy dew, or sprinkler irrigation or when new growth occurs. In all cases, follow the label directions for the repellent you are using.

The usefulness of repellents is limited. They work best to protect woody plants during the early years before they bear fruit or during winter. Most, except for some of the taste repellents, can't be used on plants or plant parts that humans eat. Repellents usually fail when you use them in a vegetable garden, an area that contains highly preferred rabbit foods, even if the repellents are registered for use on edible crops.

Habitat Management

To discourage cottontails and brush rabbits, especially in suburban habitats where alternate habitats might be limited, remove brambles, piles of brush, stones, or other debris where rabbits can hide. Control vegetation along fence rows, ditch banks, or brushy areas. Keep in mind vegetation management can affect other wildlife such as songbirds. Removing cover probably will have little effect on jackrabbits,

because they can use cover that often is great distances from their feeding sites.

If outbuildings such as sheds, trailers, or other storage units are on slightly raised platforms of about 2 to 12 inches, construct a mesh barrier to exclude rabbits from hiding underneath.

Other Control Methods

Shooting can be an effective means of eliminating small numbers of rabbits where it is safe to do so in rural locations, but it is prohibited in urban and suburban locations. Best results are achieved in early morning or around dusk when rabbits are more active. Check both local and game regulations for license requirements and any restrictions on shooting in your area.

"Frightening" devices, such as noise-makers and flashing lights, generally aren't effective nor are ultrasonic units, which rely on sound waves to repel rabbits. A pet dog left loose within the area you want to protect can be somewhat effective in keeping rabbits away, but some dogs are better at this than others.

Toxic baits are registered for use in agricultural situations to resolve serious crop damage problems when jackrabbits are numerous, but their use in urban and suburban situations isn't practical. In order to comply with label instructions, you must recover all rabbits that die after coming into contact with the bait. Because the rabbits are likely to die outside the baited property, carcass recovery is almost impossible.

Rabbits serve as food for a number of predators, including hawks and coyotes, but in urban and suburban situations, the greatest threat is from cats and dogs. Although relatively vulnerable to predators, rabbits generally cope well and maintain their populations in spite of this threat.

FOLLOW UP

If you have built barriers to exclude rabbits, follow up consists of regularly inspecting the area to ensure rabbits aren't breaching them. Inspect previously undamaged plantings for new damage, as rabbits can switch to new food sources after you have excluded them from an existing feeding site.

If trapping or shooting has reduced the rabbit population to a tolerable level, periodically search the area for signs of an increase in rabbits. Look for droppings, trails, and the characteristic 45° cut on twigs and stems. Rabbits are easy to see, but because they frequently feed when it is dark, you might have to examine the garden at night with a flashlight to see them. Their eyes shine yellow or red in a flashlight beam.

Because few, if any, rabbits are acceptable in a garden or landscaped area, take appropriate action when you first observe signs of them. Rabbits seen nearby frequently will invade a garden when the plantings become desirable to them. Consider exclusion methods such as a fence before damage actually occurs.

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WARNING ON THE USE OF CHEMICALS

Pesticides are poisonous. Always read and carefully follow all precautions and safety recommendations given on the container label. Store all chemicals in the original, labeled containers in a locked cabinet or shed, away from food or feeds, and out of the reach of children, unauthorized persons, pets, and livestock.

Pesticides applied in your home and landscape can move and contaminate creeks, rivers, and oceans. Confine chemicals to the property being treated. Avoid drift onto neighboring properties, especially gardens containing fruits or vegetables ready to be picked.

Do not place containers containing pesticide in the trash or pour pesticides down the sink or toilet. Either use the pesticide according to the label, or take unwanted pesticides to a Household Hazardous Waste Collection site. Contact your county agricultural commissioner for additional information on safe container disposal and for the location of the Household Hazardous Waste Collection site nearest you. Dispose of empty containers by following label directions. Never reuse or burn the containers or dispose of them in such a manner that they may contaminate water supplies or natural waterways.

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