



Non-lethal Methods for Controlling Deer Damage

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At the turn of the century, it was estimated that there were less than 500,000 deer left in North America. Today that number is approaching 20 million, making deer a conservation success story. In many areas of the country the rising deer population and increased human development have combined to create problems for landowners and the public alike. In recent years, landowners throughout the Northwest have expressed their concern over rising numbers of deer and the damage they are causing to agriculture, forestry, and ornamental crops. Damage can

be severe and costly. There are several methods of preventing this damage, and all begin with assessing the problem.

Identifying the Culprit

Before deciding on a control method you need to ascertain what animal is doing the damage. There are some telltale signs that will let you know if deer are the perpetrator.

- Deer have no upper incisors so the observed bite marks will have very rough, serrated edges. A clean-edged cut indicates rodent, or rabbit/hare damage.
- Deer can reach for food up to 8 feet, but will only do so when other browse is unavailable. Generally deer damage will occur at 3 to 5 feet above the ground. There will often be a visible “browse line” on plants in the area where the deer have been feeding.
- Deer rubs are easy to identify. They are the result of male deer rubbing their antlers on the limbs of seedlings and small-diameter trees and shrubs.



Photo 1. Very rough, serrated-edged bite marks are a characteristic of deer damage.



Photo 2. Stunted trees may be the result of browsing deer.



Photo 3. Damage to a small-diameter tree caused by the antler rubbing of a male deer.

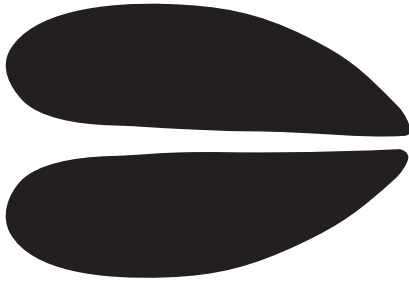


Figure 4a. *White-tailed deer track.* Size: 2½–3½ inches (L), 1–¾ inches (W).

- If damage is the result of trampling then tracks should be noticeable. Deer tracks are about 2–3 inches long and the typical stride of a deer is between 13 and 20 inches in length, depending on the animal’s size.

Non-lethal Methods of Controlling Deer Damage

The main objective of non-lethal damage control is to persuade deer to forage and rub their antlers elsewhere. Deer are creatures of habit and they learn over time which areas provide the best feeding opportunities. It is important to exclude the deer from your property before they get into the habit of going there. It is a lot easier to discourage deer from ever starting to feed in

certain areas than it is to interrupt them after they’ve already begun. Keep in mind that the methods of damage control discussed below are going to be more successful early on in the growing season.

1. Repellents

Repellents are the most common method of preventing deer browsing on small acreages. These repellents operate as a taste or an odor deterrent, or both. It is important to remember that while repellents often do work, their long-term effectiveness varies. Some things to remember when considering using repellents include:

- Repellents will only *reduce* browsing and antler rubbing. They will not eliminate these activities.
- Some applications will wash off in the rain and must be re-applied.
- Repellent effectiveness is increased if applied *before* any damage occurs.
- Repellents that are effective in one location may not work in another, even if environmental and crop conditions are similar.

Meat Protein

Repellents made from animal by-products have been shown to do a particularly good job in repelling deer for up to six months. They are often made up with a relatively high percentage of edible animal protein, such as dried blood. Products made from eggs also do well. Deer are sensitive to the sulfur content of the eggs that suggests a meat-eating predator is in the area. Cost and frequency of application vary but there are many commercial brands available.

Garlic Oil and Capsaicin

Garlic oil may be an effective deterrent. Garlic is a component in many commercially available products. It is usually placed in a dispenser and lasts for up to six months; however, a dispenser is designed to protect only one plant.

Capsaicin is most effective when used on fruit trees and food crops. It must be applied before the fruit sets or edible portions begin to form, and must never be placed on ripening or matured fruit or vegetables. Capsaicin, the ingredient that gives chili peppers their heat, is the active ingredient in hot pepper and is an effective deterrent for mammals, but does not



Figure 4b. *Walking pattern of white-tailed deer (straddle= 5–10 inches).*

repel birds. Products containing capsaicin are often mixtures of several repellent ingredients.

2. Frightening

There are many types of devices available to scare deer away from specific areas. The effectiveness of these devices is greatest during their initial use, but they become less effective as deer get used to them. There are two rules to follow when using frightening devices: never rely on one type of device, and

change the timing and location of the devices you deploy every couple of days.

Propane Cannon

Propane cannons have been used for some time to scare unwanted pests away from agricultural products. They emit loud explosions at timed intervals. They are available commercially for anywhere from \$200 and \$500, depending on the options included. In some locations you can get propane cannons on loan from local wildlife agen-

cies. Propane cannons may come equipped with automatic timers, rotating barrels, and motion detectors. The higher off the ground the cannon, the louder the explosions. Like all frightening devices, they need to be moved every few days to maintain their effectiveness.

Miscellaneous Frightening Devices

Shell crackers, fireworks, ultrasonic devices, and gunfire are devices that can be used to supplement other deterrent

Table 1. Some commonly used commercially available deer repellents.

Repellent Name and Function	Active Ingredients	Characteristics
Deer Away®—odor and taste repellent	Putrescent egg solids	85–100% effective for 2–6 months
Hinder®—odor repellent	13.8% ammonium soaps derived from higher fatty acids	2–4 weeks effective; must be re-applied after heavy rains
Thiram—taste repellent	Fungicide (10–42% tetramethylthiuram disulfide)	Does not weather well; may accumulate in surrounding soil after prolonged use; concerns it may effect beneficial soil fungi
Ro-pel®—taste repellent (bitter)	benzyl diethyl [(2,6,xylyl-carbomoyl)] methyl ammonium saccharide plus thymol	Should not be used on edible crops
Tree Guard®—taste repellent	Bitrex (denatonium benzoate)	Conditions deer to identify treated plants and avoid them; bonds to plant with a latex formulation; weathers well
Get-Away®	allyl isothiocyanate 0.216%; capsaicin and related capsaicinoids 0.042%	Use is allowed in lawns, gardens, landscaped areas and non-bearing trees and shrubs
Deer, Rabbit and Squirrel Repellent®	putrescent whole egg 0.7813%, capsaicin 0.0006% and garlic oil 0.0006%	Use is allowed on vegetable gardens and food crops
Repellex, Deer Repellant Concentrate®	dried blood 30%; potassium sorbate 1%	Not to be used on fruit or vegetables intended for consumption

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methods. Shell crackers are fired from a twelve gauge shotgun and explode between 165 and 250 feet away. Fireworks and gunfire can be used when patrolling areas not covered by propane cannons. Ultrasonic devices can be used in areas with greater human population; they emit sounds that humans can't hear but are loud and frightening to many other mammals, including deer. Motion sensor lights and sprinklers may also be effective.

3. Fencing

By far, the most effective method of deterring deer damage is through fencing. There are numerous fencing materials and designs available, from wire to electrical, which vary in cost and maintenance requirements. A standard 8-foot deer fence made from woven wire is the most effective and permanent design, but it is also costly at about \$1.15 per foot. Wire fences are designed to exclude deer from an area and must be high enough to deter them from jumping over. Electrical fencing is more popular because it is not as permanent as wire, it requires less materials and maintenance, and costs less than \$0.30 per foot. It also takes less time to set up, but must be monitored and kept clear of vegetation. Electrical fences repel deer by emitting an electric shock when touched. Because it's effectiveness is based on changing deer behavior, electrical fencing should be installed where damage is expected to occur, but before any damage begins.

Types of Electrical Fencing

A single-strand electrical fence is the most common and inexpensive type, costing less than \$0.15 per foot. Single-strand deer fences work best when first slathered with vegetable oil and then baited with peanut butter on pieces of tin foil wrapped around the fence strand, or with apple-scented metal caps placed along the length of the fence. Deer receive a shock when they taste the peanut butter or investigate the apple scent. This initial shock is necessary so the deer will learn not to approach the fence in the future.

Another type is a 3D electrical fence. They are constructed by placing two single-strand fences side by side. Deer have difficulty judging distances so the theory behind the 3D fence is that deer are less likely to jump a fence that has width as well as height and length. It also is necessary to bait 3D fences, and they require a bit more construction time, expense, and maintenance than a single-strand fence.

Temporary Fencing

Constructing temporary fencing can be a cost-effective way of protecting vegetation during a fixed period of time, such as a growing season. For conifer seedlings, this time period may last to about 3 to 5 years of age, when the seedlings lose their palatability. Around the United States, temporary fences have been used to protect agricultural croplands, nurs-

eries, home gardens, orchards, and forest plantations from deer damage. Effectiveness is dependant on many factors, including the degree of habitual use, snow cover, proper fence maintenance, the availability of alternative habitat, and deer population densities. Some considerations for using temporary fencing include:

- Large acreages can be protected fairly easily if fencing is necessary only during the growing season.
- It is more difficult to protect areas during the dormant season because many native foods are not as available.
- Don't place fences across existing deer trails.
- If deer population densities are high and food is scarce, temporary fencing may not be effective at all (it is difficult to deter a starving animal).

4. Habitat Modification

Simple changes in the habitat can often aid in preventing damage and help ensure that any damage control methods that are put in place will work. Providing highly palatable plants away from areas of concern may distract deer from valuable agricultural crops. This method may also break the deer of their dependence on those crops as a food source. However, once the preferred forage is gone, or little other food is available, the

damaging behavior may return. If deer are starving, it can be difficult to stop them from foraging on even the least-palatable vegetation. One strategy might be to plant crops of high human value closer to areas with a lot of activity as deer are less likely to venture into areas regularly occupied by humans.

Altering the Landscape

When designing a damage control scheme, it is important to consider the surrounding landscape features that may influence the effectiveness of the control methods. For example, if using frightening devices, it is important to provide the deer with escape routes when they flee from propane cannons or shell crackers. If fencing is present, providing easy access to escape cover will minimize the chances of deer running into the fence. A terrified animal will not always stop running when reaching a fence, but will likely go around if given the option. Likewise, if a deer is traveling a habitual trail that is suddenly blocked by a fence, they will most likely try to jump it. By blocking the trail entrance, you can force the deer to choose an alternate route. Do not try to exclude deer from an area all at once. Building fences in stages will allow deer to slowly get used to them and encourage them to look elsewhere for forage. This will increase the effectiveness of the fencing and minimize stress and injuries to the deer. Strategies that will increase the effectiveness of

habitat modification efforts include:

- Leave a clearing at least 60 feet wide between any plantings and field or forest edges—but remember that you will be removing habitat that other wildlife are using.
- Choose ornamentals and landscaping plants that are not attractive or preferred by deer. See the listing of plant species in Appendix A at the end of this publication.
- Use repellents and fencing along field edges adjacent to the area you want to protect.
- Attract deer away from the target crop by planting a species deer prefer. This can become problematic and prohibitively expensive, if you end up attracting more deer to the area.

Conclusion

Before designing any damage control scheme, it is important to correctly assess what animal is responsible. It is often fairly obvious if deer are the culprits, but it doesn't hurt to be sure. Investigate the different options of deer damage control that are available and remember that no method is perfect. The standard 8-foot deer fence provides the best protection, but is often prohibitively expensive. An integrated approach to pest management, such as a combination of fencing, repellents,

and frightening, is likely to be the best compromise between effectiveness and cost. It is also important to measure control costs against any losses accrued by the damage. Ask yourself if you are willing to tolerate some damage to crops. The following questions may help you determine the best approach.

1. *What is the extent of the damage? In other words, is it antler rubbing, browsing, or trampling of plants?* This will help you determine what kind of control will be appropriate.
2. *Am I losing any money as a result of deer damage, and if so, how much?* You need to determine the cost and benefits of different controls.
3. *Is there a seasonal pattern to the damage?* You will need to determine as best you can if the damage that is occurring is consistent year after year, or is the result of extreme weather episodes. As mentioned before, little will deter a starving animal, so a method that may have worked one season may not be effective after a severe winter. It is best to plan for the most severe situation experienced during the past five years as your standard.
4. *What are the characteristics of the local deer population?* Are there any pending land use actions on adjacent properties that may drive

deer onto your property? Contact your local state Fish and Wildlife office and find out how many deer live in your region, and where the high-use areas are.

5. *How large is the area to be controlled?* Fencing tends to decrease in effectiveness beyond 25 acres as the opportunities for deer to break through the fence increases with the amount of fencing present. In addition, damaged areas next to forest and heavy brush are more attractive to deer because of the proximity of escape cover. Lands surrounded by open spaces and development usually experience less deer damage.

Deer are adaptable and graceful animals that can be quite enjoyable to have around, but at times their natural behavior brings them into conflict with human interests. Choosing the most effective and appropriate method of damage control will help to alleviate damage to croplands, gardens, and reforestation efforts, while maintaining the safety and health of the deer.

For More Information:

An Integrated Approach to Deer Damage Control. Pub. No. 809. Cooperative Extension Service, West Virginia University.

Integrating Deer Damage Management by Individuals. In *Conference Proceedings: Deer Management and Policy Options in Maryland*. Center for Agriculture and Natural Resource Policy. University of Maryland, College Park, MD.

Russell Link, *Landscaping for Wildlife in the Pacific Northwest*. Seattle, University of Washington Press, 1999.

Deer Damage Control Options. C 728. Kentucky State University Agricultural Experiment Station and Cooperative Extension Service.

Photo Credits:

Photo 1. John H. Ghent, USDA Forest Service, www.forestryimages.org

Photo 2. Jim Bottorff, Washington Department of Natural Resources

Photo 3. Gary Witmer, U.S. Department of Agriculture Animal & Plant Health Inspection Service

Figure 4. Adapted from *Mammal Tracks: Life-Size Tracking Guide* by Lynn Levine and Martha Mitchell, illustrated by Martha Mitchell. Heartwood Press, East Dummerston, VT, heartwoodpress.com.

Appendix A. Selected deer-resistant plants

Trees	Garden Herbs continued
Juniper (<i>Juniperus</i> spp.) Spruce (<i>Picea</i> spp.) Sumac (<i>Rhus</i> spp.) Hemlock (<i>Tsuga</i> spp.)	Thyme (<i>Thymus</i> spp.) Sweet marjoram (<i>Origanum majorana</i>) Oregano (<i>Origanum vulgare</i>)
Deciduous Shrubs	Perennial Flowers
Serviceberry (<i>Amelanchier alnifolia</i>) Barberry (<i>Berberis</i> spp.) Butterfly bush (<i>Buddleia</i> spp.) Hazelnut (<i>Corylus</i> spp.) Potentilla (<i>Potentilla fruticosa</i>) Chokecherry (<i>Prunus virginiana</i>) Golden current (<i>Ribes aureum</i>) Spirea (<i>Spirea</i> spp.) Snowberry (<i>Symphoricarpos</i> spp.) Lilac (<i>Syringa</i> spp.)	Yarrow Lobelia Lupine Daisy Coreopsis Bleeding heart Foxglove Globe-thistle Wild buckwheat Sea-holly Blanket flower Baby's breath Daylily Hosta Iris Poker plant Coneflower Blue-eyed-grass Blue flax Bee balm Catmint Poppy Solomon's-seal Black-eyed Susan Fall sedum California fuchsia
Evergreen Shrubs	
Sagebrush (<i>Artemesia tridentata</i>) Mock-orange (<i>Choisya</i> spp.) Mountain-laurel (<i>Kalmia latifolia</i>) Oregon-grape (<i>Mahonia aquifolium</i>) Oregon-boxwood (<i>Pachystima myrsinites</i>) Mugho pine (<i>Pinus mugo</i>)	
Ground covers	
Kinnickinick (<i>Arctostaphylos uva-ursi</i>) Bunchberry (<i>Cornus canadensis</i>) Cotoneaster (<i>Cotoneaster</i> spp.) Heather (<i>Erica</i> spp.) Sunrose (<i>Helianthemum</i> spp.)	
Bulbs, Corms, and Tubers	Annual Flowers
Crocus (<i>Crocus</i> spp.) Fritillary (<i>Fritillaria</i> spp.) Garden corn-lily (<i>Ixia</i> spp.) Trillium (<i>Trillium</i> spp.)	Ageratum Calendula Bachelor buttons Clarkia Larkspur Cosmos California poppy Geranium Sunflower Sweet alyssum Zinnia Rosemary
Garden Herbs	
Chive (<i>Allium</i> spp.) Hyssop (<i>Hyssopsis officinalis</i>) Garden mint (<i>Mentha</i> spp.) Lavender (<i>Lavandula</i> spp.)	

(Source: Russell Link, *Landscaping for Wildlife in the Pacific Northwest*. Seattle, University of Washington Press, 1999.)

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