ALABAMA A&M AND AUBURN UNIVERSITIES

An Overview and Cost Analysis of Deer Repellents for Homeowners and Landowners

ANR-1370

Forests and natural areas are being converted to urban landscapes as cities continue to expand and grow outward. The exurban landscape of the 21st century can best be described as a patchwork of residential areas and wildlife habitat. More wildlife are residing in these areas and are commonly seen living among people. As a result, some homeowners find that wildlife can be serious pests in landscape settings.

The most common wildlife species considered to be a pest in Alabama landscapes is the white-tailed deer. Deer are considered to be both agricultural and exurban pests because of their large populations and propensity to feed on agricultural and ornamental plants. With 1.8 million white-tailed deer in Alabama, the potential for this species to cause wildlife-human conflicts is tremendous.

Deer Damage

Deer are considered an edge species, which means they adapt well to transitional areas between agricultural land, forests, grasslands, and exurban landscapes. Exurban areas often provide high-quality food sources in gardens, fertilized lawns, and ornamental plantings. Because of hunting restrictions in these areas as well as a general lack of natural predators, deer densities sometimes are greater in exurban areas than rural areas. As deer densities increase in these neighborhoods and competition for food escalates, damage to ornamental plantings increases.

If you find damage to ornamental plants in your landscape, you should first determine if deer are to blame. Deer lack upper incisors but have lower incisors, therefore browsing appears as torn or jagged edges on foliage (figure 1).

Deer must jerk or tear plant tissues, leaving ragged edges where leaves or twigs were removed. Similar browsing animals, such as rabbits, cause damage to ornamentals as well, but they have upper incisors, which leave a smooth, clean cut. Additionally, damage caused by rabbits or other herbivores will only be found within 1 to 2 feet from the ground because of the size of these animals.

Figure 1. Deer damage to Indian hawthorn *(Rhaphiolepis indica)*

Deer also prefer specific portions of different plants. Typically, plants shorter than 3 feet suffer damage to the tops and sides. The most desirable parts of shrubs, fruit trees, and forest seedlings tend to be buds, twig ends, and foliage. In situations where deer regularly browse the same plants, they have a tendency to create a browse line where they have eaten. This browse line often includes destruction of the majority of limbs or foliage within their reach, usually below the height of about 6 feet. This damage, accompanied by deer tracks, is a sign your plants are victims of significant deer browsing. Deer tracks can be recognized by their cloven-hoof shape (figure 2). Other signs of deer presence might include trampled plants, antler rubbing on tree trunks, deer droppings, and deer beds. Bucks use small trees and saplings to polish their antlers, removing the velvet once antler growth is complete (figure 3). Additionally, bucks also make these antler rubs to serve as communication posts among deer during breeding season. Rubs to remove velvet usually occur sometime in September and conclude in late November, and rubs during breeding season will occur from late November through January.

Deer droppings, also called scat (figure 4), can be easily confused with rabbit scat (figure 5). Pellets left behind by deer have pinched-off ends, unlike rabbit pellets, which are rounded. In addition to these signs, small, circular areas in landscape mulch or flattened plant material in an oblong shape, 2 to 5 feet long by 2 to 3 feet wide, is a sign of deer beds.

Figure 2. Deer track

Figure 3. Deer rub on a tree

Management Options

Several control options for deer damage are available. Most nonlethal management techniques are more widely accepted by the public, but lethal methods can be an option in some cases. Several management techniques are listed and discussed below.

Habitat Modification

Humans can manipulate habitats to make them less attractive to deer browse. Often, habitat modifications made to minimize deer presence are rarely practical

Figure 4. Deer scat

Figure 5. Rabbit scat

because deer adapt well to most human-modified environments. However, deer do not adapt well to highly-developed downtown areas or any areas devoid of easily accessible cover. As a result, deer populations decrease as you move toward more urban settings and increase as you move into suburban areas. Because suburban areas with patches of woods are equally attractive to most homeowners and deer, habitat modification usually is not a feasible strategy.

Scare Tactics

Scare tactics are techniques used to scare deer away from a desired area. These frightening devices can range from motion sensing irrigation or lighting to pyrotechnic devices. Motion sensing irrigation or lighting works by sensing animal movement, which automatically sets off the irrigation or lighting. Pyrotechnics (e.g., fireworks, gunfire) or propane cannons can be used to deter deer from farmlands, but are not practical in suburban settings because loud noises have the potential to disturb other residents. Scare tactics are not widely used because deer tend to become accustomed to the sound or disturbance over time.

Exclusions

Exclusion is a more reliable method of controlling deer damage in an area. Fencing is used as a barrier to surround areas where deer are unwelcome. Both electric and barrier fences can be used to exclude deer from an area (figure 6). Consider these important factors when determining if fencing is the best option for a situation: deer pressure in the area and size of the area to be protected. Fencing can be less economical for smaller areas, so most fencing is used as a barrier around large areas or in large management situations.

Deer-resistant Plantings

Deer are considered foragers, but they do have preferences for certain types of plants. Knowing what types of plants are highly palatable to deer can be significant for a homeowner. Frequently, careful selection of plant material in combination with the use of a repellent can help minimize deer damage to suburban landscapes.

Culling

Culling is population reduction through sport hunting. This is not a realistic method of management for suburban areas because laws and regulations usually restrict hunting in populated areas.

Repellents

Of all the options discussed, deer repellents have become the most common deer deterrents for homeowners. Many common types of deer repellents are on the market. When selecting a deer repellent for home use, keep several key factors in mind, including mode of action of the repellent as well as aesthetics of the product, application method, reapplication timing, using the right repellent on the right plant species, cost, and coverage of the product. All of these aspects will be discussed in detail to help you determine the best product for your situation.

Repellents Overview

Repellents work by reducing the palatability and attractiveness of a plant species, making the plant undesirable to the deer. Repellents can be divided into two groupings: direct and indirect repellents. Direct repellents repel through bad taste and often contain a bittering agent. Bittering agents work by sticking to the leaf surface of plants, making your plants taste bad. The major disadvantage to taste repelling products is that the deer must sample the plant to determine that the plant is undesirable, so some damage will occur. In contrast, indirect repellents repel through sight, smell, or sound. Putrescent egg solids are a common ingredient in many deer repellents and tend to use both odor and bad taste for effectiveness. This is an example of a product that is considered both a direct and indirect repellent. Other ingredients, such as dried animal blood, may theoretically signal to deer that a predator is in the vicinity or that an animal has been killed in the area. Because these types of repellents are targeted to deter strictly through smell, they are classified as indirect repellents. Table 1 lists some of the most common commercial deer repellents currently on the market. The second column lists the active ingredients in each product, which can be used to determine if the product will deter directly or indirectly. The active ingredients may also influence choice of product because specific attributes, such as a distinctive and sometimes potent odor during the application process, may be offensive.

Figure 6. Homeowner fence around garden

Mode of Action and Application Method

Table 2 lists the same repellents as above along with the mode of action and application method. Mode of action of the repellents is generally through odor or taste. However, the Deer Stopper Plotsaver Deer Barrier System Kit can be considered a barrier as well as an odor and taste repellent. Application methods are listed in the third column. The application of repellents is most often determined by the form in which the product is marketed. Most products are applied as sprays, which means they come in a liquid form that is either concentrated or ready to use. Concentrated products must be diluted in water to form a solution that will not be harmful to the plants. Some repellents can also be purchased in a ready-to-use form, which means the repellent has already been diluted for convenience. For example, Plantskydd is listed as a soluble powder, a concentrate in powder form; however, this product must still be diluted in water. Deer Scram and Shake-Away are both granular products that are typically applied around borders and serve as a barrier to decrease deer browse. Plant Pro-Tec Probes are release probes that clip on plants and discharge a garlic odor to repel deer.

Reapplication Timing

For a repellent to be effective to its full potential, understanding and following reapplication timing is a key aspect to successfully deterring deer from a desired area. Repellents must be applied and reapplied according to manufacturer guidelines to achieve their full effect. Most people prefer convenience, so a longer reapplication time is often desired, which means that fewer applications are required. Table 3 lists the common deer repellents along with their suggested reapplication timings.

Repellent Labels

When purchasing deer repellents, another key factor to consider for increasing product effectiveness is to determine what brands of repellents are labeled exclusively for different plant groups. Repellents can be applied to various plant species for protection from deer browsing depending on label recommendations. Read each label carefully to identify what types of repellents are safe for your plant species. This is especially important when considering repellents for vegetable crops because all repellents are not labeled for edibles. Table 4 lists the common deer repellents and the plants that each is labeled to protect.

Cost

Deer repellents are often sold in a gallon concentrate form, though some repellents may also be purchased in a ready-to-use form. These ready-to-use forms are often less expensive than the concentrate, but will not cover as large of an area as concentrates. Typically, purchasing concentrated products is more cost effective than purchasing ready-to-use products. However, ready-to-use products are more convenient for the applicator and do not require any advanced preparations. Table 5 lists the common repellents along with their current cost.

Coverage

Coverage is an important issue when dealing with any type of deer repellent. Table 6 lists the maximum area covered by each product. Typically, application areas for homeowners are much smaller than commercial areas. Because a lower quantity is needed for home use, calculations are based upon application of each product to a 100-square-foot area. Table 7 shows the cost of one application per 100 square feet and the cost of reapplying the product according to reapplication timing on each label for a complete year.

From the cost analysis, it is relatively inexpensive to treat a 100-square-foot area with one application of repellent. However, look at the reapplication timing because it can drastically increase the yearly cost, as with Miller Hot Sauce. The most cost effective repellent for yearly application is Deer Out, with a cost of $1 per year for a 100-square-foot area. Other repellents that cost less than $2 for yearly application are Plantskydd and Spotrete F. Other products range from $2.20 for yearly application to $518.18. Keep in mind that the cost of a product is totally independent of the effectiveness of the product.

Other information including the manufacturer name and Web site can be found in table 8 below.

When purchasing deer repellents, consider all of the factors, including mode of action of the repellent, application method, reapplication timing, using the right repellent on the right plant species, cost, and coverage of the product. Another idea is to use a combination of the management techniques listed to prevent deer browse. For example, select ornamental plants that are less frequently browsed by deer and use repellents. Or use fencing to protect larger areas and repellents in smaller areas. Remember to begin management techniques before significant damage takes place. Once deer become accustomed to browsing an area, deterrents become less effective.

Table 1. Active Ingredients in Common Deer Repellents

Repellent name	Active ingredients
Bobbex	garlic oil, acetic acid, cloves, gelletin, fish meal, edible fish oil, onions, eggs
Buck Off	putrescent whole egg solids, potassium sorbate
Deer Off Squirrel, Rabbit, & Deer Repellent	putrescent egg solids, capsaicin and related capsaicinoids, garlic
Deer Out	high peppermint content
Deer Pharm	soybean oil, citric acid, garlic oil
Deer Scram Deer & Rabbit Repellent	blend of selected organic components
Deer Stopper Plotsaver Deer Barrier System Kit	putrescent whole egg solids, rosemary oil, mint oil, sodium chloride, potassium sorbate
Deer Stopper Repellent	putrescent whole egg solids, rosemary oil, mint oil, sodium chloride, potassium sorbate
Deerbusters Brand Deer Repellent	putrescent egg, garlic, hot pepper
Hinder	ammonium soaps of higher fatty acids
Liquid Fence Deer & Rabbit Repellent	putrescent egg solids, garlic, sodium lauryl sulfate, potassium sorbate
Miller Hot Sauce	extremely concentrated hot pepper
No Deer Zone	denatonium benzoate or Benzyldiethyl*
Plant Pro-Tec Repellents	oil of garlic
Plantskydd	dried blood (porcine and/or bovine)
Shake-Away Deer Repellent Granules	garlic oil
Spotrete F	Thiram*
Tree Guard	denatonium benzoate or Benzyldiethyl*

*Indicates a bittering agent

Table 2. Mode of Action and Application Method of Common Deer Repellents

Repellent Name	Mode of action	Application method
Bobbex	odor, taste	spray
Buck Off	taste	spray
Deer Off Squirrel, Rabbit, & Deer Repellent	odor, taste	spray
Deer Out	odor, taste	spray
Deer Pharm	odor	spray
Deer Scram Deer & Rabbit Repellent	odor	granular
Deer Stopper Plotsaver Deer Barrier System Kit	odor, taste, barrier	spray, barrier
Deer Stopper Repellent	odor, taste	spray
Deerbusters Brand Deer Repellent	odor, taste	spray
Hinder	odor	spray
Liquid Fence Deer & Rabbit Repellent	odor	spray
Miller Hot Sauce	odor, taste	spray
No Deer Zone	taste (bittering agent)	spray
Plant Pro-Tec Repellents	odor	garlic odor release probe
Plantskydd	odor	soluble powder concentrate
Shake-Away Deer Repellent Granules	odor, taste, barrier	deer repellent granules
Spotrete F	taste (bittering agent)	spray
Tree Guard	taste (bittering agent)	spray

Table 3. Reapplication Timing of Common Deer Repellents

Repellent name	Reapplication
Bobbex	reapply every 2 months
Buck Off	reapply monthly
Deer Off Squirrel, Rabbit, & Deer Repellent	reapply every 2 to 3 months
Deer Out	reapply every 3 to 4 months
Deer Pharm	spray as needed
Deer Scram Deer & Rabbit Repellent	reapply monthly
Deer Stopper Plotsaver Deer Barrier System Kit	one package protects 3 months
Deer Stopper Repellent	reapply monthly
Deerbusters Brand Deer Repellent	reapply every 3 to 4 months
Hinder	reapply monthly depending on rainfall
Liquid Fence Deer & Rabbit Repellent	reapply 1 week later and then monthly
Miller Hot Sauce	apply every 2 to 3 weeks
No Deer Zone	reapply every 3 to 4 months
Plant Pro-Tec Repellents	reapply every 6 to 8 months
Plantskydd	reapply every 3 to 6 months
Shake-Away Deer Repellent Granules	reapply twice monthly
Spotrete F	reapply every 1 to 3 months
Tree Guard	reapply every 4 months

Table 4. Label Recommendations of Common Deer Repellents

Repellent name	Labeled for
Bobbex	ornamental/flowering shrubs
Buck Off	flowers, bulbs, nonbearing food crops, hedges, shrubs, and trees
Deer Off Squirrel, Rabbit, & Deer Repellent	edible crops, flowers, grass, bulbs, shrubs, seedlings, and trees
Deer Out	flowers, shrubs, vegetable plants, row crops, trees, and vines
Deer Pharm	plants, fruits, berries, edibles, and herbs
Deer Scram Deer & Rabbit Repellent	ornamental plants
Deer Stopper Plotsaver Deer Barrier System Kit	shrubs, flowers, edible crops, forest, and fruit trees
Deer Stopper Repellent	shrubs, flowers, edible crops, forest, and fruit trees
Deerbusters Brand Deer Repellent	ornamental plants and vegetable gardens
Hinder	flowers, trees, shrubs, crops, and food crops
Liquid Fence Deer & Rabbit Repellent	landscaped garden areas, flowers, shrubs, trees, and vines
Miller Hot Sauce	ornamental plants
No Deer Zone	deciduous, nonbearing fruit trees, conifers, shrubs, flowers, and ornamentals
Plant Pro-Tec Repellents	trees, shrubs, and flowers
Plantskydd	broadleaf plants, row crops, conifers, and deciduous trees
Shake-Away Deer Repellent Granules	small gardens, flower beds, and yards
Spotrete F	deciduous and evergreen trees, shrubs, and nonbearing vines and orchards
Tree Guard	deciduous, nonbearing fruit trees, conifers, shrubs, flowers, and ornamentals

Table 5. Cost of Common Deer Repellents

Repellent name	Cost (as of January 2010)
Bobbex	$97.98 per gallon concentrate
Buck Off	$87.50 per gallon concentrate
Deer Off Squirrel, Rabbit, & Deer Repellent	$146.04 per gallon concentrate
Deer Out	$99.00 per gallon concentrate
Deer Pharm	$95.00 per gallon concentrate
Deer Scram Deer & Rabbit Repellent	$18.95 per 2.5 pound container
Deer Stopper Plotsaver Deer Barrier System Kit	$49.95 per kit
Deer Stopper Repellent	$124.95 per gallon concentrate
Deerbusters Brand Deer Repellent	$165.95 per gallon concentrate
Hinder	$37.99 per gallon concentrate
Liquid Fence Deer & Rabbit Repellent	$124.99 per gallon concentrate
Miller Hot Sauce	$289.00 per gallon concentrate
No Deer Zone	$29.95 per 1 gallon ready-to-use
Plant Pro-Tec Repellents	$35.10 per 50 unit bag
Plantskydd	$24.95 per pound soluble powder concentrate
Shake-Away Deer Repellent Granules	$14.95 per 20 oz. container
Spotrete F	$39.00 per gallon concentrate
Tree Guard	$47.95 per gallon ready-to-use

Table 6. Coverage of Common Deer Repellents

Repellent name	Area covered
Bobbex	1 gallon concentrate protects 3,000–4,000 sq. ft.
Buck Off	1 gallon concentrate protects 8,000 sq. ft.
Deer Off Squirrel, Rabbit, & Deer Repellent	1 gallon concentrate protects 16,000 sq. ft.
Deer Out	1 gallon concentrate protects 40,000 sq. ft.
Deer Pharm	1 gallon concentrate protects 4,000 plants* or 100,000 sq. ft.
Deer Scram Deer & Rabbit Repellent	2.5 pounds protects 1,600 sq. ft.
Deer Stopper Plotsaver Deer Barrier System Kit	1 kit protects 5,000 sq. ft.
Deer Stopper Repellent	1 gallon concentrate protects 40,000 sq. ft.
Deerbusters Brand Deer Repellent	1 gallon concentrate protects 1,200–1,600 plants* or 30,000–40,000 sq. ft.
Hinder	1 gallon concentrate protects 4,400 sq. ft.
Liquid Fence Deer & Rabbit Repellent	1 gallon concentrate protects 32,000 sq. ft.
Miller Hot Sauce	1 gallon concentrate protects 1,450 sq. ft.
No Deer Zone	1 gallon ready-to-use protects 20 medium shrubs* or 500 sq. ft.
Plant Pro-Tec Repellents	3–4 units per plant* or 200 sq. ft. per 50 unit bag
Plantskydd	1 pound powder protects 200–300 plants* or 7,200–10,800 sq. ft.
Shake-Away Deer Repellent Granules	20 oz. container covers 600 linear ft.**
Spotrete F	1 gallon protects 1 acre or 43,560 sq. ft.
Tree Guard	1 gallon ready-to-use protects 1,000 sq. ft.

*Plants were assumed to be a medium size of 5 feet by 5 feet and consume 25 square feet of space.

**This granular repellent outlines the area to protect, therefore is measured in linear feet rather than square feet.

Table 7. Cost Analysis of Common Commercial Deer Repellents

Repellent Name	Cost/100 sq. ft. area	Cost/100 sq. ft. area/year
Bobbex	$3.27/ 100 sq. ft.	$19.62/ 100 sq. ft.
Buck Off	$1.09/ 100 sq. ft.	$13.08/ 100 sq. ft.
Deer Off Squirrel, Rabbit, & Deer Repellent	$0.91/ 100 sq. ft.	$5.46/ 100 sq. ft.
Deer Out	$0.25/ 100 sq. ft.	$1.00/ 100 sq. ft.
Deer Pharm	$0.09/ 100 sq. ft.	$2.16/ 100 sq. ft. **
Deer Scram Deer & Rabbit Repellent	$1.18/ 100 sq. ft.	$14.16/ 100 sq. ft.
Deer Stopper Plotsaver Deer Barrier System Kit	$1.00/ 100 sq. ft.	$4.00 / 100 sq. ft.
Deer Stopper Repellent	$0.31/ 100 sq. ft.	$3.72/ 100 sq. ft.
Deerbusters Brand Deer Repellent	$0.55/ 100 sq. ft.	$2.20/ 100 sq. ft.
Hinder	$0.86/ 100 sq. ft.	$10.32/ 100 sq. ft.
Liquid Fence Deer & Rabbit Repellent	$0.39/ 100 sq. ft.	$5.07/ 100 sq. ft.
Miller Hot Sauce	$19.93/ 100 sq. ft.	$518.18/ 100 sq. ft.
No Deer Zone*	$5.99/ 100 sq. ft.	$23.96/ 100 sq. ft.
Plant Pro-Tec Repellents	$17.55/ 100 sq. ft.	$35.10/ 100 sq. ft.
Plantskydd	$0.35/ 100 sq. ft.	$1.40/ 100 sq. ft.
Shake-Away Deer Repellent Granules	$2.49/ linear ft.	$59.76/ linear ft.
Spotrete F	$0.09/ 100 sq. ft.	$1.07/ 100 sq. ft.
Tree Guard*	$4.80/ 100 sq. ft.	$14.40/ 100 sq. ft.

*Indicates ready-to-use products
**Calculated for reapplication every 2 weeks

Table 8. Manufacturer Names and Web sites

Repellent name	Manufacturer
Bobbex	Bobbex, Inc., *www.bobbex.com*
Buck Off	Cleary Chemical Corporation, *www.clearychemical.com*
Deer Off Squirrel, Rabbit, & Deer Repellent	Woodstream Cooperation, *www.havahart.com*
Deer Out	Deer Out, *www.deerout.com*
Deer Pharm	Pharm Solutions, *www.organicpharmsolutions.com*
Deer Scram Deer & Rabbit Repellent	Deer Scram, *www.deerscram.com*
Deer Stopper Plotsaver Deer Barrier System Kit	Messina Wildlife Management, *www.messinawildlife.com*
Deer Stopper Repellent	Messina Wildlife Management, *www.messinawildlife.com*
Deerbusters Brand Deer Repellent	Trident Enterprises International Inc., *www.deerbusters.com*
Hinder	Pace International, *www.paceint.com*
Liquid Fence Deer & Rabbit Repellent	Liquid Fence Co., Inc., *www.liquidfence.com*
Miller Hot Sauce	Miller Chemical & Fertilizer Corporation, *www.millerchemical.com*
No Deer Zone	Monterey Lawn and Garden Products, Inc., *www.montereylawngarden.com*
Plant Pro-Tec Repellents	Plant Pro-Tec, LLC, *www.plantprotec.com*
Plantskydd	Tree World, Inc., *www.shakeawayproducts.com*
Shake-Away Deer Repellent Granules	Shake Away, *www.shakeawayproducts.com*
Spotrete F	Cleary Chemical Corporation, *www.clearychemical.com*
Tree Guard	Becker Underwood Inc., *www.treeguard-deer.com*

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