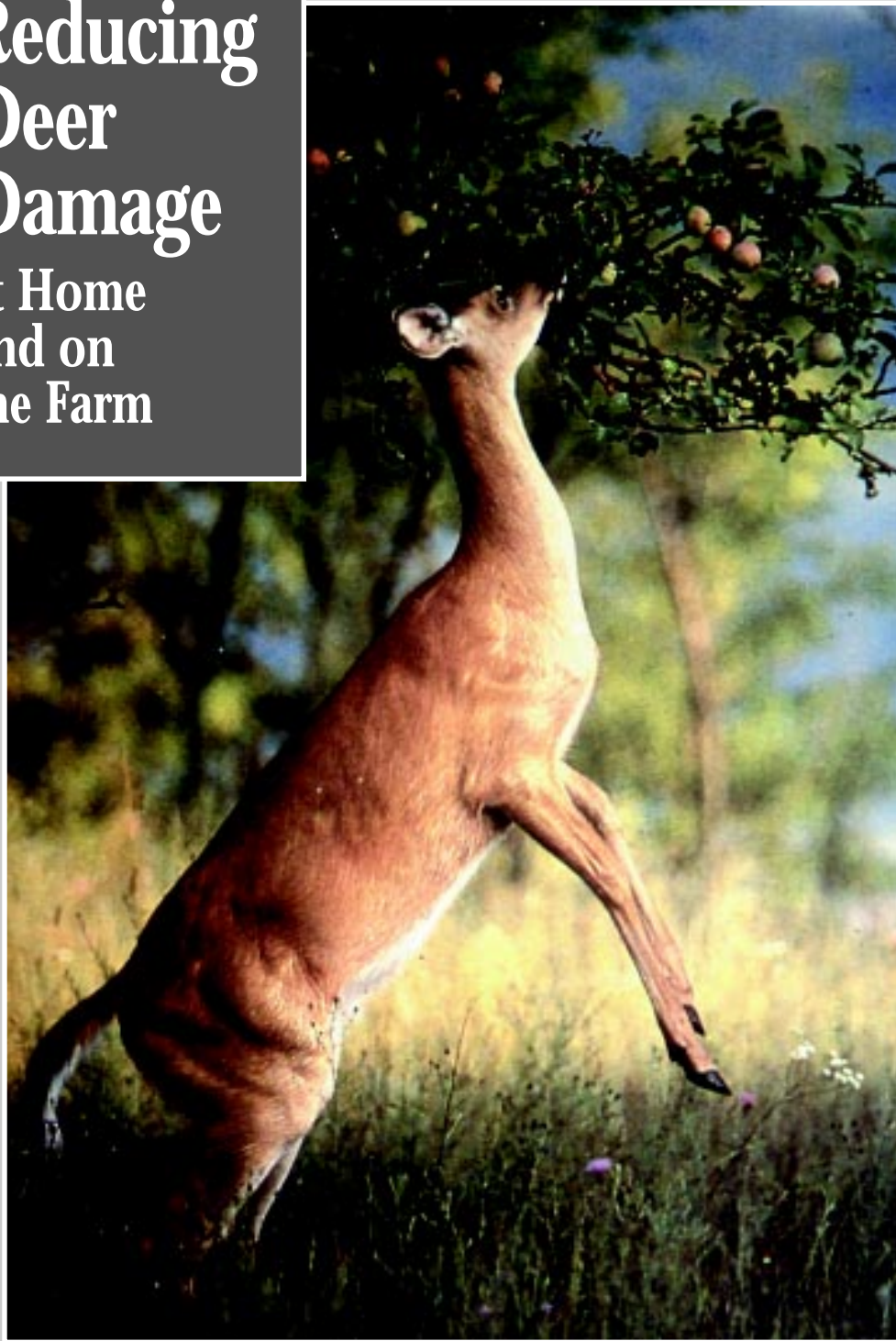


AFW 6
May 1996

**Reducing
Deer
Damage
at Home
and on
the Farm**



CLEMSON
E X T E N S I O N

Reducing Deer Damage at Home and on the Farm

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Cooperation with Clemson University Extension
IPM Program

I. INTRODUCTION

The white-tailed deer is one of the most adaptable, widely distributed, best-loved, and most pursued game by hunters. No other game species is so well known in South Carolina. In fact, the white-tailed deer is the official state animal. It can make its home in nearly any setting from rural to suburban within sight and sound of human activity. With its remarkable ability to adapt, the white-tailed deer has increased its interaction with humans, bringing about a love-hate relationship. Fortunately, unlike other pest species implicated in damage, deer possess a positive economic value. The white-tailed deer contributes both directly and indirectly to the state economy.

Today we recognize many values associated with wildlife — recreation, economics, and aesthetics just to name a few. Statewide, wildlife-oriented recreation contributes more than \$800 million a year to South Carolina. The hunting of deer alone contributes an estimated \$125 to 200 million of this amount to the state. Much of this money comes from hunting on private land which contributes millions of dollars to rural communities in South Carolina. A study conducted by Clemson University in two rural counties, Jasper and McCormick, revealed annual revenue totaling more than \$15 million was generated by hunting primarily deer on

private lands. This revenue represented a significant boost to counties which do not have large industrial capital. In McCormick and Jasper counties alone, more than \$7 million was contributed directly to local community businesses. This study also demonstrated lease fee hunting opportunities can provide landowners with additional cash flow. In addition, money from the sale of special deer harvest permits (antlerless tags etc.) helps support research on the white-tailed deer and habitat conservation for many non-game species as well.

Many people are fond of the white-tailed deer, although their popularity and presence do not come without problems. Most of these problems are a result of deer overpopulation. Many people fail to realize that overpopulation can occur when deer



numbers are NOT extremely high. If there are more deer than available food, the herd is overpopulated.

In South Carolina, the white-tailed deer population is around 750,000 to one million. Deer/auto collisions on the state's highways have increased from 3,000 reports in 1990 to around 4,800 reports in 1994 as reported to the South Carolina Department of Transportation. Many more collisions and near misses go unreported. The number of deer/vehicle collisions is a result of many factors which include, but are not limited to, deer density, miles of highways, vehicle traffic, and roadside management. For now, wildlife biologists and highway department officials can only advise motorists to practice extra vigilance and caution, particularly when driving at dusk and dawn in rural areas known for high deer density or activity, such as on roadways bisecting forests and farmlands.

Habitat deterioration is another result of overpopulation. Preferred food plants are overutilized and sometimes eliminated by excessive browsing pressure. The ability of an area to support a healthy deer herd can be severely damaged, requiring many years for the habitat to recover. When habitats become damaged, other wildlife species suffer as well. Once the habitats are over browsed, pressure to find alternative food sources increases dramatically.

Deer are fond of a variety of agricultural crops including both grains and vegetables. The depredation on commercial agricultural crops is often extensive and severe, especially to agricultural crops adjacent to dense deer populations. Agonomic crops like corn, soybeans, cotton, and tobacco are important to the rural economics of many

South Carolina counties. The value of these crops to farmers is tremendous. One study done by Clemson University and the Department of Natural Resources, commonly referred to as the Smathers & Stratton Survey, estimated deer damage to South Carolina crops to be \$52.4 million in 1992 alone. However, damage to nurseries, orchards, and home landscapes, is also important. Orchard losses are usually greatest to small trees since they often have to be replaced several times because of severe browsing. Another type of damage often overlooked is the damage to planted trees on forest land. Reforestation efforts can be hampered when deer feed on young seedlings. These losses are costly and preventing damage can be time consuming.

It is apparent that managing white-tailed deer to maintain a balance that meets everyone's objectives while maintaining healthy herds cannot be done without forethought.

The challenge of reducing deer damage involves numerous biological and ethical considerations. At present, damage control methods are primarily built around effective deer herd management. But not everyone feels deer herds should be effectively managed or manipulated. Many people are happy to have the deer around their homes and gardens and believe that deer should be allowed to range freely under nature's control. The coastal isles of South Carolina for example, with the influx of retirees and vacationers, have experienced rapid encroachment into nearly pristine areas. Urban and golf course development has pushed the white-tailed deer into suburban areas in search of food. Many deer become pets as some homeowners feed them.

II. DEER FEEDING HABITS AND FOOD REQUIREMENTS

While deer are known to eat many different kinds of plants, they generally prefer to forage or browse on high protein plants and plant parts. Plants, especially legumes such as soybeans, that have been fertilized are eaten because of the high protein and mineral content. This fact, along with easy availability to deer, makes these agronomic crops especially enticing. As long as a variety of foods are plentiful and available in their natural habitat, deer seldom are a problem. However, when natural, preferred foods become scarce, there are relatively few plant species that deer will not eat.

In South Carolina, the most intense damage to crops, home gardens, and landscapes occurs following a very dry spring and summer season. Without adequate rainfall, tender, succulent new plant growth is limited. This causes deer to seek alternative food sources. However, in areas where whitetails traditionally are not hunted, such as parks, residential communities, golf courses, airports, and other open spaces in urban/suburban settings, the deer can become a serious nuisance year-round when unregulated population growth results in extensive feeding pressure on plantings as well as native vegetation. Deer feed most actively in early morning and evening. Deer develop predictable travel patterns, and prior damage is often a good indicator of potential future problems.

As a general rule, deer consume about 3% of their body weight in forage each day. This may seem like a small amount, but when you take into consideration that this amount is taken as tender shoots, young emerging seedlings, buds, and leaves,

the effect can be quite devastating to both farmers and homeowners experiencing deer damage.

III. DAMAGE AND DAMAGE IDENTIFICATION

Deer damage is recognized by a jagged or torn appearance on stems and twigs of browsed vegetation. This is because the white-tailed deer lacks upper incisors. Rabbits and other rodents will leave a clean cut surface. The height of damage from the ground up can be nearly six feet high. This is called the browse line. In addition, the deer track is almost unmistakable.

IV. DEER DAMAGE CONTROL OPTIONS

Damage control options include:

- A. living with the damage
- B. habitat modification
- C. herd management
- D. scare tactics
- E. repellents
- F. physical barriers

A. Living with Damage

Many homeowners have simply adjusted to living with the damage and have learned what not to plant in their yards. Many farmers are also learning to tolerate a certain level of deer damage in exchange for having deer on their property. However, most people who are experiencing heavy damage are seeking ways to effectively reduce at least part of the damage on their property.

B. Habitat Modification

Damage to ornamental plants can be minimized by selecting landscape and garden plants that are

less preferred by deer. In many cases, original landscape objectives can be met by planting species that have some resistance to deer damage. Included in this brochure in the Appendix is a list of plants indigenous to South Carolina. Keep in mind that none of these plant species are guaranteed to be avoided by deer.



For crops, it is best to harvest as early as possible to reduce the period of vulnerability to deer. Research at Clemson University has shown that time of damage during plant growth can affect a crop yield. For example, with crops such as soybeans, growth stages from the emerging seedling to pod production are desirable to deer; however, soybeans can recover from some early-season browsing as long as some leaf nodes remain on the plants. New growth will occur from shoot buds at these nodes. Please note that soybean plants will be killed and stands will be lost if early-season browsing removes the whole plant shoot below the first node. Damage after pod formation is irreversible and results in large yield losses. Therefore, incorporating repellents and/or fences during critical periods can lessen damage. Agronomists at Clemson University are conducting research to identify varieties and cultural practices to reduce crop losses from deer. Many new varieties which are disease and pest resistant sometimes appear less palatable to deer and are now appearing on the market. Varieties such as Crockett, Lamar, and an insect resistant breeding line variety may provide some relief from severe crop loss *only* if an alternative food source is present. Check with your local county Extension office or seed supply store for further information on these varieties, but keep in mind, that no deer resistant varieties now exist.

Weeds also reduce soybean yields by competing for soil nutrients, water and sunlight. Deer influence weed growth because they keep soybean plants cropped back which allows weeds to grow taller and faster. Weeds grow taller if not shaded by healthy soybeans and can cause substantial crop loss. Timely weed control is very important in fields where deer feed. Timing the crop planting to coincide with planting by other farmers in the area, will help spread out damage, lessening the severity to particular areas. Also, plant susceptible crops as far from wooded areas as feasible. Lure crops that have been planted to attract deer to another area have met with varying success. Most important, drilling of soybeans in areas with potential for light to moderate deer damage is suggested because a drilled stand can recover from random browsing better than a damaged crop planted in wide rows.

C. Herd Management

The most widely used damage control option is herd management which includes controlled harvesting; trapping and relocation (live removal); and biological control. Many landowners attempting to reduce deer damage find herd management using controlled harvesting along with scare devices, repellents, fencing, or a combination of these options to be most effective.

Proper deer herd management includes producing an adequate number of healthy deer by maintaining deer herds below the carrying capacity of the land. Carrying capacity is defined as the maximum number of animals a habitat can sustain in a healthy condition. South Carolina must manage its deer herd

to satisfy many interest groups. Most people agree it is easier to prevent an overpopulation of deer than to remedy situations after it occurs.

Biological control is a relatively new approach. This control method involves delivering immunocontraceptives to female deer. Many experimental pen-deer studies have been successful in preventing reproduction but it is not likely to become available as a field-applicable contraception for years. Therefore, under herd management, harvesting is the most practical way to remove deer.

Hunting Seasons & Shooting Permits

Effective use of the legal deer hunting seasons is probably the most common way to control deer populations. In parts of South Carolina, this season is the longest in the nation, with low-country seasons lasting four and a half months. By allowing hunting, landowners can provide public access while at the same time reducing deer damage problems.

In South Carolina, most biologists agree that the real key to controlling a crop depredation is controlling deer population numbers. The first step a landowner should take is to decide upon a management objective for their property. Biologists with the South Carolina Department of Natural Resources can help determine this. Unfortunately, because of the daily and seasonal movements of deer, only rarely does a single landowner control all the land a deer uses. At the present, existing attempts to control whitetail numbers on particularly hard hit farmlands consists of scare tactics and shoot-to-kill (depredation) permits issued to farmers.

The issuance of depredation permits has increased dramatically during the past few years, and trends show a continued increase in requests from farmers. However, these permits represent a stop-gap approach, at best. In many cases, the removals of a few deer have little, if any, impact upon the crop damage. This was also demonstrated in the Smathers and Stratton Survey. A more reasonable approach is the removal of substantial numbers of doe deer from large contiguous tracts of land during the deer season. One possible solution to this problem is to establish a cooperative community approach to deer herd management.

Community Approach to Reducing Damage

The community approach involves managing large units or blocks of adjacent land, usually greater than 2000 acres, as opposed to managing individual lands separately. Community-based management operates on the premise that providing relief for farmers through the reduction of herd density will provide quality deer for the hunter at the same time.

The responsibility for maintaining healthy deer herds on farmland does not rest solely with the farmer. Affected stakeholders must find ways to make deer herd management biologically sound, economically feasible for the farmer, and in compliance with the management objectives of a majority of landowners. Hunters have a responsibility to the resource, landowners, and the community to harvest adequate numbers of deer. This may mean changing from a recreational mode of hunting to a management mode. The community approach addresses this responsibility.

By initiating a community-wide effort, landowners can increase deer herd health and quality while at the same time helping to reduce deer damage problems. Deer numbers can be effectively reduced on a large enough area to result in a reduction in deer damage.

The landowner/manager's greatest obstacle is managing hunters. Historically, deer hunters have focused their attentions on buck harvests. This results in overpopulation, and badly skewed sex ratios. With yearling harvest rates high, very few bucks live long enough to reach their biological potential and obtain quality status. Access control, dedication to strict harvest quotas, and time are required to reduce deer herds and start producing quality animals.

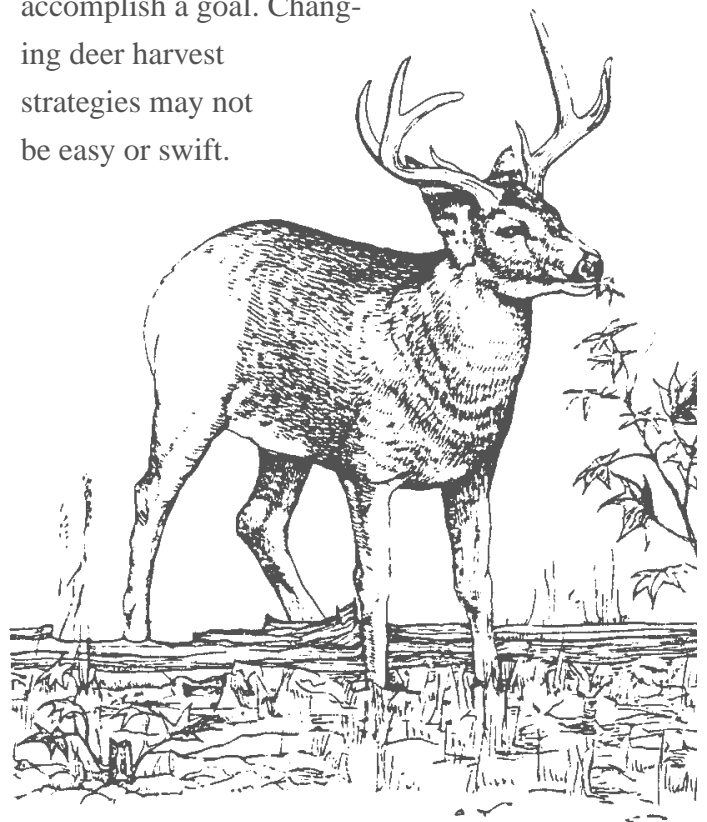
For community deer herd management to be effective in high deer density areas, the "buck only" mind-set must be abandoned and more liberal approaches to deer harvests initiated. No longer can hunters continue to only harvest bucks because total herd management cannot be achieved this way. Landowners and managers must instill in hunters the importance of controlling deer numbers while maintaining quality within the deer herd. Meanwhile hunters must help the neighboring farmer with crop depredation, and the community with reduced deer-vehicle accidents.

Increasing doe harvests will ultimately prove effective in reducing herd densities and changing the buck/doe ratio while producing the type of quality deer and hunting experience a growing number of sportsmen demand. When the relationships between density and habitat resources are proper, deer herd sex ratios, age structure, and

quality will follow. Similarly, with the proper herd-habitat relationship, conflicts between humans and deer can be minimized.

Landowners interested in organizing a community-based deer harvest management effort should contact their neighbors to discuss the idea. If you do not know your neighbor, contact your local Consolidated Farm Services Agency or tax assessor's office to obtain names and boundary lines. Enlisting wildlife professionals such as the Department of Natural Resources, USDA-Animal Damage Control, Clemson Extension, and deer management groups like the Quality Deer Management Association can be helpful in obtaining sources of information to accomplish community deer harvest goals.

By participating in a community-based deer management effort, landowners establish a community bond that develops by working as a team to accomplish a goal. Changing deer harvest strategies may not be easy or swift.



Encouraging hunters to take more does will be challenging, but a necessary initial change to ensure quality deer herds and fewer deer problems for the future.

No matter which hunting approach you decide to take, whether it is a community effort or an individual plan, landowners who want to control deer damage must allow a heavy harvest of female deer. Where landowners have the opportunity to allow hunting on their properties, the recruitment of safe, dependable, and capable hunters is essential. Insist that hunters harvest antlerless deer where doe tags are issued. Also, minimize last minute scouting for deer signs. Deer quickly recognize sounds of humans in the woods and fields. Remember to keep productive stands filled. Some stands are better than others year after year. Utilize these stands.

Live Removal

In some states, deer may be captured alive in urban areas such as cities, parks, and neighborhoods and moved to more rural areas. This option is not readily practiced in South Carolina. Trained professionals use rocket nets, drop-door box traps, or tranquilizer guns. These techniques are not practical because they are expensive and time-consuming. Occasionally, a trained person from the local animal control facility may assist in the removal of a problem animal using the tranquilizer gun without a cost. However, this usually requires assistance from an available state wildlife employee in relocating the deer to a suitable area for release. Live trapping is not a viable long term solution to deer problems. Studies have shown low survival in live removal and relocation of deer. In addition, relocation sites

are not always available. Special permits may also be necessary.

D. Scare Tactics

Noisemaking and visual scare devices like sirens, lights, and exploders are not recommended for the home landscape and garden because of the disturbance to neighbors and possible suburban ordinances. However, the use of dogs as a frightening agent may provide a solution. A dog of sufficient size and temperament may be kept on a leash outside or contained with an underground fencing system. This system is actually a buried electric fence which relays an electrical current of a chosen intensity to a special collar on the dog. The dog will sense this current as it approaches the buried wire. Such an invisible fence has great utility in keeping the dog in specified areas, which can frighten the deer. At this time a specific breed of dog for this purpose is not known, but some studies suggest herding breeds such as Border Collies are very effective. The average cost for an invisible fence is around \$300.00.

Scare tactics for the farm or nursery are effective only if spaced sufficiently throughout the damage prone area. They must be installed as quickly as possible after first damage signs occur to be most effective.

Gas exploders set to detonate at regular intervals are most commonly used. They may cost \$200-\$500 from commercial sources or they may be borrowed from wildlife agencies if available. To maximize the effectiveness of exploders, move them every few days and stagger the firing sequence. If not, the deer will soon become accustomed to the regular pattern. By raising the explod-

ers off the ground, you can increase the noise level. Gas exploders are usually effective only for a few weeks as temporary control. A motion activated light and a firing mechanism may help to increase the effectiveness of exploders.

Products such as Deer Gard Super ADC® repels deer by using a recording of a pack of barking dogs on microchips. The barking is broadcast at random to four separate speakers creating the illusion dogs are running throughout the area. It is claimed to protect up to 10 acres, and is currently in field trials. The unit and accompanying speakers cost around \$500.00.

Fireworks and gunfire can provide some temporary control as well. This method is a relatively inexpensive way to minimize deer damage. Another scare tactic is to patrol farm perimeters and field roads at dusk and dawn. Deer activity is usually at the highest levels at these times of the day.

E. Repellents

Repellents can be useful in reducing deer damage especially when combined with other deer damage abatement techniques. No repellent will totally eliminate damage. Repellents are best suited for small orchards, gardens, and ornamentals. Commercial applications can be very costly over a large area, and are variable on specific use and effectiveness. This makes them impractical for farm/row crop use.

Repellents that are either applied directly to the plants and affect the deer by taste are called a contact repellent. Some others are applied near the plants and repel the deer by odor. These are called area repellents. Contact repellents are most effective on trees and shrubs during their dormancy. Most should not be applied to plants designed for human

consumption. Apply contact repellents during good weather when temperatures are above freezing. Treat to a height of six feet. Remember that all new growth after application will be unprotected. When using a commercial preparation, always follow the manufacturer's instructions. The following discusses common commercial and home-remedy repellents and is provided as a survey and not an endorsement. It is meant to show the wide range of formulations available.

Big Game Repellent - Deer Away® (37% putrescent egg solids)

This contact (odor/taste) repellent has been used extensively in western conifer plantations and is reported to be 85 to 100 percent effective in field studies. It is registered for use on fruit trees prior to flowering, ornamentals, and Christmas trees. Apply it to all susceptible new growth and leaders. Applications weather well and are effective for two to six months. One gallon of liquid or one pound of powder costs around \$32.00 and covers four hundred 3-inch saplings or seventy-five 4-foot evergreen shrubs.

Hinder® (Ammonium soaps of higher fatty acids)

This area repellent is one of the few which is registered for the use on edible crops. You can apply it directly to vegetable and field crops, forages, ornamentals, and fruit trees. Its effectiveness is usually limited to two to four weeks but varies due to weather and application technique. Re-application may be necessary after heavy rains. For fields less than 30 acres, you can treat the entire field; for fields greater than 30 acres, apply an 8- to a 15-foot strip around the perimeter of the field. Apply at temperatures above freezing. Four gallons of liquid

costs around \$80.00 dollars and when mixed with 100 gallons of water will cover 1 acre. Hinder® is compatible for use with most pesticides.

Thiram (7 - 42% tetramethylthiuram disulfide)

Thiram, a fungicide which acts as a contact (taste) deer repellent, is sold under several trade names including Bonide Rabbit-Deer Repellent®, Nott's Chew-Nott®, Gustafson 42-S®, and Wilbur-Ellis Scram 42-S® among others. It is most often used on dormant trees and shrubs. A liquid formation is sprayed or painted on individual trees. Although thiram itself does not weather well, adhesives such as Latex 202-A® or Vapor Gard® can be added to the mixture to increase its resistance to weathering. Thiram-based repellents also protect trees against rabbit and mouse damage. Two gallons of 42% thiram costs around \$50.00 and when mixed with 100 gallons of water will cover one acre. Cost will vary depending upon the concentration of thiram.

Miller's Hot Sauce® Animal Repellent (2.5% capsaicin)

This contact (taste) repellent is registered for use on ornamental, Christmas, and fruit trees. Apply it with a backpack or trigger sprayer to all susceptible new growth, such as leaders and young leaves. Do not apply to fruit-bearing plants after fruit set. Vegetable crops also can be protected if they are sprayed prior to the development of edible parts. Weatherability can be improved by adding an anti-transparent such as Wilt-Pruf® or Vapor Gard®. Hot Sauce® and Vapor Gard® will cost about \$80 and \$30 per gallon respectively. Eight ounces of Hot Sauce® and 2 quarts of anti-transparent mixed with 100 gallons of water will cover 1 acre of trees.

Tankage (putrefied meat scraps)

Tankage is a slaughterhouse by-product traditionally used as a deer repellent in orchards. It repels deer by smell, which is readily apparent. To prepare containers for tankage, remove the tops from aluminum cans, puncture the sides in the middle of the cans to allow for drainage and attach the cans to ends of 4-foot stakes. Drive the stakes into the ground, 1 foot from every tree you want to protect or at 6-foot intervals around the perimeter of a block. Place one cup of tankage in each can. You can use cloth bags instead of cans. You may have to replace the containers periodically because foxes or other animals sometimes pull them down. A 50-pound bag costs around \$20 and is enough to make 300 cans/bags. This amount will cover 2 acres. Tankage may also be bought by the ton.

Ro-pel® (benzyl diethyl [(2,6 xylylcarbomoyl) methyl] ammonium saccharide (0.065%) thymol (0.035%))

Ro-pel® repels deer with its extremely bitter taste. Apply Ro-pel® once each year to new growth. It is not recommended for use on edible crops. Spray at full strength on nursery and Christmas trees, ornaments, and flowers. One gallon costs around \$50 and covers about 1 acre of 8- to 10-foot trees.

Plant Pro-Tec® (10% oil of garlic and 3% chili pepper)

This odor/taste repellent in clip-on, color coded, cone-shaped units looks similar to an ink pen. It is used primarily on forest and orchard seedlings and trees as well as on grapes and roses. Units can be clipped on to plants or placed in the ground next to plant. A garlic odor is released when the barrier on

the unit is punctured. This repellent works on a per plant basis or it can be spread out every 4 to 6 feet to protect an area. It should last for a complete growing season. Plant Pro-Tec® also repels rabbits.

Hair Bags (Human Hair)

Human hair is an area (odor) repellent that costs very little but has not consistently repelled deer. Place two handfuls of hair in fine-mesh bags (nylon stockings, onion bags). Where severe damage occurs, hang hair bags on the outer branches of individual trees with no more than 3 feet between individual bags. For larger areas, hang several bags, 3 feet apart, from a fence or rope around the perimeter of the area to be protected. Attach the bags early in spring and replace them monthly through the growing season. You can get hair at local barber shops or salons.

Bar Soap

Numerous testimonials have suggested that bars of soap applied like hair bags can reduce deer damage. Drill a hole in each bar and suspend with string. Each bar appears to protect a radius of 3 to 6 feet. Most any brand of bar soap will work. Some studies show Irish Spring®, Coast®, and other highly scented brands are most effective.

Toxicants

At present, there are no toxicants registered for deer control. Poisoning deer is illegal.

Other Remedies

A wide variety of home remedies have been used with mixed success. These include blood meal, feather meal, cat feces, moth balls, creosote, bottled ammonia, urine, and rotten eggs.

F. PHYSICAL BARRIERS

Scare devices, repellents, and shooting all have a place in deer damage control. Effective control for fields, orchards, and other large areas will usually depend on excluding the deer with one or a combination of several types of fences. Some fencing designs are available to meet specific needs. Attractive fences for suburban areas are possible. Temporary electrified fences are simple, inexpensive, and are useful in protecting garden and field crops. Deer are attracted to these fences by their appearance or smell, and are lured into making contact with their noses. This causes an effective shock which trains them to avoid the fenced area.

There are several types of fence chargers on the market today. High-quality fence chargers are recommended. Chargers must be approved by the Underwriters Laboratories (UL). Recommendations of 110-volt chargers are suggested. Six and twelve volt chargers require battery recharging every 2 to 4 weeks. Use solar panels in remote areas to charge batteries continuously. For high-tensile fences, use high-voltage, low impedance chargers only (3000 to 5000 volts and current pulse duration of at most 1/1000 second).

Permanent, high-tensile, electric fences provide year-round protection from deer and are best suited to high-valued specialty or orchard crops and the home landscape. The electric shocking power and unique fence designs present both psychological and physical barriers to deer. Incorporating an electric fence to the home landscape can be done so that it is both effective and aesthetically appealing. By installing the electric fence with five horizontal wires spaced 8 inches apart, and constructing wooden garden structures throughout, the home

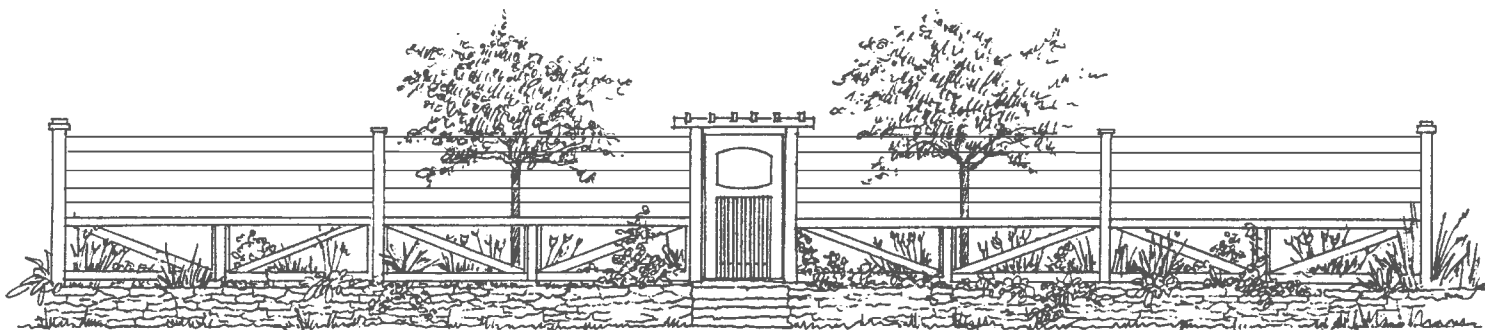


Figure 1. An attractive fence for a home landscape.

Illustration by Carol A. Moyles

landscape can maintain its eye-appeal to the homeowner and neighbor. See Figure 1.

Permanent woven-wire fences provide the ultimate deer barrier. They require little maintenance but are very expensive to build. Fencing in general is expensive. You should consider several points before constructing a fence:

1. Historical review. Study field histories, deer numbers, and movements to help you decide on an abatement method.
2. Deer pressure. This reflects both the number of deer and the level of their dependence on agricultural crops and home landscapes. If deer pressure is high in your area, you probably need fences.
3. Plant value. Crops, plants, and orchards of high value may need the protection fencing can provide to them.
4. Field size. In general, fencing is less practical for areas of 40 acres or less. However, the cost per acre for fencing decreases as acreage increases.
5. Cost-benefit analysis. To determine the cost effectiveness of fencing and the type of fence to install, weigh the value of the plants/crops to be protected against the acreage involved, the cost of materials, construction and possible high cost of maintenance as well as the life expectancy of the fence.

Temporary Electric Fencing

Temporary electric fences provide inexpensive protection for many crops. They are easy to con-

struct, do not require rigid corners, and use readily available materials. Install fences at the first sign of damage to prevent deer from establishing feeding patterns in your crops. Such fences require weekly inspection and maintenance.

Peanut Butter Fence

The peanut butter fence is effective for moderately-sized truck gardens, nurseries, orchards, and field crops up to 40 acres that are subject to moderate deer pressure. Deer are attracted by the peanut butter and encouraged to make nose-to-fence contact. After being shocked, deer learn to avoid fenced areas. The cost for materials, excluding labor, is about 11 cents per linear foot.

To build a peanut butter fence (*Figure 2*), follow these steps:

1. Install wooden corner posts.
2. String one strand of 17 gauge, smooth wire around the corners and apply light tension.
3. Set 4-foot fiberglass rods along the wire at 60 foot intervals.
4. Attach the wire to insulators on the rods at 2.5 feet above ground level and apply 50 pounds of tension.
5. Attach 3- x 4-inch foil strips to the wire at 3-foot intervals, using 1- x 2-inch strips of cloth adhesive tape.
6. Apply a mixture of 1:1 peanut butter and vegetable oil to the adhesive strips and fold the foil over the strips.

7. Connect the wire to positive (+) post of a well-grounded fence charger.
8. For fields larger than one acre, it is more practical to apply the peanut butter mixture directly to the wire. Apply peanut butter once a month. Application can be made simpler by running wire through a pail filled with the mixture. Attach foil flags to the fence near paths or areas of high deer pressure to make the fence more attractive. Check weekly for damage by deer and grounding by vegetation.

Polytape Fence

The polytape or polywire fence material is very strong and portable. You can use it to protect up to 40 acres of vegetable and field crops under moderate deer pressure. Deer receive shocks through nose-to-fence contact and learn to avoid fenced areas. The cost for materials is about 11 cents per linear foot. This price excludes labor.

To build a polytape fence (*Figure 3*), follow these steps:

1. Drive round fiberglass posts 2 feet into the ground at the corners.
2. String two strands of polytape around the corners and apply light tension (one strand 3 foot high can be used).

3. Use square knots or half-hitches to make splices or to secure the polytape to corner posts.
4. Set 4-foot fiberglass rods along the wires at 60 foot intervals.
5. Attach the two strands of polytape to insulators on the rods at 1, and 3 feet above ground level and apply 50 pounds of tension.
6. Connect the polytape to the positive (+) post of a well-grounded fence charger. Check the fence weekly.

Permanent High Tensile Fencing

High-tensile fencing can provide year-round protection from deer damage. Many designs are available to fit specific needs. All require strict adherence to construction guidelines concerning rigid corner assemblies and fence configurations. Frequent inspections and maintenance are necessary. High tensile fences have a 20- to 30- year life expectancy.

Offset or Double Fence

This high-tensile fence is mostly for gardens, yards, truck farms, or nurseries up to approximately 40 acres that experience moderate deer pressure.

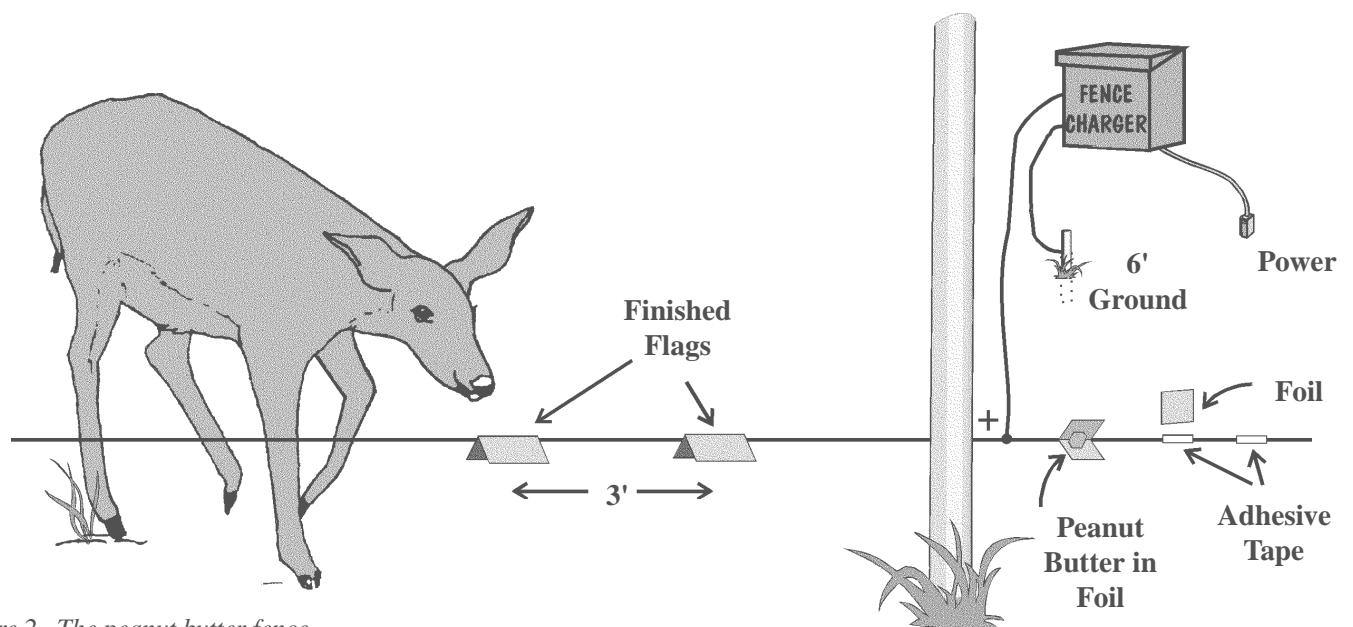
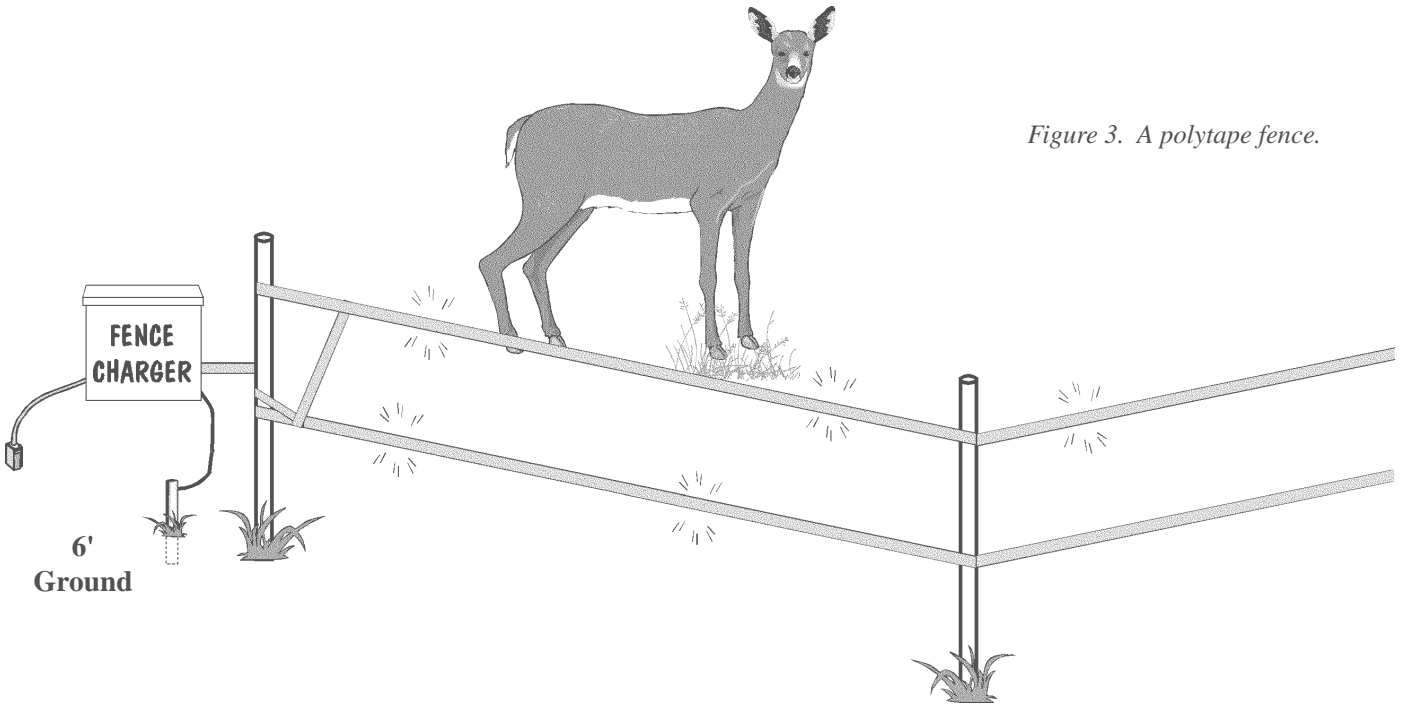


Figure 2. The peanut butter fence.

Figure 3. A polytape fence.



Deer are repelled by the shock and the fence's three-dimensional nature. You can add wires if deer pressure increases. Cost for materials, excluding labor, is about 35 cents per linear foot.

To build an offset or double fence (Figure 4), follow these steps:

For the outside fence:

1. Install swing corner assemblies where necessary.
2. String a 12.5 gauge high-tensile wire around the outside of the swing corner assemblies and apply light tension.
3. Set 5 foot line posts along the wire at 40 to 60 foot intervals.
4. Attach the wire to insulators on the line posts, 15 inches above ground level and apply 150 to 250 pounds of tension.
5. String a second wire at 43 inches and apply 150 to 250 pounds of tension.

For the inside fence:

6. String a wire around the inside of the swing corner assemblies and apply light tension.
7. Set 5-foot line posts along the wire at 40 to 60 foot intervals.
8. Attach the wire to insulators on line posts at 30 inches above ground level.
9. Attach all wires to positive (+) post of a well-grounded, low impedance fence charger.
10. Clear and maintain a 6 to 12-foot open area outside the fence so deer can see it.

Maintenance includes weekly inspections and voltage checks. The offset or double fence can also

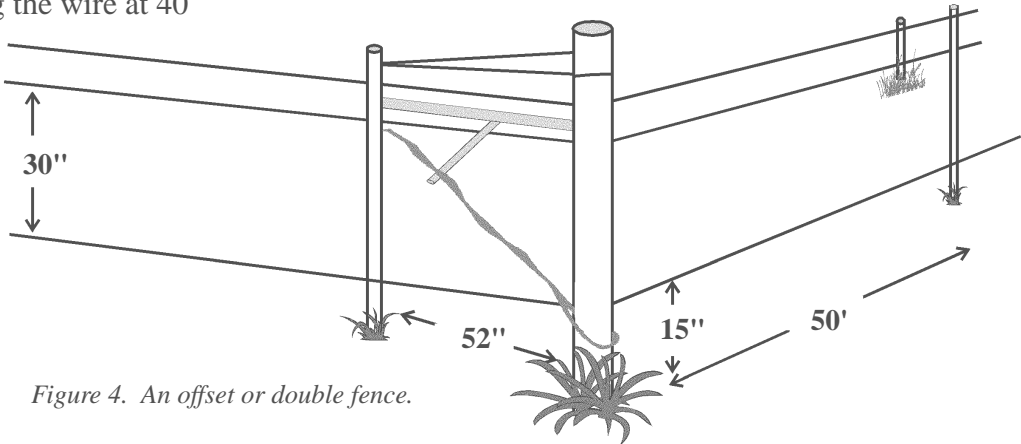


Figure 4. An offset or double fence.

be reversed with two strands of wire on the outside fence and one strand on the inside fence. For cost reduction, fiberglass posts may be substituted.

Vertical Deer Fence

Vertical high-tensile fences are effective at protecting large truck gardens, orchards, and other fields from moderate to high deer pressures. Because of the prescribed wire spacing, deer try to go through the fence and are effectively shocked. Vertical fences use less ground space than three-dimensional fences, but they are probably less effective at keeping deer from jumping over fences. There are a wide variety of fence materials and specific designs you can use. Cost for materials, excluding labor, ranges from .75 to \$1.50 per linear foot.

To build a seven-wire vertical deer fence (Figure 5), follow these steps:

1. Install rigid corner assemblies where necessary.
2. String a 12.5 gauge high-tensile wire around the corner assemblies and apply light tension.
3. Set 8-foot line posts along the wire at 33-foot intervals.
4. Attach the wire to insulators at 8 inches above ground level and apply 150 to 250 pounds of tension.
5. Attach the remaining wires to insulators at 16, 26, 36, 48, 60, and 72 inches above the ground level and apply 150 to 250 pounds of tension.
6. Connect the second, fourth and fifth wire from the top, and the bottom wire to the positive (+) post of a well-grounded, low impedance fence charger.
7. Connect the top, third and sixth wire directly to ground. The top wire should be negative for lightning protection and the bottom wire should be "hot" to prevent deer from crawling under fences.

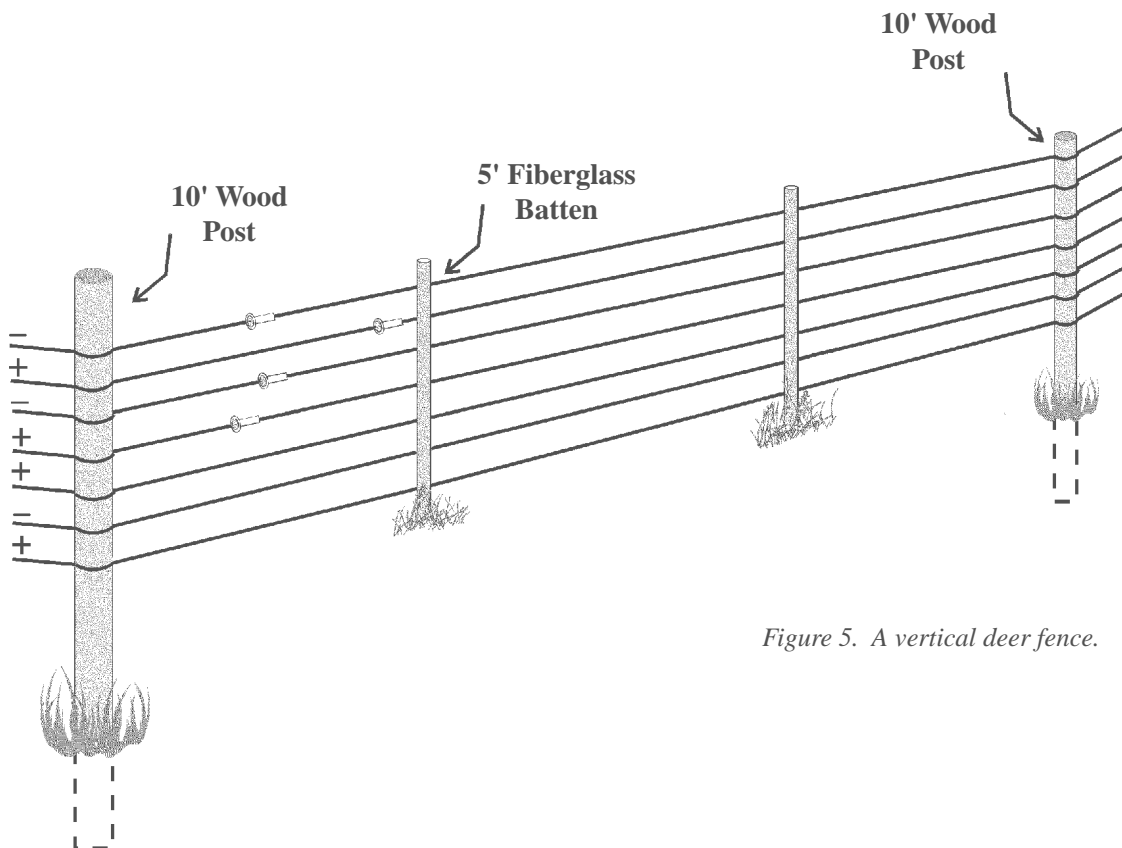


Figure 5. A vertical deer fence.

- Clear and maintain a 6 to 12-foot open area outside the fence so deer can see it.

Maintenance includes weekly fence inspection and voltage checks.

Slanted Seven-Wire Deer Fence

This high-tensile fence is used where high deer pressures threaten moderate to large size orchards, nurseries and other high value crops. It presents a physical and psychological barrier to deer because of its electric shock and three-dimensional nature. Cost excluding labor, is \$.75 to \$2 per linear foot.

To build a slanted seven-wire deer fence (Figure 6), follow these steps:

- Set rigid, swing corner assemblies where necessary.
- String 12.5 gauge high-tensile wire around the corner assemblies and apply light tension.
- Set angle braces along the wire at 90 foot intervals.
- Attach the wire at the 10-inch position and apply 150 pounds of tension.
- Attach the remaining wires at 12-inch intervals and apply 150 pounds of tension.
- Place fence battens at 30 foot intervals.
- Connect the top, third, fifth and bottom wires to the positive (+) post of a well-grounded, low impedance fence charger.
- Connect the second, fourth, and sixth wire directly to ground.
- Clear and maintain 6 to 12 foot areas outside the fence so deer can see the fence. Maintenance includes weekly inspections and voltage checks.

Permanent Woven-Wire Fencing

Woven-wire fences are used for year round protection of high value crops subject to high deer

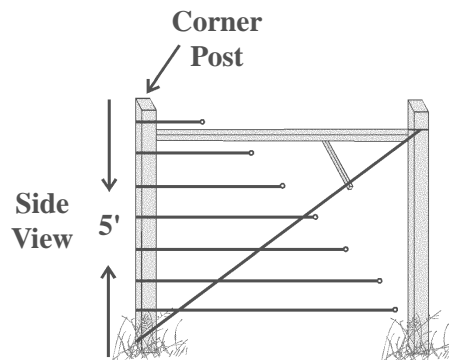
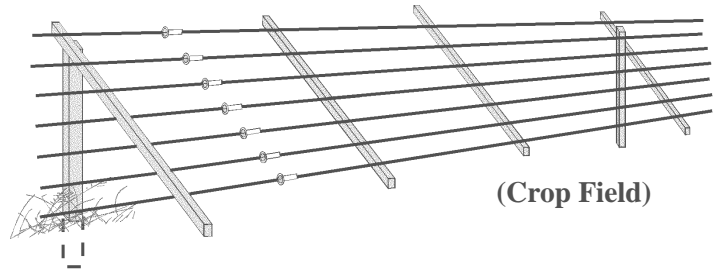
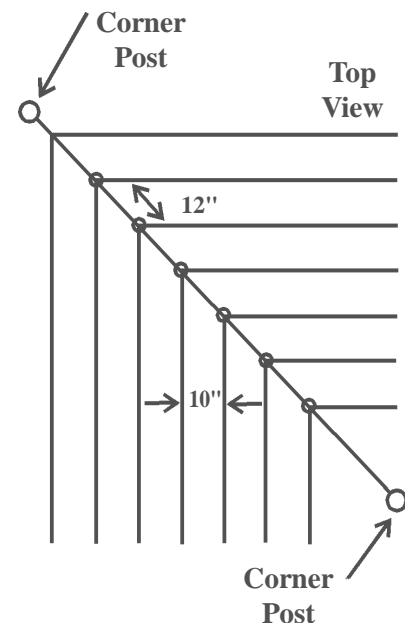


Figure 6.
The slanted
seven-wire fence.



pressure. These fences are expensive, difficult to construct, but easy to maintain. Before high-tensile electric fencing, woven-wire fences were used most often to protect orchards or nurseries where the high crop value, perennial nature of damage, acreage, and 20 year life span of the fence justified its initial costs. Cost for materials, excluding labor, is \$2 to \$4 per linear foot. The high cost has resulted in reduced use of woven wire fences.

To build a woven-wire fence (*Figure 7*), follow these steps:

1. Set rigid corner assemblies where necessary.
2. String a light wire between two corners and apply light tension.
3. Set 16-foot posts along the wire at 40-foot intervals, to a depth of 4 to 6 feet.
4. At ground level, attach a roll of 4-foot woven wire to each of the two corners and roll it out to be the center of the run.
5. Attach fence strainers to the free ends of the two rolls, apply 50 pounds of tension and splice the roll-ends together.

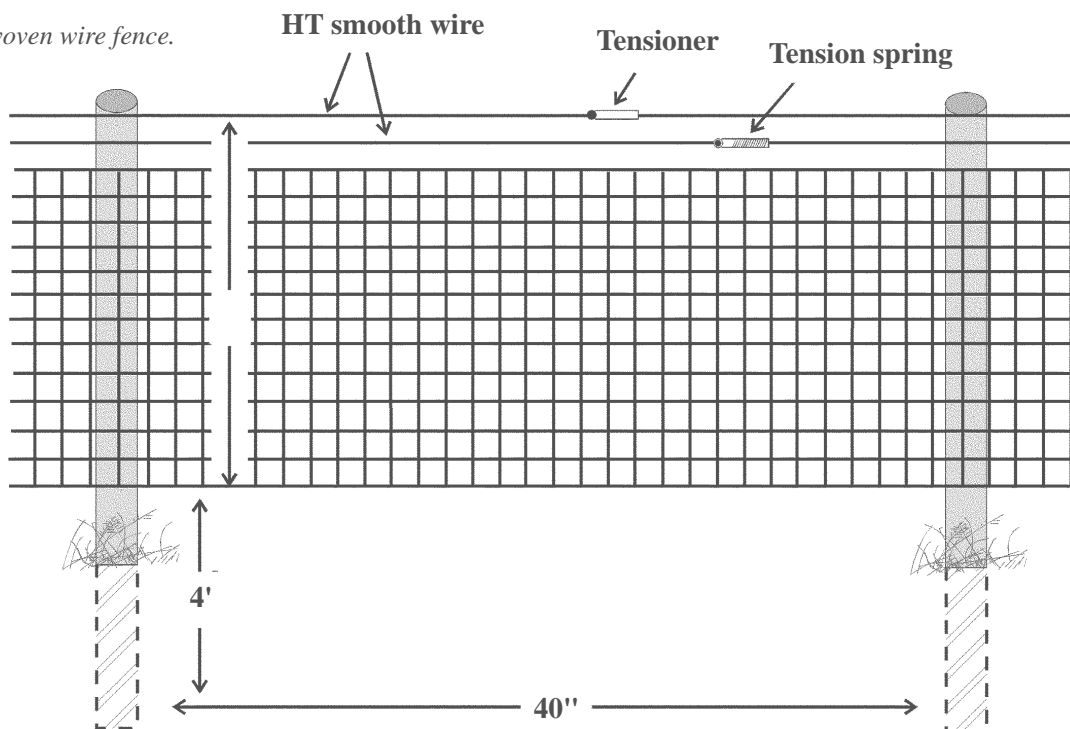
6. For the 4 to an 8-foot span, start at the 4 foot level and repeat steps 4 and 5.
7. Attach the 0 to 4-foot, and the 4 to 8 foot spans together with hog rings.
8. Repeat steps 3 through 7 for the remaining sides of the fence.
9. To increase its effectiveness, attach two strands of high-tensile smooth wire to the top of the fence to raise the height of the fence to 9 to 10 feet. See combination fence (below).

Minimal maintenance is required. Inspect area for locations where deer can crawl under the fence.

Combination Fencing

Combination fencing incorporates both woven wire and high tensile or electric wire. This fence can be nearly 10 ft tall. They are nearly as effective as a total woven wire system but are less expensive to construct and just as easy to maintain. This option is often more attractive to landowners with moderate to heavy deer damage than a total woven wire system. To build a combination fence, follow these steps:

Figure 7. A woven wire fence.



1. Set ridged corner assemblies where necessary.
2. Follow steps 2 through 8 listed above in woven wire assembly.
3. Attach seven strands of high tensile 12 gauge wire spaced 6 inches apart, above the woven wire assembly.

Minimal maintenance is required. Inspect area for locations where deer can crawl under the fence.

Fencing Tips

Do not buy cheap materials. This will only reduce the effectiveness and life span of the fence. Recommendations include:

- Fiberglass, metal or treated wood posts.
- High quality galvanized wire and steel components.
- Compression sleeves for splicing wires and making electrical connections.
- Lightning arresters or newer lightning diverters to protect chargers.
- High quality fence chargers. Chargers must be UL approved.
- Gates should be electrified, well insulated and suited for the type of farming operation.
- Fences must be properly constructed; do not deviate from the manufacturer or recommended guidelines.
- Prepare fence-lines before construction.
- Ensure electrical system is well grounded.
- Use rigid brace assemblies.
- Allow wires to slide freely through insulators to allow for temperature changes, deer hits, etc.
- Post electric fence warning signs at 300 foot intervals.
- Consult an expert for all of your fencing needs.

Tree Protectors

Use Vexar[®], Tubex[®], plastic tree wrap, or woven-wire cylinders to protect young trees from deer and rabbits. Four-foot woven wire cylinders can keep deer from rubbing tree trunks with their antlers.

CONCLUSION

Both homeowners and farmers should be tolerant of some losses caused by wildlife and understanding in making management choices. It may be your personal choice to tolerate some damage in return for the natural beauty of wildlife. But it is also important to remember to be understanding of your neighbor's choices because they may perceive a true economic threat from wildlife damage. The most important question all South Carolinians must ask themselves is whether they prefer a small number of healthy deer or a large number of unhealthy deer and which option is best for the deer populations of our state.

SUMMARY

The history of the white-tailed deer is a success story. From virtual elimination to nearly 1 million today, their success brings value to our state in many ways. But despite their economic and aesthetic values, deer also have a variety of negative impacts—they damage crops, gardens, and personal property. These factors make deer damage control a difficult social, political, and a biological problem. Scare devices, repellents, and the effective use of the legal hunting season, all have a place in deer damage control. However, the best control method is built around effective deer herd management.

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This brochure, *Reducing Deer Damage at Home and on the Farm*, can be obtained through your local county Extension office.

Brand names appearing in this publication/production are for product identification. No endorsement is intended or implied, nor is any criticism of similar products not mentioned.

Information Sources

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APPENDIX

Ornamental plants, listed by susceptibility to deer damage.¹

BOTANICAL NAME	COMMON NAME
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Plants Rarely Damaged:

<i>Berberis spp.</i>	Barberry
<i>Berberis vulgaris</i>	Common Barberry
<i>Betula papyrifera</i>	Paper Birch
<i>Buxus sempervirens</i>	Common Boxwood
<i>Elaeagnus angustifolia</i>	Russian Olive
<i>Ilex opaca</i>	American Holly
<i>Leucothoe fontanesiana</i>	Drooping Leucothoe
<i>Pieris japonica</i>	Japanese Pieris

Plants Seldom Severely Damaged:

<i>Betula pendula</i>	European White Birch
<i>Calastrus scandens</i>	American Bittersweet
<i>Cornus sericea</i>	Red Osier Dogwood
<i>Cornus florida</i>	Flowering Dogwood
<i>Cornus kousa</i>	Kousa Dogwood
<i>Crataegus laevigata</i>	English Hawthorn
<i>Enkianthus campanulatus</i>	Redvein Enkianthus
<i>Fagus sylvatica</i>	European Beech
<i>Forsythia spp.</i>	Forsythia
<i>Gleditsia triacanthos</i>	Honey Locust
<i>Ilex cornuta</i>	Chinese Holly
<i>Ilex glabra</i>	Inkberry
<i>Juniperus chinensis</i>	Chinese Junipers (green)
<i>Juniperus chinensis</i>	Chinese Junipers (blue)
<i>Kalmia latifolia</i>	Mountain Laurel
<i>Kolkwitzia amabilis</i>	Beautybush
<i>Picea abies</i>	Norway Spruce
<i>Pinus nigra</i>	Austrian Pine
<i>Pinus rigida</i>	Pitch Pine
<i>Pinus mugo</i>	Mugo Pine
<i>Pinus resinosa</i>	Red Pine
<i>Pinus sylvestris</i>	Scots Pine
<i>Prunus serrulata</i>	Japanese Flowering Cherry
<i>Salix matsudana tortuosa</i>	Corkscrew Willow
<i>Sassafras albidum</i>	Common Sassafras
<i>Syringa vulgaris</i>	Common Lilac
<i>Wisteria floribunda</i>	Japanese Wisteria

Plants Occasionally Severely Damaged:

<i>Acer griseum</i>	Paperbark Maple
<i>Acer rubrum</i>	Red Maple
<i>Acer Saccharinum</i>	Silver Maple
<i>Acer saccharum</i>	Sugar Maple
<i>Aesculus hippocastanum</i>	Common Horsechestnut
<i>Amelanchier arborea</i>	Downy Serviceberry
<i>Amelanchier laevis</i>	Allegheny Serviceberry
<i>Campsis radicans</i>	Trumpet Creeper
<i>Chaenomeles speciosa</i>	Japanese Flowering Quince
<i>Cornus racemosa</i>	Panicled Dogwood
<i>Cotinus coggygria</i>	Smokebush
<i>Cotoneaster spp.</i>	Cotoneaster
<i>Cotoneaster apiculatus</i>	Cranberry Cotoneaster
<i>Cotoneaster horizontalis</i>	Rockspray Cotoneaster
<i>Cryptomeria japonica</i>	Japanese Cedar
<i>Forsythia (x) intermedia</i>	Border Forsythia
<i>Hamamelis virginiana</i>	Common Witchhazel
<i>Hibiscus syriacus</i>	Rose of Sharon
<i>Hydrangea arborescens</i>	Smooth Hydrangea
<i>Hydrangea anomala petiolaris</i>	Climbing Hydrangea
<i>Hydrangea paniculata</i>	Panicle Hydrangea
<i>Ilex crenata</i>	Japanese Holly
<i>Ilex (x) meserveae</i>	China Girl Holly
<i>Juniperus virginia</i>	Eastern Red Cedar
<i>Larix decidua</i>	European Larch
<i>Lonicera (x) heckrottii</i>	Goldflame Honeysuckle
<i>Ligustrum spp.</i>	Privet
<i>Magnolia (x) soulangiana</i>	Saucer Magnolia
<i>Metasequoia glyptostroboides</i>	Dawn Redwood
<i>Parthenocissus quinquefolia</i>	Virginia Creeper
<i>Philadelphus coronarius</i>	Sweet Mock Orange
<i>Pinus strobus</i>	Eastern White Pine
<i>Potentilla fruticosa</i>	Bush Cinquefoil
<i>Prunus avium</i>	Sweet Cherry
<i>Pseudotsuga menziesii</i>	Douglas Fir
<i>Pyracantha coccinea</i>	Firethorn
<i>Pyrus calleryana 'Bradford'</i>	Bradford Callery Pear
<i>Pyrus communis</i>	Common Pear
<i>Quercus alba</i>	White Oak
<i>Quercus prinus</i>	Chestnut Oak
<i>Quercus rubra</i>	Northern Red oak
<i>Rhododendron spp.</i>	Deciduous Azalea
<i>Rhododendron carolinianum</i>	Carolina Rhododendron
<i>Rhododendron maximum</i>	Rosebay Rhododendron

Appendix, continued

<i>Rhus typhina</i>	Staghorn Sumac
<i>Rosa multiflora</i>	Multiflora Rose
<i>Rosa rugosa</i>	Rugosa Rose
<i>Salix spp.</i>	Willows
<i>Spiraea (x) bumalda</i>	Anthony Waterer Spiraea
<i>Spiraea prunifolia</i>	Bridalwreath Spiraea
<i>Syringa (x) persica</i>	Persian Lilac
<i>Syringa reticulata</i>	Japanese Tree Lilac
<i>Syringa villosa</i>	Late Lilac
<i>Tilia cordata</i> 'Greenspire'	Greenspire Littleleaf Linden
<i>Tilia americana</i>	Basswood
<i>Tsuga canadensis</i>	Eastern Hemlock
<i>Tsuga caroliniana</i>	Carolina Hemlock
<i>Viburnum (x) juddii</i>	Judd Viburnum
<i>Viburnum rhytidophyllum</i>	Leatherleaf Viburnum
<i>Viburnum plicatum tomentosum</i>	Doublefile Viburnum
<i>Viburnum carlesii</i>	Koreanspice Viburnum
<i>Weigela florida</i>	Oldfashion Weigela

Plants Frequently Severely Damaged:

<i>Cercis canadensis</i>	Eastern Redbud
<i>Chamaecyparis thyoides</i>	Atlantic White Cedar
<i>Clematis spp.</i>	Clematis
<i>Cornus mas</i>	Cornelian Dogwood
<i>Euonymus alatus</i>	Winged Euonymus
<i>Euonymus fortunei</i>	Wintercreeper
<i>Hedera helix</i>	English Ivy
<i>Malus spp.</i>	Apples
<i>Prunus spp.</i>	Cherries
<i>Prunus spp.</i>	Plums
<i>Rhododendron spp.</i>	Rhododendrons
<i>Rhododendron spp.</i>	Evergreen Azaleas
<i>Rhododendron catawbiense</i>	Catawba Rhododendron
<i>Rhododendron periclymenoides</i>	Pinxterbloom Azalea
<i>Rosa (x) hybrid</i>	Hybrid Tea Rose
<i>Sorbus aucuparia</i>	European Mountain Ash
<i>Taxus spp.</i>	Yews
<i>Taxus baccata</i>	English Yew
<i>Taxus brevifolia</i>	Western Yew
<i>Taxus cuspidata</i>	Japanese Yew
<i>Taxus (x) media</i>	English/Japanese Hybrid Yew
<i>Thuja occidentalis</i>	American Arborvite

¹ From M.J. Fargione, P.D. Curtis, and M.E. Richmond. 1991. Resistance of woody ornamental plants to deer damage. Cornell Coop Ext. Fact Sheet. Ithaca, N.Y. 4 pp. Revised 1995 for South Carolina by Bob Polomski, Extension Horticulture Associate, Clemson University.

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Cornell University, Ithaca, NY.