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FRONT COVER: Mule deer buck, Auburn, California. Photo by Peggy Mattison.

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INTRODUCTION

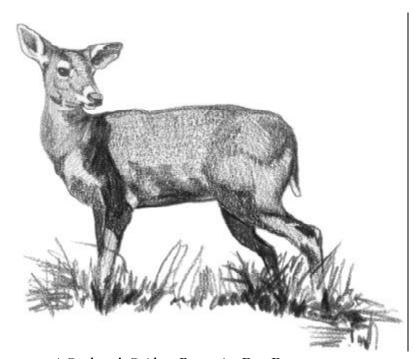
Part of the appeal of living in rural or semi-rural California is the ability to watch wildlife in your own back yard. Deer are especially fascinating to observe, but many homeowners are dismayed to discover that deer can be very destructive to gardens.

In some areas the damage can be seasonal, peaking in the winter when food sources for deer are at their lowest. Other areas, where deer habitat is heavily affected by residential development, may experience problems year-round. Drought, wildfires, livestock grazing and other habitat-altering events also play a role because they affect food sources for deer.

Rural dwellers frequently ask the California Department of Fish and Game how to minimize landscape damage caused by hungry deer. This booklet details three methods:

- -the use of landscape plants that deer don't seem to like;
- -application of commercial deer repellents;
- -construction of deer-proof fencing.

All of the techniques are considered harmless to deer and other wild and domestic animals.



A Gardener's Guide to Preventing Deer Damage

"DEER-RESISTANT" PLANTS

Deer are attracted to many popular garden and landscape plants but avoid others. The following list of deerresistant plants should be considered a guide rather than the final word.

Certain plants may not suffer deer damage in some gardens and landscapes, yet might be completely destroyed in others. This is due in part to the availability of natural food sources and the taste preferences of individual deer. If there is a severe shortage of natural deer browse, deer-resistant landscape plants may suffer damage.

Some of the plants listed are, in addition to being deer-resistant, considered noxious weeds. For example, bamboo is a pervasive grower and can become a significant problem because of its tendency to escape. Alternatively, native plants are better-adapted to the local climate than their exotic counterparts, and should be considered first in landscape planning.

Both native and introduced plants are listed in this booklet. The designation "some native" means some subspecies of the plant are native to California. Always consult a local nursery to select species which best fit your needs and your local climate. The Department of Fish and Game encourages use of native plant species where feasible. For example, most native perennial bunchgrasses would be suitable candidates for deer-resistant landscaping as well as being drought-resistant.

AQUATIC PLANT

Bamboo (noxious) Bamboo

CROP/ORCHARD PLANTS

Asparagus falcatus Helianthus spp. (some native)

Sickle-thorn asparagus Sunflower

Clivia miniata Leptospermum sp.

Kaffir lily Tea tree

rea tree

Diospyros virginiana Olea europaea Persimmon Olive

Ficus sp. Punica granatum 'Nana'

Fig Pomegranate

Gymnocladus dioica Rhubarb sp.

Kentucky coffee tree (poisonous to livestock and humans)

Rhubarb

GRASSES/FORBS

Acanthus mollis Catharanthus roseus (Vinca rosea)
Bear's breech Madagascar periwinkle

Achillea sp. (some native) Cerastium tomentosum Yarrow Snow-in-summer

Aconitum sp. (native) Chives sp. Monkshood Chives

Agapanthus sp. Chrysanthemum frutescens Lily-of-the-Nile Marguerite, Paris Daisy

Ageratum houstonianum Chrysanthemum maximum

Floss flower Shasta daisy

Ajuga sp. Clarkia

Bugle weed, Carpet bugle Godetia, Mountain garland,

Farewell to spring

Amaryllis belladonna Belladonna lily, Naked lady Coreopsis grandiflora

Coreopsis

Aquilegia (some native)

Columbine

Coronilla varia

Crown vetch Arabis sp.

Rockcress Crinum sp.

Arctosis sp.
African daisy

Crinum

Crocosmia sp.

Crocosmia
Arum sp.

Arum Cyclamen Cyclamen

Asarum caudatum (some native)
Wild-ginger
Cymbalaria muralis
Kenilworth ivy
Poppy

Aster alpinus
Aster Cyperus
Cyperus

Begonia tuberhybrida
Tuberous begonia
Delphinium spp. (some native)
Larkspur

Calendula officinalis
Pot marigold Dendromecon

Bush poppy
Campanula medium

Bellflower Dicentra (native)
Bleeding heart

GRASSES/FORBS CONTINUED

Dietes vegeta

Fortnight lily Hypericum
St. Johnswort

Digitalis (native)
Foxglove Iris spp. (some native)

Duchesnea indica

Indian mock strawberry

Ixia maculata
African corn lily

Epimedium (native)
Epimedium

Jasminum spp.
lasmine

Eschscholzia californica (native)
California poppy
Kniphofia waria

Redhot poker, Torch-lily, Poker plant

Dead nettle

Festuca ovina (native)
Sheep fescue

Lamium maculatum (noxious)

Fragaria chiloensis (native)
Wild strawberry, Sand strawberry

Laurentia fluviatilis

Blue star creeper
Freesia
Freesia
Leucojum spp.

Snowflake Galium odoratum (Asperula odorata)

Sweet woodruff Liriope Lily turf

Gamolepis chrysanthemoides
Gamolepis Lobelia(native)

Lobelia Gerbera jamesonii

African or Transvaal daisy Lychnis coronaria

Crown-pink, Mullein-pink Helichrysum spp.

Strawflower Lysimachia nummularia Moneywort, Creeping jennie

Helleborus spp.
Hellebore Mentha
Mint

Hemerocallis
Daylily
Mirabilis jalapa
Four o'clock

Herbs, except Basil

Moluccella laevis

Hippophae rhamnoides Bells-of-Ireland Sea buckthorn

Monarda Hosta (Funkia) Bee balm, Oswego tea

Plantain lily

Douglas

úrís

GRASSES/FORBS CONTINUED

Myosotis spp. Soleirolia soleirolli Forget-me-not Baby's tears, Angel's tears

Narcissus spp. Sparaxis tricolor Narcissus, Daffodil, Jonquil Harlequin flower

Nepeta Stachys byzantina Catnip Lamb's ears

Ophiopogon japonicus Strelitzia reginae Lily turf Bird of paradise

Paeonia suffruticosa Teucrium fruticans Tree peony Bush germander

Papaver rhoeas Tolmiea menziesii (native) Flanders field poppy, Shirley poppy Piggy-back plant

Papaver orientale Tradescantia spp. Oriental poppy Spiderwort, Wandering Jew

Papaver nudicaule Trillium spp. (some native)

Iceland poppy Trillium, Wake-robin Penstemon spp. (some native) Tulipa spp.

Penstemon, Beard tongue Tulip

Phormiam tenax Valeriana officinalis

New Zealand flax Valerian, Garden heliotrope

Verbena

Zinnia

Romneya coulteri (native and rare) Vallota speciosa Matilija poppy Scarborough lily

Rudbeckia hirta Verbena (native) Gloriosa daisy, Black-eyed Susan

Scabiosa spp. Vinca spp. (some native)

Pincushion flower Periwinkle

Scilla peruviana Zantedeschia spp. Peruvian scilla Calla lily

Blue-eyed grass Silene acaulis Zinnia

Sisyrinchium (native) Abutilon (native)

Cushion pink, Moss campion

Blue-eyed grass Flowering maple, Chinese lantern

SHRUBS

Acer circinatum (native)

Vine maple

Calycanthus occidentalis (native)

Spice bush

Agave spp. (some native)

Century plant

Alcea rosea Hollyhock

Caragana arborescens Siberian peashrub

Aloe Aloe

Aralia spinosa

Devil's walking stick, Hercules' club,

Angelica tree

Arctostaphylos uvaursi, and other species

(some native)

Bearberry, Kinnikinnick

Baccharis pilularis (native, also noxious)

Coyote brush, Dwarf chaparral broom

Berberis (some native)

Bragmansia (Datura) Angel's trumpet

Barberry

Carpenteria californica (native)

Bush anemone

Bushanemone

Brodiaea (native) Brodiaea Cassia (some native)

Senna

Buddleia davidii

Buxus spp.

Butterfly bush, Summer lilac

Ceanothus gloriosus (native)

Wild lilac

Boxwood

Mexican orange

Cactaceae (some native)

Cactus, many species and varieties

Cissus rhombifolia

Choisya ternate

Grape ivy

Calliandra tweedii

Trinidad female bush,

Brazilian flame bush

Rockrose

Callistemon Bottlebrush

Cistus

Clematis (some native)

Clematis

SHRUBS continued

Clianthus puniceaus Euonymus japonica Parrot-beak Evergreen euonymus

Coleonema pulchrum Euphorbia Pink breath of heaven Spurge

Coprosma repens Euryops pectinatus

Mirror plant Euryops

Corokia cotoneaster Fatshedera lizei Corokia cotoneaster Fatchedera

Correa spp. Fern, except Pellaea (some native)

Australian fuchsia Fern

Cotoneaster buxifolius Forsythia
Cotoneaster Forsythia

Cycas revoluta Gaultheria shallon (native)

Sago palm Salal, Lemon leaf

Daphne spp.Gelsemium sempervirensDaphneCarolina jessamine

Datura Genista monosperma Jimson Weed Bridal veil broom

Diosma Grevillea Coleonema Grevillea

Dodonaea viscosa Griselinia lucida Hop bush, Hopseed bush Griselinia

Echium fastuosum Gunnera
Pride of Madeira Gunnera

Elaeagnus pungens Halimium (native) Silverberry Halimium

Erica Hedera helix (noxious)

Heath English ivy

Eriogonum (some native) Heteromeles arbutifolia (native) Wild buckwheat Toyon, Christmas berry,

California holly

Escallonia spp.
Escallonia Hibbertia scandens
Guinea gold vine

SHRUBS CONTINUED

Impatiens wallerana Nolina parryi (native)

Busy Lizzie Nolina

Iochroma cyaneum Osteospermum fruticosum

Iochroma Trailing african daisy, Freeway daisy

Kerria japonica Oxalis oregana

Japanese rose Oregon Oxalis, Redwood sorrel

Lantana montevidensis Pandorea pandorana Trailing lantana Wonga-wonga vine

Lavandula Phaedranthus buccinatorius Lavender Blood red trumpet vine

Leonotis leonurus Phlomis fruticosa Lion's tail Jerusalem sage

Loropetalum chinense Plumbago auriculata Loropetalum Cape plumbago

Lupinus (some native) Potentilla fruticosa (native)

Lupine Shrubby cinque foil

Mahonia spp. (some native)

Raoulia australis

Mahonia, Oregon grape

Raoulia

Melianthus major Rhododendron—except azaleas (native) Honey bush R. macrophyllum, R. occidentalis

Mimulus Rhus ovata (native) Monkey flower Sugar bush

Muehlenbeckia complexa Ribes (native)

Mattressvine, Wirevine Currant, Gooseberry

Myoporum laetum Rosmarinus officinalis

Myoporum Rosemary

Myrtus californica Ruscus aculeatus Wax myrtle Butcher's broom

Nandina domestica Sambucus (native) Heavenly bamboo Elderberry

Nerium oleander Santolina Oleander Santolina

SHRUBS CONTINUED

Senecio cineraria Dusty miller

Symphoricarpos albus (native) Common snowberry

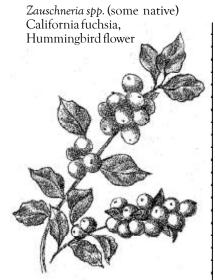
Syringa vulgaris Common lilac

Syzygium paniculatum Bush cherry, Australian brush cherry

Tecomaria capensis Cape honeysuckle

Trachelospermum jasminoides Star jasmine

Yucca spp. (some native) Yucca, Spanish bayonet



Common snowberry

TREES

Abies (some native) Araucaria spp.

Fir Araucaria

Acer macrophyllum (native) Arbutus unedo Bigleaf maple Strawberry tree

Acer palmatum Arbutus menziesii (native)

Japanese maple Madrone, Madrono

Acer negundo (native)
Box elder
Box elder
Beaucarnea recurvata
Ponytail, Bottle palm

Agonis flexuosa Brachychiton populneus
Peppermint tree Bottle tree

Albizia Calocedrus decurrens (native)

Silk tree, Plume acacia Incense cedar

Angophora costata (A. lanceolata)

Gum myrtle

Casuarina stricta

Mountain or Drooping she-oak,

Coast beefwood

TREES CONTINUED

Catalpa bignonioides Fraxinus velutina (native)

Common catalpa, Indian bean Arizona ash

Cedrus Gagetes spp.
Cedar Marigold

Celtis australis Ginko biloba European hackberry Maidenhair tree

Ceratonia siliqua Hakea suaveolens Carob, St. John's bread Sweet hakea

Cercis occidentalis (native) Ilex (except thornless)

Western redbud Holly

Chamaecyparis sp. (native)

Jubaea chilensis (J. spectabilis)

Juniper

False cypress Chilean wine palm

Chamaerops humilis Juniperus (some native)

Mediterranean fan palm

Cordyline australis Larix decidua
Dracaena palm European larch

Cornus capitata Liquidambar styraciflua Evergreen or Himalayan dogwood American sweet gum

Corylus cornuta californica (native) Lithocarpus densiflorus (native)

Western hazelnut Tanbark oak

Cotinus coggygria Lyonothamnus floribundus (native)

Smoke tree Catalina ironwood

Crataegus spp. (some native) Maclura pomifera Hawthorn Osage orange

Cupressus spp. (some native) Magnolia spp. Cypress Magnolia

Erythea edulis Maytenus boaria
Guadalupe palm Mayten tree

Erythea armata Melaleuca leucadendra

Mexican blue palm Cajeput tree

Eucalyptus spp. Melia azedarach Eucalyptus, Gum China-berry

TREES CONTINUED

Metrosideros excelsus New Zealand Christmas tree

Michelia figo Banana shrub

Myrtus communis True myrtle

Parkinsonia aculeata

Jerusaleum thorn, Mexican palo verde

Paulownia tomentosa Empress tree

Phoenix spp. Date palm

Picea spp. (some native) Spruce

Pinus spp. (some native)

Pine

Pittosporum spp. Pittosporum

Platanus racemosa (native) California sycamore

Podocarpus Fern pine

Prunus caroliniana and other spp. (some native)

Carolina laurel cherry

Quillaga saponaria Soapbark tree

Robinia pseudoacacia Black locust

Sabal Palmetto

Schinus molle California pepper tree Thuja spp. (some native)

Arborvitae

Trachycarpus fortunei Windmill palm

Umbellularia california (native) California laurel, California bay, Oregon myrtle, Pepperwood

Washingtonia spp. Washington palm



DEER REPELLENTS

Various types of devices and chemicals have been used to repel deer including scare devices, over-the-counter repellent sprays and powder, and home remedies. Scare devices such as exploders, radios, lights, and even a dog on a leash have short-term limited effectiveness at best. Home remedies such as hanging bags of hair, soap, rotten eggs or animal urine are not trustworthy, long-term repellents. Over-the-counter repellents have been the most successful deterrent for non-commercial users experiencing

light to moderate damage. However, repellents must be applied frequently and vigilantly prior to and during the period of anticipated damage in order to be effective. For example, repellents should be applied to plants prior to planting and reapplied during the growing season.* 'Hinder,' which is a mixture of ammonium soaps, and 'Deer Away,' made from putrescent whole egg solids have been the most widely used and effective repellent sprays. Other repellents available are:

REPELANIMAL REPELLENT Farnam Co. Inc. 301 W. Osborn Rd. Phoenix, AZ 85013 (800) 825-2555

HOT SAUCE ANIMAL REPELLENT Miller Chemical & Fertilizer Corp. P.O. Box 333 Hanover, PA 17331

HINDER Crompton Chemical UAP Great Lakes La Crescent, MN (507) 895-2103 **DEER AWAY Intagra, Inc. 8500 Pillsbury Ave. South Minneapolis, MN 55420 (612) 881-5535

NATIONAL DEER REPELLANT National Scent P.O. Box 667 San Jacinto, CA 92581 (909) 654-2442

- * Consult individual manufacturers for proper spray concentration and application.
- ** Deer Away is not approved for application on edible crops.

FENCING APPLICATIONS

For nurseries, orchards, pastures, and large gardens, fencing is often the only way to prevent damage from animals. Many of the fencing options discussed on the following pages also work well for small gardens because they are easy to

build and very cost-effective. The following fencing designs are the primary methods being used by professional game managers and many state and federal agencies to control damage from both livestock and wild animals.

HIGH-TENSILE WIRE FENCE

By far, the most effective and most maintainable new fencing used are the New Zealand-designed high-tensile wire fences (See FIGURE A, page 19). Although the initial cost is high, this type of fence requires the least maintenance, and thus the cost per ft/yr is the lowest of all discussed. The fence uses smooth wire instead of barbed wire which is tensioned using a 'strainer' device. The strength of this type of fencing is in the tension applied. Animals cannot "squeeze" through the fence.

Although construction is somewhat technical, the fence actually takes less labor to install because line posts are

only needed every 25-50 ft. Proper construction of the "H-brace" corners is critical since the twelve wires used exert tremendous pressure on the corners (See FIGURE B, page 20). The horizontal wires can be spaced varying distances apart (usually from 4-6 inches) and separated by fiberglass or wooden 'droppers' (similar to stays) every five feet. The bottom wire is placed 6 in. off the ground. Tension is applied using a rachet tool and must be periodically adjusted for the fence to function effectively. Because construction is highly specialized, the manufacturer should supply instructions when purchasing materials.

ELECTRIFIED HIGH-TENSILE WIRE FENCE

In areas experiencing persistent and severe deer damage, the same fence discussed above can be electrified using AC current (See FIGURE C, page 21). DC battery or solar/battery chargers are used where electricity is unavailable. The modern-type fence chargers currently available have a strong shocking power (up to 8000 volts) but low impedance. Thus, they are extremely effective but safer than older-type chargers because they don't cause a burning effect. Construction is similar although insulators are used in lieu of staples, fewer wires are needed, and wires are

alternating negative and positively charged (with a positive wire on the bottom and top). This is important in that the animal will always be in contact with the ground-wire even when standing in deep snow or in a mid-air jump. The fence functions as more of a psychological barrier than a physical one after animals have experienced the shock, thus even a low fence (+ or - 24") can be effective in keeping the majority of animals out. The fence can be baited by tying aluminum foil flags covered with peanut butter on to the charged wire to aid in training animals to the fence.

MODIFIED ELECTRIC HIGH-TENSILE WIRE FENCE

A nice feature of the above design is that it can be used with an existing fence in a variety of applications, and can be utilized even on a small scale for the average garden grower. The electric hightensile fence discussed above can actually be constructed on top of an existing fence (such as a square or v-mesh wire or wood fence) using extensions, such as stand-off insulators for a single wire, or a 2" x 4" board attached to the existing post with lag screws for multiple wires. High-tensile fencing manufacturers do not recommend combining electric fencing with barbed wire however as severe injury and fatalities to animals have resulted. With the multiple wire design, positive wires should be alternated with grounded wires.

An advantage to this type of fencing over the completely electrified high-tensile fence is that this one will not often ground out due to vegetation growth and thus will require less maintenance. Much of this equipment can also easily be erected on a temporary basis during the height of the growing season if the problem is only a seasonal one. A disadvantage is that it will probably not be 100% effective in keeping out all animals. 'Polywire,' which is basically an electrified plastic tape can also be used for higher visibility (a bright orange color) and doesn't require tensioning.

SQUARE-MESH WOVEN-WIRE GAME FENCE

Square-mesh fence has been used primarily to control damage to orchards and nurseries (See FIGURE D, page 22). The fence is constructed similar to the high-tensile design, is considerably lighter than the V-mesh wire fence and is easier to construct. The fence is constructed using 10 ft. posts set 4 ft. in the

ground and spaced 20 ft. apart. Wire fencing is available in 6-ft. and 8-ft. heights. This fence design has been proven to repel deer and elk. The fence is also effective against coyotes, pigs and rabbits when the wire is buried one foot in the ground.

V-MESH

The V-mesh wire fences have been used primarily to control damage to hay-stacks. The V-mesh wire fence is constructed using 10 ft. wood posts set 4 ft. in the ground at 12 ft intervals. The V-

mesh wire comes in heights of 42 in. to 96 in. with the 72 in. being the most commonly used to control deer. This fence is difficult to build because of the heavywire.

CONSTRUCTION

All fence designs utilize double braced corner posts set in concrete or 'tamped' in gravel, with line-posts in between corners and fence-stays in between line-posts to maintain wire position. A construction manual or the fence manufacturer should be consulted on how to build particular fence types. Several are listed on page 25. Cost per foot and fence lengths may vary

depending on the manufacturer (See "PLANNING," page 23). Manufacturers and other pertinent regulatory agencies should be contacted when using any treated wood products, particulary around groundwater. Except where noted, longer posts and taller wire can be used with each design with minor modifications to control elk effectively as well.

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Fence diagrams provided by Minnesota Department of Natural Resources.

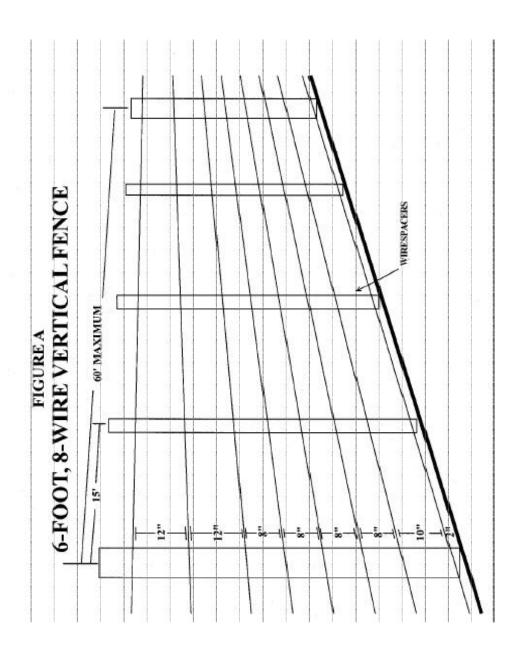
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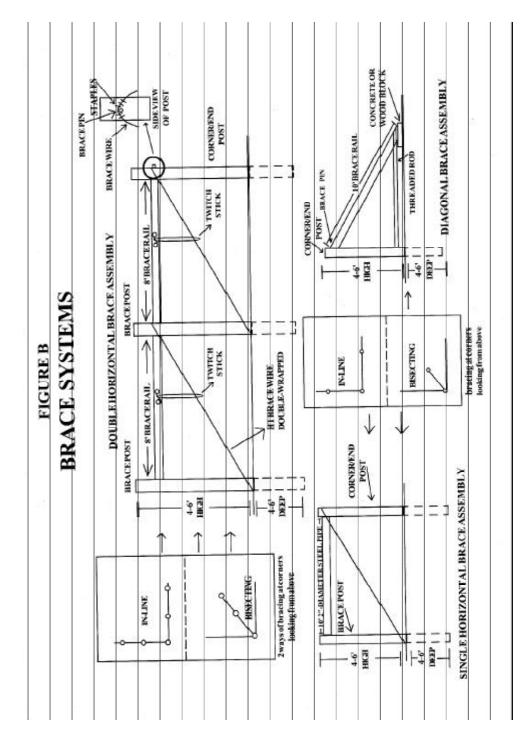
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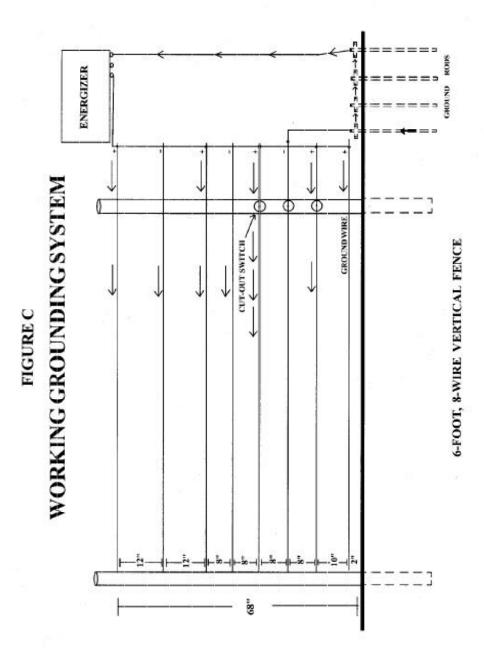
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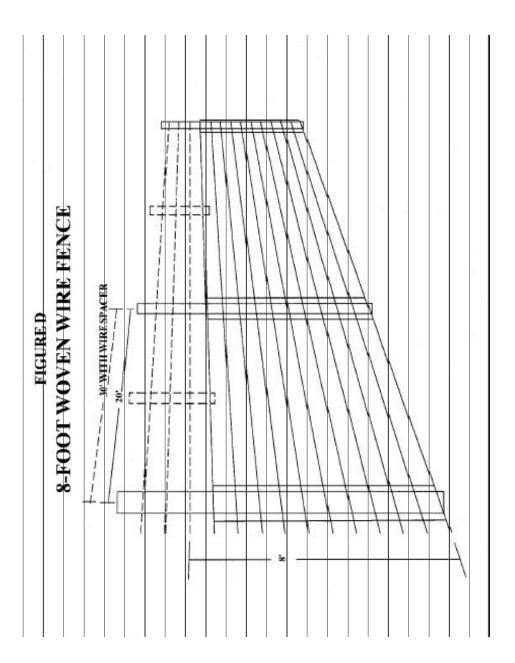




A Gardener's Guide to Preventing Deer Damage



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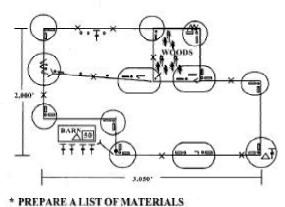
PLANNING

- * CHECK LOCAL LAWS AND ZONING REGULATIONS REGARDING FENCES AND ELECTRICITY, ESPECIALLY IN URBANAREAS
- * LOCATE HAZARDS AND OBSTACLES SUCH AS POWER LINES, HILLS, DIPS AND
- * USE AS FEW CORNERS AS POSSIBLE

Cheaper and easier to manage



* PREPARE A SKETCH OF THE FENCE



KEY	BASIC FENCECOMPONENTS
50	CONTROLLER
Ŧ	GROUND ROD
٠	STANDARD DUTY POSTS- END CORNER RISE OR DIP
-	STANDARD DUTY BRACE
•	HEAVY DUTY POSTS-END CORNER RISE OR DIP
-	HEAVY DUTY BRACE
X	WIRE TENSIONERS
/α	CURL ON CONNECTORS
7	GATE HANDLES
Δ	LIGHTNING DIVERTERS

- TRETAKE ALIST OF MATERIALS
- * A WELL-PREPARED FENCE LINE SAVES TIME AND MATERIALS
- * INCLUDE SPACE FOR EASY FENCE CONSTRUCTION AND VEHICLE ACCESS
- * BUILD THE FENCE AT LEAST FIVE FEET FROM OLD FENCE ROWS, BRUSH LINES OR WOODS
- * A CHARGER MUST BE READY BEFORE CONSTRUCTION BEGINS