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Limiting
Deer Browse
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Landscape Plants

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It doesn't seem all that long ago that spotting a deer was special. I remember back in the late 1960s when my mom called us to the back window. "Move slowly," she said, "there's a deer at the edge of the corn field". We all stood quietly watching for several minutes until the deer melted back into the neighboring woods.

Each year, more and more Nutmeggers have the opportunity to watch deer in their own backyards and gardens. Unfortunately, this increasingly common sight has a cost. Severe browsing by large deer herds has seriously impaired the natural regeneration of some Connecticut forests. Many a gardener knows the frustration of waking up to find prized roses, perennial plant beds, or vegetable gardens damaged by deer browse. Deer damage is not limited to plants. Over 10,000 deer have been killed by collisions with vehicles over the past five years (Kilpatrick et al. 1999). Deer are also a host species for the ticks that transmit Lyme disease (Main et al. 1981).

This Bulletin focuses on how gardeners can use plant selection in landscape design to limit or reduce browse damage by white-tailed deer (*Odocoileus virginianus*). The Introduction describes how the deer population has changed over the past hundred years in Connecticut, the impact of the increasing deer herd on the natural landscape, and the ecology and feeding patterns of white-tailed deer. The next section presents the results of a survey of Connecticut gardeners about browse damage susceptibility. Over 250 Connecticut gardeners and landscapers in 63 towns participated in this survey. They ranked deer browse damage to plants in their gardens from 0 (never damaged) to 5 (extreme, can not grow species). The results can be used by gardeners, landscapers, and others to choose plants appropriate for the number of deer in their neighborhoods.

INTRODUCTION

Deer were common in pre-colonial Connecticut and were an important source of protein and hides for Native

Americans. The herd quickly declined following European colonization. In 1648, the Legislature outlawed deer hunting, but to little avail. Deer hunting was prohibited again in 1893. Hunting to control crop damage was allowed in 1907 and sport hunting in 1957. In recent years, Connecticut has increased available permits for hunters and lengthened the hunting season to reduce the growth rate of the state's deer population, particularly in suburban areas. Nevertheless, the deer population continues to surge upward. The deer herd in Connecticut has increased from 12 at the turn of the century, to 20,000 in the late 1970s, and is now estimated to be over 76,000 (Figure 1).

Today, deer are increasingly a part of the suburban landscape in Connecticut. Deer have acclimated to both urban and suburban settings throughout the country (Conover 1995) and will continue to be a challenge for gardeners. A healthy doe in a suburbanized landscape can give birth to one or more fawns every year (Swihart et al. 1995). After accounting for natural mortality, deer herds can increase by 50% or more each year (Alexander 1980, McCullough, 1997). Deer have large overlapping home ranges of 160-500 acres (Swihart et al. 1995). Dispersal, especially male, can range upwards of several miles (Kammermeyer and Marchinton 1976). The combination of high reproductive rates, large home ranges, and wide dispersal potential can limit the temporal and spatial effectiveness of localized (neighborhood) herd control measures in reducing browse damage to landscape plants.

Deer are primarily browsers. While deer will concentrate on an abundant food source (acorns, field corn, hay fields, etc.) when available, at other times during the year they browse on a variety of vegetation (Wise 1988). Deer browse an average of 5-15 pounds of vegetation per day (Alexander 1980). Their normal diet consists of leaves, twigs, forbs, acorns, lichens, and fruit. Suburban deer will preferentially browse on ornamental species rather than native plants (Swihart et al 1995). Forests with deer densities exceeding 20 deer/mile² will have little, if any, natural regeneration (Behrend et al. 1970, Tilghman 1989). At higher densities, a

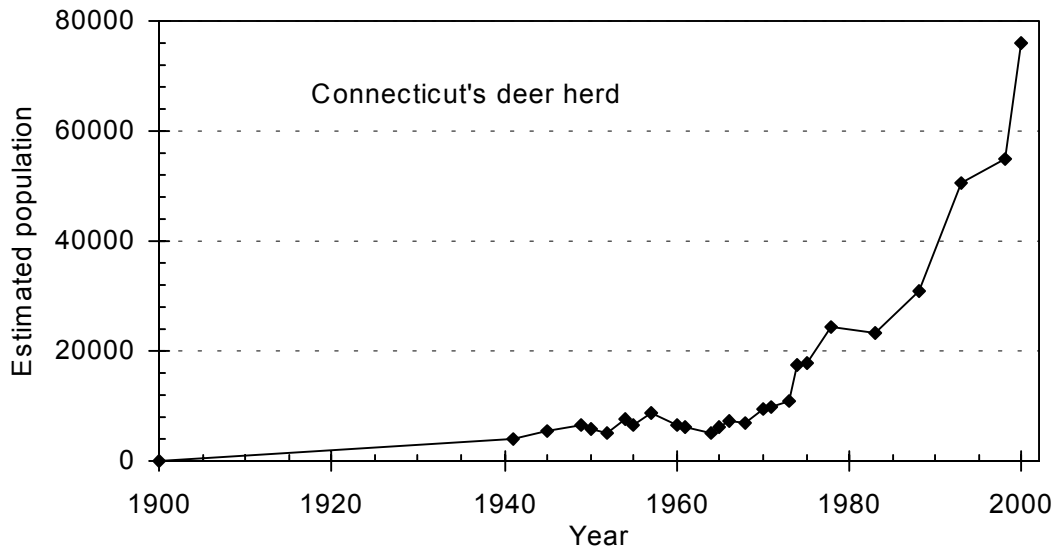


Figure 1. Estimated deer population in Connecticut (compiled from Herig 1974, Anon. 1985, Kilpatrick 1999, Gregonis 2000).

browse line may develop where all palatable plant parts within six feet of the ground are eaten. Under starvation conditions deer begin to strip bark off small trees and branches.

Browse damage by large deer herds is a problem throughout much of the United States, including Connecticut (Conover 1995). The problem can be especially acute in, or near, parks and natural areas where hunting is prohibited. Forest understories have become dominated by browse resistant species such as hophornbeam, blue beech and striped maple along with exotic invasives such as Japanese barberry, ailanthus, oriental bittersweet, and winged euonymus. Unfortunately, these browse resistant species often have lower economic, aesthetic, and wildlife values than the species they displace. The damage caused by browsing is not limited to trees. At least 98 threatened or endangered plants are browsed by white-tailed deer (Miller et al. 1992a). Many spring wildflowers (lilies, trilliums, orchids, lobelias, and buttercups) and flowering shrubs (dogwoods, viburnums, roses, and rhododendrons) are favored by deer. Change in forest structure caused by deer browse can have a negative impact on bird species that nest in the understory (McShea and Rappole 1997).

Severe deer browse has fostered groundcovers dominated by ferns, grasses, and unpalatable tree species in some forests (Miller et al. 1992a, Strole and Anderson 1992, Rooney and Dress 1997). Understories dominated by hophornbeam, blue beech, striped maple, and barberry are good indicators of severe browse pressure. Severe browsing also reduces natural regeneration of desired species (e.g.,

oak, maple, pine) needed to replace harvested or dead trees. In areas where eastern hemlock is threatened by hemlock woolly adelgid, replanting with other conifers would be futile unless the seedlings are given some protection from browsing (Ward et al. 2000).

There are five strategies for reducing deer browse damage to landscape plants: herd control, psychological, repellents, physical barriers, and plant selection. This Bulletin focuses on choosing plants that are appropriate for the level of browse damage in your neighborhood. The effectiveness of this strategy will depend on your tolerance of deer browse damage, local deer density, their feeding habits, and availability of food in the neighborhood and the surrounding woods. Which species are browsed, and the amount of browse damage, will vary from year to year, and from neighborhood to neighborhood.

DEER BROWSE DAMAGE SURVEY

Over the past two years, 269 Connecticut gardeners in 63 towns have participated in a survey of deer browse damage. An analysis of the surveys shows that gardens and landscape plants of most respondents have been impacted by deer. The average gardener reported growing 66 species of landscape plants (range 1-247). Most gardeners (97%) who completed the survey have had some browse damage to their landscape plants. Eighty-eight percent of gardeners noted browse damage to both their shrubs and herbaceous plants. Fully 95% of respondents have observed one or more deer on their property.

Table 1. Landscape species that Connecticut gardeners have discontinued growing because of extreme deer browse damage.

>20% of gardeners		
Tulip (<i>Tulipa</i>)	Yew (<i>Taxus</i>)	Golden sunflower (<i>Heliopsis</i>)
Foxtail lilies (<i>Eremurus</i>)	Perennial sunflower (<i>Helianthus</i>)	Lilies (<i>Lilium</i>)
Hosta (<i>Hosta</i>)		
15-19% of gardeners		
Daylily (<i>Hemerocallis</i>)	Euonymus (<i>Euonymus</i>)	Arborvitae (<i>Thuja</i>)
Bolton's aster (<i>Boltonia</i>)	Annual sunflower (<i>Helianthus</i>)	Miniature hollycocks (<i>Sidalcea</i>)
Impatiens (<i>Impatiens</i>)	Phlox, garden or summer (<i>Phlox paniculata</i>)	
10-14% of gardeners		
Hibiscus (<i>Hibiscus</i>)	Caladium (<i>Caladium</i>)	Lupine (<i>Lupinus</i>)
Canna (<i>Canna</i>)	Painted daisy (<i>Pyrethrum</i>)	Dahlia (<i>Dahlia</i>)
Rose mallow (<i>Malva</i>)	Flax (<i>Linum</i>)	English daisy (<i>Bellis</i>)
Galdiolus (<i>Galdiolus</i>)	Turtlehead (<i>Chelone</i>)	Hollyhock (<i>Alcea</i>)
Black-eyed Susan (<i>Rudbeckia</i>)	Shasta daisy (<i>Leucanthemum</i>)	Yucca (<i>Yucca</i>)
Candytuft (<i>Iberis</i>)	Coneflower (<i>Echinacea</i>)	Azalea, deciduous (<i>Rhododendron</i>)

As part of the survey, gardeners noted which species had, and had not, been browsed in their gardens. This provided an estimate of the frequency of browse damage. For example, 132 of 195 gardeners (68%) who grew impatiens (*Impatiens wallerana*) noted some browse damage. In contrast, only 3 of 62 gardeners (5%) noted browse damage on catnip (*Nepeta cataria*). Frequency of browse damage ranged from 0% for poison ivy (*Rhus radicans*) and birch (*Betula* spp.) to a high of 90% of hosta (*Hosta* spp.).

Gardeners then recorded the amount of browse damage (severity) to plants that had been browsed. Severity was noted on a scale from 0-5: 0-no damage, 1-light damage (rarely noticed), 2-moderate damage (noticeable but tolerable), 3-heavy damage (growth and floral display affected), 4-severe damage (some plants have to be replaced), and 5-extreme (cannot grow species). Of those species that had been browsed, severity ranged from 1 (light damage) for oak (*Quercus* spp.), winter aconite (*Eranthis* spp.), and kerria (*Kerria japonica*) to 4.3 (severe) for tulip (*Tulipa* spp.).

The relationship between browse frequency and severity is shown in Figure 2. As might be expected, frequency and severity were highly correlated ($r=0.601$, $\chi^2=93.9$, $p<0.001$). Species that were frequently browsed (> 60%), such as daylilies (*Hemerocallis* spp.), had moderately heavy to severe damage when browsed. Light damage was noted on species that were infrequently browsed, such as lavender (*Lavandula angustifolia*) and thyme (*Thymus* spp.).

Browse damage can cause a shift in the type and number of landscape species that are grown. In general, more species were grown in gardens that had low browsing frequency than in gardens where most species had some browse damage (Fig. 3). There were 229 respondents who reported

growing at least 10 species of landscape plants. Of these, 134 had stopped growing at least one species because of deer browse damage (Table 1). Gardeners who have reported extreme browse damage have discontinued growing an average of 5.6 species (range 1-34 species). Over half of the gardeners who completed the survey have stopped growing tulips because of browse damage. In addition, one-fifth of gardeners who had grown yew (*Taxus* spp.), perennial sunflowers (*Helianthus x multiflorus*), foxtails lilies (*Eremurus*), lilies (*Lilium*), and hosta no longer do so because of extreme deer browse damage.

SELECTING PLANTS

No species is completely immune to browse damage. This is exemplified by daffodils (*Narcissus* spp.). Daffodils are listed as highly resistant to deer browse damage (Horton and Edge 1994, Tilt et al. 1996, Kays et al. 1997). However, 15% of gardeners in this survey reported at least some browse damage, albeit light, to their daffodils. This damage was probably caused by fawns that had not yet learned that daffodils were unpalatable because of calcium oxylate crystals and toxic alkaloids (Foster and Caras 1994).

An index of browse damage susceptibility was calculated for each species using both the frequency and severity of browsing using:

$$\text{Index of browse damage susceptibility} = 100 * \text{frequency} * \text{severity}.$$

High index values indicate species susceptible to browse damage. Species that are resistant to browse damage have low index values. If you are starting a new garden, or are uncertain about browse damage in your neighborhood, use the following general guide. Plants with index values over

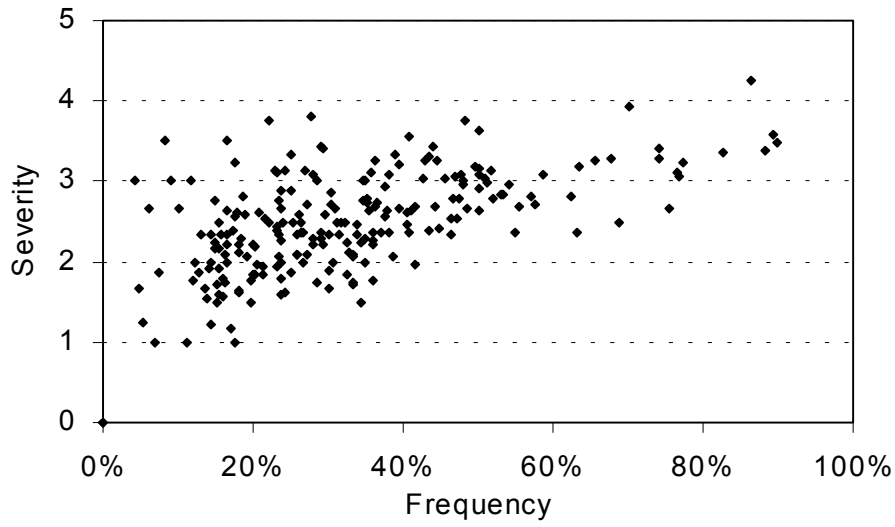


Figure 2. The relationship between browse damage severity and frequency for 224 landscape species in Connecticut. Browse severity ranges from 0 (no damage) to 5 (cannot grow plants). Frequency (%) is the proportion of gardeners who observed browse damage to a species in their garden.

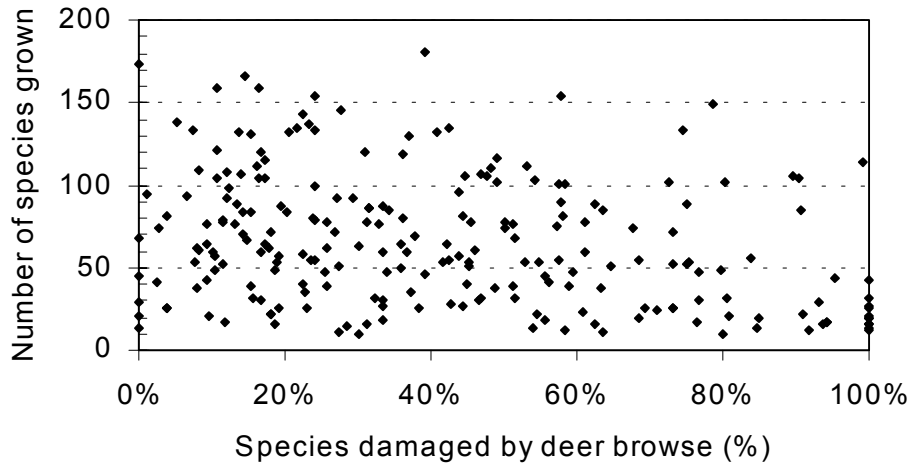


Figure 3. The relationship between the number of landscape species grown and the proportion of species damaged by deer browse for 229 gardeners in Connecticut. Only gardeners who grew at least ten species are shown.

Table 2. Plants that were found to be resistant to deer browse damage by a survey of Connecticut gardeners. These plants are appropriate for areas where moderate browse damage may be expected. Plants are listed by common name with genus in parentheses.

<u>Annuals and perennials grown as annuals</u>		
Spiderflower (<i>Cleome</i>)	Marigold (<i>Tagetes</i>)	Forget-me-not (<i>Myosotis</i>)
Vinca (<i>Catharanthus</i>)	Alyssum (<i>Lobularia</i>)	Dusty miller (<i>Senecio</i>)
<u>Groundcovers</u>		
Myrtle (<i>Vinca</i>)	Dead nettle (<i>Lamium</i>)	Pachysandra (<i>Pachysandra</i>)
Bugleweed (<i>Ajuga</i>)	Sweet woodruff (<i>Galium</i>)	Wild ginger (<i>Asarum</i>)
<u>Bulbs and corms</u>		
Hen & chicks (<i>Sempervivum</i>)	Star of Bethlehem (<i>Ornithogalum</i>)	Snowdrop (<i>Galanthus</i>)
Ornamental chives (<i>Allium</i>)	Daffodil (<i>Narcissus</i>)	
<u>Herbaceous perennials</u>		
Lily of the valley (<i>Convallaria</i>)	Lamb's ears (<i>Stachys</i>)	Lavender (<i>Lavandula</i>)
Yarrow (<i>Achillea</i>)	Foxglove (<i>Digitalis</i>)	Mint (<i>Mentha</i>)
Russian sage (<i>Perovskia</i>)	Oregano (<i>Origanum</i>)	Silvermound (<i>Artemisia</i>)
Lady's mantle (<i>Alchemilla</i>)	Thyme (<i>Thymus</i>)	Poppy (<i>Papaver</i>)
Catmint (<i>Nepeta</i>)	Goldenrod (<i>Solidago</i>)	Rubarb (<i>Rheum</i>)
Monkshood (<i>Aconitum</i>)	Mayapple (<i>Podophyllum</i>)	
<u>Vines</u>		
Bittersweet (<i>Celastrus</i>)	Wisteria (<i>Wisteria</i>)	Virginia creeper (<i>Parthenocissus</i>)
<u>Shrubs and trees</u>		
Leucothoe (<i>Leucothoe</i>)	Flowering quince (<i>Chaenomeles</i>)	Weigela (<i>Weigela</i>)
Butterfly bush (<i>Buddleia</i>)	Deutzia (<i>Deutzia</i>)	Spruce (<i>Picea</i>)
Cotoneaster (<i>Cotoneaster</i>)	Boxwood (<i>Buxus</i>)	Spirea (<i>Spiraea</i>)
Honeysuckle (<i>Lonicera</i>)	Heather (<i>Calluna</i>)	Barberry (<i>Berberis</i>)
Goldenbells (<i>Forsythia</i>)	Andromeda (<i>Pieris</i>)	

Table 3. Plants that were found to be very susceptible to deer browse damage by a survey of Connecticut gardeners. These plants are not likely to survive in areas where deer browse damage is expected. Plants are listed by common name with genus in parentheses.

<u>Annuals and perennials grown as annuals</u>		
Impatiens (<i>Impatiens</i>)	Sunflower (<i>Helianthus</i>)	English daisy (<i>Bellis</i>)
Dahlia (<i>Dahlia</i>)	Fibrous begonia (<i>Begonia</i>)	
<u>Bulbs and corms</u>		
Tulip (<i>Tulipa</i>)	Daylily (<i>Hemerocallis</i>)	Lilies (<i>Lilium</i>)
Spring-flowering crocus (<i>Crocus</i>)		
<u>Herbaceous perennials</u>		
Hosta (<i>Hosta</i>)	Garden phlox (<i>P. paniculata</i>)	Hollyhock (<i>Alcea</i>)
Daisy (<i>Chrysanthemum</i>)	Black-eyed Susan (<i>Rudbeckia</i>)	Jerusalem artichoke (<i>Helianthus</i>)
Candytuft (<i>Iberis</i>)	Shasta daisy (<i>Leucanthemum</i>)	Coneflower (<i>Echinacea</i>)
Cardinal flower (<i>Lobelia</i>)	Hibiscus (<i>Hibiscus</i>)	Rose mallow (<i>Malva</i>)
<u>Shrubs and trees</u>		
Yew (<i>Taxus</i>)	Euonymus (<i>Euonymus</i>)	Arborvitae (<i>Thuja</i>)
Deciduous azalea (<i>Rhododendron</i>)	Rhododendron (<i>Rhododendron</i>)	Evergreen azalea (<i>Rhododendron</i>)
Rose (<i>Rosa</i>)	Hydrangea (<i>Hydrangea</i>)	American holly (<i>Ilex</i>)
Evergreen holly (<i>Ilex</i>)	Yucca (<i>Yucca</i>)	Eastern red cedar (<i>Juniperus</i>)
Juniper (<i>Juniperus</i>)	Mountain laurel (<i>Kalmia</i>)	Hemlock (<i>Tsuga</i>)

200 will probably suffer severe-to-extreme browse damage if deer are browsing plants on other properties in the neighborhood. Plants with index values between 100-200 will likely suffer heavy-to-severe browse damage; index values between 50-100 indicate plants may occasionally be damaged; and plants with index values < 50 are unlikely to be damaged by deer browsing. A simplified summary of this study is provided to help you choose plants for your garden. Browse resistant species (low index values) are in Table 2. Species that are susceptible to browse damage (high index values) are in Table 3.

More comprehensive guides with 256 landscape species can be found in Tables 4 – 9. Plants are grouped into general growth types. Table 4 lists annuals and perennials grown as annuals in Connecticut. Table 5 lists groundcovers and Table 6 lists bulbs and corms. Herbaceous perennials are listed in Table 7. Table 8 lists vines and Table 9 lists shrubs and small trees. In each table, plants that are most susceptible to browse damage are found at the beginning of the list, and plants that are resistant to browse damage are found at the end of the list.

To use the comprehensive guides it is important to determine the degree of browse damage to landscape plants in your neighborhood. The first step is to note which plants in your garden are lightly or occasionally browsed, i.e., occasional nibbling here and there. Where possible, scout for browse damage in your neighborhood, especially on plants that you are considering adding to your landscape. Discovering which species have light browse damage will allow you to determine the browse pressure in your neighborhood.

The next step is to find those plants that are lightly or occasionally browsed in your neighborhood on one of the lists (Tables 4-9). Note the index values for each species. Lastly, choose plants with a similar or lower index value for your garden.

I will use the gardens of May Flores (a hypothetical gardener) as an example. The numbers in parentheses are the index value for each species. She observed that deer destroyed her tulips (368) and hosta (314), and caused moderate damage to her crocus (142), hollyhocks (158), and foundation junipers (149). Damage to her viburnums (98), gayfeathers (100), and larkspurs (87) was light (acceptable). This indicates that she should select plants with index values

less than 100 (e.g., nasturtiums, pachysandra, fritillary, primrose, etc.). These plants should experience little or light damage in her garden. There are no guarantees against browse damage (deer are unpredictable), but choosing resistant plants will increase the odds that deer will not cause extensive damage to the shrubs and flowers in your landscape.

OTHER HINTS

There are other steps you can take to reduce deer browse damage. Plant the most browse resistant plants along the edge of your property or where deer access your property (Table 2). This will help deter deer from including your landscape as part of their feeding territory. Plants that are highly susceptible to deer browse (Table 3) should be planted close to the most commonly used door, intermingled with browse resistant plants, or grown within a small fenced area (Lee 1998, Miller et al. 1992b).

Research at The Connecticut Agricultural Experiment Station and elsewhere has shown that repellents can reduce deer browsing in orchards, nurseries, and Christmas tree plantations (Swihart and Conover 1988, Manson 1997). Plastic flagging or metal pie pans attached to treated foliage can increase the effectiveness of a repellent (Campbell and Evans 1987). Repellents may be sufficient to lower browse damage to an acceptable level. The relative effectiveness of repellents varied among studies and plant species (Swihart and Conover 1988, El Hani and Conover 1995, Lutz and Swanson 1995, Anon. 1998). For example, Anon. (1998) recommended Hinder as the most effective and inexpensive product. However, Lutz and Swanson (1995) ranked Hinder average in effectiveness. More information on using repellents can be found in Manson (1997).

ACKNOWLEDGEMENTS

This work would not have been possible without the gardeners of Connecticut who participated in the browse survey. A special thanks to the Federated Garden Clubs of Connecticut, the Wilton Garden Club, and Ms. Margaret Boehm for their assistance.

Table 4. Annuals and perennials grown as annuals in Connecticut listed from most to least susceptible to browse damage. Index is a composite of percent of respondents reporting damage for that species (%) and average damage when there was browsing (Avg.): 0=No damage, 1=Light damage (<10%), 2=Moderate damage (10-25%), 3=Heavy damage (25-50%), 4=Severe damage (50-75%), and 5=Extreme, can't grow plants. N is the number of respondents for each species.

Common name	Genus	Browse damage Index	%	Avg.	N
Impatiens	Impatiens	223	68%	3.3	195
Sunflower	Helianthus	181	48%	3.8	83
English daisy	Bellis	180	59%	3.1	46
Dahlia	Dahlia	159	54%	3.0	74
Fibrous begonia	Begonia	155	51%	3.0	49
Tuberous begonia	Begonia	151	53%	2.8	47
Caladium	Caladium	145	41%	3.6	22
Zinnias	Zinnias	138	46%	3.0	81
Aster	Callistephus	131	50%	2.6	70
Galdiolus	Galdiolus	126	39%	3.2	38
Geranium	Pelargonium	119	44%	2.7	133
Flowering kale, cabbage	Brassica	118	36%	3.3	33
Coleus	Coleus	118	46%	2.5	56
Petunia	Petunia	105	40%	2.7	81
Cosmos	Cosmos	100	38%	2.6	79
Canna	Canna	100	29%	3.4	24
Morning glory	Ipomoea	96	35%	2.7	54
Pinks, Sweet William	Dianthus	88	37%	2.4	73
Larkspur	Consolida	87	30%	2.9	23
Moss rose	Portulaca	86	29%	3.0	28
Nasturtium	Tropaeolum	85	27%	3.1	52
Pansy	Viola	82	31%	2.7	113
Snapdragons	Antirrhinum	80	39%	2.1	83
Lobelia	Lobelia	79	32%	2.5	66
Globe amaranth	Gomphrena	70	35%	2.0	20
Verbena	Verbena	69	33%	2.1	52
Salvia	Salvia	65	29%	2.2	92
Cockscomb	Celosia	64	28%	2.3	25
Blue floss flower	Ageratum	59	32%	1.8	37
Spiderflower	Cleome	55	22%	2.5	51
Marigold	Tagetes	47	18%	2.6	101
Forget-me-not	Myosotis	45	23%	1.9	69
Vinca	Catharanthus	38	24%	1.6	84
Alyssum	Lobularia	30	20%	1.5	61
Dusty miller	Senecio	22	14%	1.5	79

Table 5. Groundcovers suitable for Connecticut listed from most to least susceptible to browse damage. Index is a composite of percent of respondents reporting damage for that species (%) and average damage when there was browsing (Avg.): 0=No damage, 1=Light damage (<10%), 2=Moderate damage (10-25%), 3=Heavy damage (25-50%), 4=Severe damage (50-75%), and 5=Extreme, can't grow plants. N is the number of respondents for each species.

Common name	Genus	Browse damage		Avg.	N
		Index	%		
Ground ivy	Hedera	118	38%	3.1	84
Thrift, seapine	Armeria	105	35%	3.0	20
Myrtle, periwinkle	Vinca	45	20%	2.2	128
Dead nettle	Lamium	44	17%	2.6	48
Pachysandra	Pachysandra	41	21%	1.9	150
Wild ginger	Asarum	39	18%	2.1	44
Bugleweed	Ajuga	34	16%	2.1	61
Sweet woodruff	Galium	25	12%	2.0	65

Table 6. Bulbs and corms suitable for Connecticut gardens listed from most to least susceptible to browse damage. Index is a composite of percent of respondents reporting damage for that species (%) and average damage when there was browsing (Avg.): 0=No damage, 1=Light damage (<10%), 2=Moderate damage (10-25%), 3=Heavy damage (25-50%), 4=Severe damage (50-75%), and 5=Extreme, can't grow plants. N is the number of respondents for each species.

Common name	Genus	Browse damage		Avg.	N
		Index	%		
Tulip	Tulipa	368	86%	4.3	183
Daylily	Hemerocallis	298	88%	3.4	204
Lilies	Lilium	277	83%	3.3	149
Spring-flowering crocus	Crocus	142	48%	3.0	129
Wood hyacinth	Endymion	104	35%	3.0	55
Hyacinth	Hyacinthus	100	41%	2.5	96
Trout lily	Erythronium	90	38%	2.4	42
Iris (rhizome)	Iris	85	36%	2.4	133
Iris (bulbs)	Iris	83	34%	2.5	121
Autumn-flowering crocus	Crocus	83	25%	3.3	24
Grape hyacinth	Muscari	82	36%	2.3	103
Fritillaria	Fritillaria	80	36%	2.2	25
Siberian squil	Scilla	68	24%	2.9	38
Glory-of-the-snow	Chionodoxa	66	26%	2.5	38
Autumn crocus	Colchicum	58	17%	3.5	24
Hen & chicks	Sempervivum	52	19%	2.8	86
Snowflake	Leucojum	47	13%	3.5	15
Star of Bethlehem	Ornithogalum	45	18%	2.6	40
Snowdrop	Galanthus	29	15%	1.9	78
Ornamental chives	Allium	27	14%	1.9	85
Daffodil	Narcissus	23	15%	1.5	198

Table 7. Herbaceous perennials suitable for Connecticut gardens listed from most to least susceptible to browse damage. Index is a composite of percent of respondents reporting damage for that species (%) and average damage when there was browsing (Avg.): 0=No damage, 1=Light damage (<10%), 2=Moderate damage (10-25%), 3=Heavy damage (25-50%), 4=Severe damage (50-75%), and 5=Extreme, can't grow plants. N is the number of respondents for each species.

Common name	Genus	Browse damage		Avg.	N
		Index	%		
Hosta	Hosta	314	90%	3.5	216
Golden sunflower	Heliopsis	275	70%	3.9	20
Phlox, garden/ summer	P. paniculata	243	74%	3.3	54
Turtlehead	Chelone	214	66%	3.3	29
Sunflower, perennial	Helianthus	182	50%	3.6	38
Candytuft	Iberis	161	52%	3.1	62
Hollyhock	Alcea	158	50%	3.2	60
Daisy	Chrysanthemum	158	50%	3.2	105
Black-eyed Susan	Rudbeckia	154	50%	3.1	102
Shasta daisy	Leucanthemum	152	51%	3.0	92
Coneflower	Echinacea	147	48%	3.1	105
Stonecrop	Aethionema	146	50%	2.9	24
Hibiscus	Hibiscus	144	44%	3.3	36
Cardinal flower	Lobelia	144	47%	3.1	34
Bolton's aster	Boltonia	144	48%	3.0	25
Rose mallow	Malva	143	43%	3.3	53
Stokes' aster	Stokesia	139	43%	3.3	28
Aster	Aster	133	48%	2.8	82
Joe Pye weed	Eupatorium	130	49%	2.7	37
Lupine	Lupinus	130	39%	3.3	54
Balloonflower	Platycodon	129	43%	3.0	68
Solomon's seal	Polygonatum	129	47%	2.8	58
Stonecrop	Sedum	111	42%	2.7	53
Blanketflower	Gaillardia	111	36%	3.1	28
Larkspur	Delphinium	110	38%	2.9	40
Phlox, creeping	Phlox	108	41%	2.6	100
Bellflower	Campanula	106	41%	2.6	69
Pasqueflower, snowdrop	Anemone	106	28%	3.8	18
Blazing star, gayfeather	Liatris	100	37%	2.7	41
Gentian	Gentiana	100	29%	3.4	17
Butterfly weed	Asclepias	98	35%	2.8	51
Marsh marigold	Caltha	96	41%	2.4	27
Bugbane, Fairy candles	Cimicifuga	96	35%	2.8	23
False indigo	Baptisia	94	35%	2.6	31
Obedient plant	Physostegia	86	28%	3.1	43
Flax	Linum	83	22%	3.8	18
Speedwell	Veronica	83	30%	2.7	46
Meadow rue	Thalictrum	81	32%	2.5	31
Primrose	Primula	77	31%	2.5	74
Coralbells	Heuchera	77	30%	2.6	98
Yellow bleeding heart	Corydalis	76	24%	3.1	29
Violet	Viola	73	31%	2.3	105
Virginia Bluebell	Mertensia	73	32%	2.3	37
Bloodroot	Sanguinaria	72	23%	3.1	39
Pincushion flower	Scabiosa	71	23%	3.1	35
Goatsbeard	Aruncus	70	33%	2.1	30
Spiderwort	Tradescantia	70	30%	2.3	40
Lungwort	Pulmonaria	69	33%	2.1	51
Evening primrose	Oenothera	68	29%	2.4	76

Table 7. Herbaceous perennials suitable for Connecticut gardens listed from most to least susceptible to browse damage (continued). Index is a composite of percent of respondents reporting damage for that species (%) and average damage when there was browsing (Avg.): 0=No damage, 1=Light damage (<10%), 2=Moderate damage (10-25%), 3=Heavy damage (25-50%), 4=Severe damage (50-75%), and 5=Extreme, can't grow plants. N is the number of respondents for each species.

Common name	Genus	Browse damage			N
		Index	%	Avg.	
Cranesbill	Geranium	68	26%	2.6	65
False Solomon's seal	Smilacina	63	27%	2.4	30
Bachelor buttons	Centaurea	63	24%	2.7	38
Beebalm	Monarda	63	25%	2.5	103
Columbine	Aquilegia	62	28%	2.2	114
Purple loosestrife	Lythrum	62	31%	2.0	26
Peony	Paeonia	60	26%	2.3	124
Celandine poppy	Stylophorum	60	24%	2.5	25
Baby's breath	Gypsophila	57	18%	3.2	51
Meadow sage	Salvia	57	30%	1.9	30
Loosestrife	Lysimachia	56	23%	2.4	39
Red-hot poker	Kniphofia	56	22%	2.5	18
Carnation, pinks	Dianthus	55	23%	2.3	64
Comfrey	Symphytum	54	21%	2.6	24
Bleeding heart	Dicentra	54	26%	2.1	139
False spirea	Astilbe	54	26%	2.1	89
Jacob's ladder	Polemonium	53	27%	2.0	90
Foamflower	Tiarella	52	34%	1.5	29
Lenten rose	Helleborus	50	29%	1.8	28
Tickseed	Coreopsis	49	19%	2.6	63
Monkshood	Aconitum	44	20%	2.2	45
Foxglove	Digitalis	42	18%	2.3	98
Globe thistle	Echinops	41	15%	2.8	54
Yarrow	Achillea	40	21%	2.0	112
Ragged robin	Lychnis	39	21%	1.8	28
Silvermound	Artemisia	37	20%	1.8	89
Lady's mantle	Alchemilla	37	17%	2.2	84
Basket of gold	Aurinia	37	16%	2.3	19
Russian sage	Perovskia	35	20%	1.8	91
Rue	Ruta	33	15%	2.3	27
Betony, Lamb's ears	Stachys	33	15%	2.2	117
Snow-on-mountain	Euphorbia	30	13%	2.3	23
Lily of the valley	Convallaria	30	18%	1.7	126
Lavender	Lavandula	30	18%	1.6	115
Mayapple	Podophyllum	29	16%	1.8	31
Snow-in-summer	Cerastium	29	14%	2.0	28
Rhubarb	Rheum	26	15%	1.7	46
Poppy	Papaver	25	15%	1.6	65
Goldenrod	Solidago	24	13%	1.9	55
Costmary, tansy	Tanacetum	23	14%	1.7	22
Oregano, marjoram	Origanum	18	14%	1.2	90
Lemon balm	Melissia	16	6%	2.7	49
Mint	Mentha	14	8%	1.9	93
Trillium	Trillium	13	4%	3.0	23
Catmint	Nepeta	8	5%	1.7	62
Thyme	Thymus	7	5%	1.3	76

Table 8. Vines suitable for Connecticut gardens listed from most to least susceptible to browse damage. Index is a composite of percent of respondents reporting damage for that species (%) and average damage when there was browsing (Avg.): 0=No damage, 1=Light damage (<10%), 2=Moderate damage (10-25%), 3=Heavy damage (25-50%), 4=Severe damage (50-75%), and 5=Extreme, can't grow plants. N is the number of respondents for each species.

Common name	Genus	Browse damage		Avg.	N
		Index	%		
Clematis	Clematis	74	27%	2.7	103
Trumpet creeper	Campsis	48	24%	2.0	21
Bittersweet	Celastrus	40	18%	2.2	50
Wisteria	Wisteria	33	15%	2.2	40
Virginia creeper	Parthenocissus	20	17%	1.2	35
Poison ivy	Rhus radicans	0	0%	0.0	28

Table 9. Shrubs and trees suitable for Connecticut gardens listed from most to least susceptible to browse damage. Index is a composite of percent of respondents reporting damage for that species (%) and average damage when there was browsing (Avg.): 0=No damage, 1=Light damage (<10%), 2=Moderate damage (10-25%), 3=Heavy damage (25-50%), 4=Severe damage (50-75%), and 5=Extreme, can't grow plants. N is the number of respondents for each species.

Common name	Genus	Browse damage		Avg.	N
		Index	%		
Yew	Taxus	320	89%	3.6	150
Euonymus	Euonymus	252	74%	3.4	50
Arborvitae	Thuja	250	77%	3.2	101
Azalea, deciduous	Rhododendron	239	77%	3.1	98
Rhododendron	Rhododendron	236	77%	3.1	134
Azalea, evergreen	Rhododendron	202	63%	3.2	189
Rose	Rosa	201	75%	2.7	146
Hydrangea	Hydrangea	176	63%	2.8	144
American holly	Ilex	171	69%	2.5	48
Holly, deciduous	Ilex	161	57%	2.8	28
Holly, evergreen	Ilex	157	58%	2.7	125
Yucca	Yucca	151	44%	3.4	41
Eastern red cedar	Juniperus	151	53%	2.8	45
Mountain laurel	Kalmia	149	56%	2.7	162
Juniper, shrub	Juniperus	149	63%	2.4	133
Hemlock	Tsuga	144	52%	2.8	104
Willow	Salix	130	55%	2.4	20
Rose of Sharon	Hibiscus	120	47%	2.5	70
Crabapple, apple	Malus	109	46%	2.3	56
Burning bush	Euonymus	108	45%	2.4	183
Daphne	Daphne	104	43%	2.4	23
Viburnum	Viburnum	98	36%	2.7	88
Summersweet	Clethra	96	38%	2.6	24
Dogwood, bunchberry	Cornus	81	42%	2.0	53
Pine	Pinus	80	34%	2.3	103
Mockorange	Philadelphus	77	34%	2.3	35
Smoke Bush	Cotinus	73	27%	2.8	15
Firethorn, contoneaster	Pyracantha	72	25%	2.9	36
Witch hazel	Hamamelis	67	29%	2.3	24
Blueberry, cranberry	Vaccinium	64	36%	1.8	25
Lilac	Syringa	62	26%	2.4	137
Leucothoe	Leucothoe	58	33%	1.7	81
Flowering almond	P. glandulosa	57	33%	1.7	21

Table 9. Shrubs and trees suitable for Connecticut gardens listed from most to least susceptible to browse damage (Continued). Index is a composite of percent of respondents reporting damage for that species (%) and average damage when there was browsing (Avg.): 0=No damage, 1=Light damage (<10%), 2=Moderate damage (10-25%), 3=Heavy damage (25-50%), 4=Severe damage (50-75%), and 5=Extreme, can't grow plants. N is the number of respondents for each species.

Common name	Genus	Browse damage		Avg.	N
		Index	%		
Flowering quince	Chaenomeles	57	27%	2.1	44
Weigela	Weigela	56	23%	2.4	43
Butterfly bush	Buddleia	54	24%	2.3	93
Deutzia	Deutzia	50	30%	1.7	30
Spruce	Picea	48	23%	2.1	77
Cotoneaster	Cotoneaster	47	25%	1.9	64
Shadbush	Amelanchier	43	24%	1.8	21
Cinquefoil	Potentilla	41	17%	2.4	29
Boxwood	Buxus	39	19%	2.1	89
Spiraea	Spiraea	39	24%	1.6	87
Broom	Cytisus	38	15%	2.5	26
Honeysuckle	Lonicera	37	20%	1.8	65
Heather	Calluna	33	17%	2.0	30
Bluebeard	Caryopteris	29	8%	3.5	24
Barberry	Berberis	28	16%	1.8	74
Beautybush	Kolkwitzia	27	9%	3.0	22
Goldenbells	Forsythia	25	16%	1.6	44
Andromeda	Pieris	21	12%	1.8	141
Kerria	Kerria	18	18%	1.0	17

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