HO-102

Cooperative Extension Service

Annual and Perennial Flowers

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In this chapter:

Can you imagine a world without flowers? Their textures, colors, scents, and forms inspire gardeners, artists, and writers. The desire to grow flowers often motivates novices to take up gardening and moves experienced gardeners to become flower specialists. Annuals, biennials, and herbaceous perennials offer variety and interest to all styles of gardens.

Not so long ago, flowers often were separated from other parts of the garden. Masses of colorful annuals filled park and home display beds only in summer. Herbaceous perennials, laid out in long borders, demanded intense management without providing year-round interest. Since the 1980s, however, American garden design has moved away from flower displays that are attractive for only a few months, and gardeners now plan landscapes for all seasons. In today's smaller gardens, often entirely visible from inside the home, combinations of evergreen and deciduous shrubs, conifers, and perennial flowers keep the scene fascinating year-round. Gardens often include spring-flowering bulbs, containers of annual flowers, herbs for cooking or tea, and grasses for winter texture.

Plants in contemporary gardens are selected not only for their flowers but for multiseason characteristics, such as leaf form, foliage texture, and color. Flowers remain important, but the gardening world is taking advantage of new possibilities offered by an enormous range of ornamental herbaceous plants. These include annuals, biennials, perennials, and bulbs.

Types of Herbaceous Ornamental Plants

Annuals

Annuals live briefly. They germinate, grow, bloom, and go to seed in one year. Because they die at the end of this cycle, they must be replanted the following season.

Many annuals come up on their own from the previous year's seeds. Some, such as California poppies (*Eschscholzia californica*) and bachelor's buttons (*Centaurea cyanus*), can become weedy by reappearing from seed so prolifically. Whether or not this characteristic is desirable depends on your garden's style. Informally designed cottage-style gardens gain from self-seeded plants, but formal gardens, which require precise balance and layout, do not, and volunteer annuals must be removed.

Colorful, long-blooming, and easy to grow, annuals offer much to gardens. They often produce flowers or decorative leaves steadily from early summer until they set seed or are killed by frost. Annuals are particularly useful for colorful window boxes, container plantings, hanging baskets, and school or youth gardens. Their quick growth from seeds or transplants is gratifying for young gardeners.

Some cool-season annuals such as pansies (*Viola wittrockiana*) and ornamental kale (*Brassica* spp.) can be planted in fall to replace summer annuals in containers, window boxes, and gardens. Table 18.1 lists the height and bloom color of common annuals.

Biennials

Biennials often confuse gardeners. They require two full years to complete their growth cycle and die after the second year. The first year, they grow foliage and roots but do not flower. The second year, they flower and go to seed. Their garden uses are closer to those of annuals than perennials, but many are cherished components of perennial gardens.

Some biennials are spectacularly showy because the inflorescence (flower stalk) can be huge, as on the gray-leafed *Verbascum olympicum*, which reaches eight or nine feet tall. Foxgloves (*Digitalis purpurea*), forget-me-nots (*Myosotis sylvatica*), and hollyhocks (*Alcea rosea*) are common biennials.

Provide undisturbed space for biennial plants, because they require a summer growing season and winter rest before flowering. Many biennials need winter protection in cold climates. Some gardeners start biennials in a nursery bed and move them to permanent positions in their second year when they are ready to flower.

Know how to identify the first-year leaves (the vegetative stage) to avoid pulling the plants as weeds before their second-year flowering period.

In some cases, newer cultivars of some biennials have been bred to produce blooms the first season. Hollyhock 'Queeny Purple' and digitalis 'Camelot' are just two examples. When choosing a plant, be sure to read the information about that particular cultivar.

Table 18.1. Height and bloom color of common annuals.

Plant	Height (inches)	Bloom color
African daisy	6–12	White, yellow, salmon
Ageratum	4–24	Blue, white
Amaranthus	48–96	Red, red and green
Arctotis	24	White with bluish eye
Aster *(Callistephus chinensis)*	18	Yellow, pinkish red, blue, white, lavender
Bacopa	6–10	White, blue
Balsam *(Impatiens balsamina)*	12–18	Rose, purple, white
Basil, purple (foliage)	15	Red-purple foliage
Begonia	6–12	Pink, red, white
Browallia	8–12	Blue, violet, white
Calendula	12–24	Yellow, gold, orange
Cabbage, flowering	8–14	Red to white
Calilbrachoa	6–12	Various
Castor bean (foliage)	72–96	Red, inconspicuous flowers
Capsicum	6–24	Red, orange, purple fruit
Cockscomb *(Celosia)*	18–36	Blue, red, yellow, orange
Cornflower *(Centaurea cyanus)*	36	Pink, blue, white
Coleus (foliage)	8–20	Variegated foliage
Cosmos sulphureus	18–24	Red, orange, yellow
Cosmos bipinnatus	48+	White, lavender
Dusty miller *(Artemisia stelleriana)*	24	Silvery foliage, yellow flowers
Evolvulus 'Blue Daze'	6–10	Blue
Fan flower *(Scaevola aemula)*	6–8	Blue, white
Forget-me-not *(Myosotis)*	12	Blue, pink
Four o'clock *(Mirabilis)*	24	Pink, white, yellow
Gaillardia pulchella	15–24	Yellow, orange, red
Geranium	12–18	pink, red, white, salmon, lavender
Gomphrena	12–36	Lavender, purple, red, white
Heliotrope	10	Rose
Impatiens	8–24	Red, pink, white, orange
Lantana	12–36	Red, yellow, white, lavender
Licorice plant	6–10	Grey, lime-green
Lobelia	4–18	Blue, violet, white, pink
Mandevilla	Vine	Pink
Marigold (Tagetes)	8 - 48	Yellow, orange to red-brown
Melampodium	24	Yellow
Mimulus	12–30	Yellow, red
Nicotiana	24–48	Red, pink, white
Nigella	12–15	White, blue, violet
Pansy (Viola)	8–12	Blue, purple, white, yellow
Petunia	6–12	White to rose, purple
Portulaca	8	Yellow, white, rose, orange
Salvia	18–36	Blue, red, white
Salvia farinacea (mealycup sage)	14–18	Blue, white
Snapdragon *(Antirrhinum)*	6–18	Blue, purple, yellow, orange, red
Statice, *(Limonium) sinuatum*	18–24	Yellow, rose, violet, white
Strawflower *(Helichrysum)*	36	White, red, yellow
Sunflower *(Helianthus)*	12–108	Yellow to red-brown
Sweet alyssum *(Alyssum maritimum)*	3–10	White, purple
Sweet potato vine	vine	Green, purple
Tithonia	48	Orange
Torenia	12	White, blue, violet
Verbena	8–24	White, pink, blue, red
Vinca	8–12	White, lavender, pink
Zinnia	6–36	Red, pink, yellow, orange, white, lime green

Perennials

Unlike annuals and biennials, perennial plants live year after year. Trees and shrubs are woody perennials. Mature garden, park, and arboretum landscapes often are composed mostly of woody perennial plants.

Many familiar garden flowers are perennials, such as peonies (*Paeonia* spp.) and Shasta daisies (*Leucanthemum maximum*). These plants are called herbaceous because they do not form permanent woody branch structures as do shrubs and trees.

Hardy perennials live through winter in the ground, reviving from their crowns in spring. They send up new shoots, often through the remains of the previous year's dead stems, leaves, and flowers. Some perennials, such as peonies *(Paeonia* spp.), may survive for decades, long outliving the gardener who planted them. Some may only live a few years in the garden, if at all. It is very important to choose perennials that are appropriate for the location's hardiness zone and general climate conditions. Some hardy perennials may live for several years in this area and then mysteriously die when no obvious disease or insect problem is apparent. This type of death is often attributed to the "weather." When we have wide temperature fluctuations during the winter, the hardiness of the plant may be affected.

Tender perennials won't survive outdoor winter conditions even with protection. They must be lifted before frost, stored, and replanted after danger of freezing weather passes. Dahlias, gladiolus, and tuberous begonias are just some examples.

How a perennial is classified depends on the climate zone the plant is being grown in. For example, a lantana is an annual

Table 18.2. Bloom season, height, and bloom color of common perennials.*

Botanical name	Common name	Height (inches)	Color
Late winter, spring			
Chionodoxa luciliae	glory-of-the-snow	4	blue
Crocus (species and hybrids)	crocus	4	various
Endymion hispanicus	Spanish bluebell	12-15	blue, white
Eranthis hyemalis	winter aconite	3	yellow
Galanthus nivalis	common snowdrop	6-12	white
Helleborus (species and hybrids)	Lenten rose	15-18	various
Hyacinthus orientalis	hyacinth	12-14	various
Iberis sempervirens	candytuft	3-6	white
Iris danfordiae	danford iris	4-6	yellow
Leucojum vernum	spring snowflake	10-12	white
Mertensia virginica	Virginia bluebells	12-14	blue
Muscari armeniacum	grape hyacinth	6-8	blue
Narcissus pseudonarcissus	narcissus, daffodil	varies	various
Scilla siberica	Siberian squill	3-6	blue
Tulipa (species and hybrids)	tulip	varies	various
Late spring, early summer			
Achillea filipendulina	fern-leaf yarrow	24-36	yellow
Amsonia tabernaemontana	amsonia	12-36	blue
Aquilegia (hybrids)	columbine	varies	various
Aurinia saxatilis	basket-of-gold	12	yellow
Armeria maritima	common thrift	6-12	pink
Astilbe arendsii	astilbe	24-36	various
Baptisia australis	false indigo	36-48	blue
Brunnera macrophylla	heartleaf brummera	12-18	blue
Campanula glomerata	clustered bellflower	12-18	blue, purple
Convallaria majalis	lily of the valley	10-12	white, pink
Dianthus barbatus	sweet William	10-18	various
Dianthus gratianopolitanus	cheddar pink	9-12	rose, pink
Dicentra spectabilis	common bleeding heart	18-24	pink
Galium odoratum	sweet woodruff	4-9	white
Heucherella tiarelloides	foamy bells	15-24	pink
Hemerocallis (hybrids)	daylily	varies	various
Iris (hybrids)	tall bearded iris	12-24	various
Iris sibirica	Siberian iris	24-36	various
Leucanthemum x superbum	shasta daisy	18-24	white
Paeonia suffruticosa	tree peony	varies	various
Paeonia (hybrids)	peony	varies	various
Papaver orientale	Oriental poppy	18-36	various
Phlox subulata	moss phlox	6-9	various
Summer			
Achillea millefolium	common yarrow	12-18	various
Asclepias tuberosa	butterfly weed	24-36	orange
Coreopsis grandiflora	tickseed	12-24	yellow
Coreopsis verticillata	thread leaf coreopsis	18-36	yellow
Echinacea purpurea	purple coneflower	24-36	purple, various
Echinops ritro	globe thistle	12-36	blue
Heliopsis helianthoides	sunflower heliopsis	36-48	yellow, orange
Heuchera sanguinea	coral bells	12-18	red
Hosta (species, hybrids)	hosta	6-36	purple, white
Liatris spicata	spike gayfeather	24-36	mauve
Limonium latifolium	sea lavender	24-30	lavender
Iris kaempferi	Japanese iris	34-30	various
Lilium (species, hybrids)	lily	varies	various
Perovskia atriplicifolia	Russian sage	48+	blue
Phlox paniculata	garden phlox	36-48	various
Rudbeckia fulgida	orange coneflower	18-30	yellow
Late summer and early fall			
Anemone x hybrida	Japanese anemone	24-36	white, pink
Aster novae-angliae	New England aster	48+	violet, purple
Aster novi-belgii	Michaelmas daisy	12-48+	violet
Eupatorium purpureum	Joe-Pye weed	48+	purple
Sedum spectabile	showy stonecrop	12-24	pink
Tricyrtis hirta	common toad-lily	24-36	lilac

*Bloom times are only an estimate, because location and spring temperatures can cause plants to bloom earlier or later than expected.

in Kentucky. In southern Florida, it has become an invasive perennial. When purchasing perennials, look for those plants that are hardy in Zone 6 or less. Some parts of Kentucky are Zone 7, but plants that are labeled as Zone 7b may have some hardiness problems.

Using Herbaceous Perennials in Garden Design

Because perennials reappear year after year, they have advantages over annuals. The plants can fill space rapidly if grown in proper conditions. Many reach their mature size several years after planting, expanding gradually into large, showy clumps. There are hundreds of different perennials, each with a distinct texture, color, scent, and form, which makes choosing plants an intriguing adventure.

Most perennials bloom for a fairly short time, from one to three weeks, although some, such as coreopsis (*Coreopsis verticillata*), can bloom persistently for as long as six weeks. Careful perennial plant selection can provide garden interest from early spring to frost and even through winter.

Italian arum (*Arum italicum*) is an example of a plant that produces winter interest. The foliage appears in late fall and persists over the winter. The bright orange-red berries that are produced on strong stems also provide color well into the winter.

Successful flower gardening depends, as does any other aspect of gardening, on understanding your site's characteristics and matching them to the needs of individual plants. Annual and perennial flowers have been hybridized for centuries, chosen from wild plants originating in bogs, sunny prairies, alpine meadows, woodland shade, and many other growing conditions. Understand your garden environment before selecting herbaceous plants. Analyze the hours of daylight, soil texture, drainage, water availability, and winter frost conditions. Choose plants that have cultural needs matching your garden's characteristics.

For a low-maintenance perennial garden, consider several basic plant characteristics:

- Is the plant long-lived (lasting at least four seasons)?
- Does it grow strongly but not overwhelm other plants?
- Will it have a long bloom time?
- Is it attractive when out of bloom?
- Is it generally pest-resistant?

Peonies (*Paeonia* spp.), purple coneflower (*Echinacea purpurea*), and Autumn Joy sedum (*Sedum spectabile* 'Autumn Joy') are among the many herbaceous perennials that meet these criteria.

Garden design (which should be based on harmonious color patterns), bloom throughout the seasons, and intriguing year-round texture depend on the gardener's taste. Because herbaceous plants are used intensively in modern gardens, many books have excellent suggestions on how to design with them. Visiting gardens and nurseries and keeping an idea notebook also will help you develop design confidence and improve your garden choices.

Table 18.2 lists perennials by season of bloom and gives their height and bloom color. Figure 18.1 illustrates how plants can be arranged according to height, while Figure 18.2 shows arrangement by season of bloom. Figure 18.3 is an example of a garden design that combines perennial and annual flowers with a variety of bloom seasons, colors, heights, and textures.

Selecting Plants

Select annual and perennial plants for the best possible growth qualities. The popularity of flower gardening encourages plant hybridizers and growers to offer improved plants with more vigor, larger flowers, longer bloom periods, and more attractive leaves. For instance, pansies have been selected for color and form, production of pink flowers, orange/purple combinations (*Viola wittrockiana* 'Jolly Joker'), and diminutive yellow forms, as well as the familiar, large, purple-whiskered faces.

When a design specifies a particular plant, look for cultivars that may have improved characteristics over the parent plant. Often this means seeking a named variety rather than simply a straight species. Association garden sales, specialty nurseries, mail-order catalogs, and knowledgeable local gardeners are good sources for extraordinary plants.

Soil Preparation

If you follow some sensible basic steps when installing a new garden, you'll have good results. For perennial gardens, soil preparation is a key to strong future growth. Later applications of fertilizer can't compensate for poorly prepared soil.

First, get rid of weeds, especially perennials such as quackgrass, dandelions, morning glory, and thistles. Then dig thoroughly, loosening the soil to at least 12 inches. (Double-digging often is recommended for herbaceous perennial gardens. This process involves digging 20 to 24 inches deep, loosening the soil, and moving the top layer down about one shovel's depth.

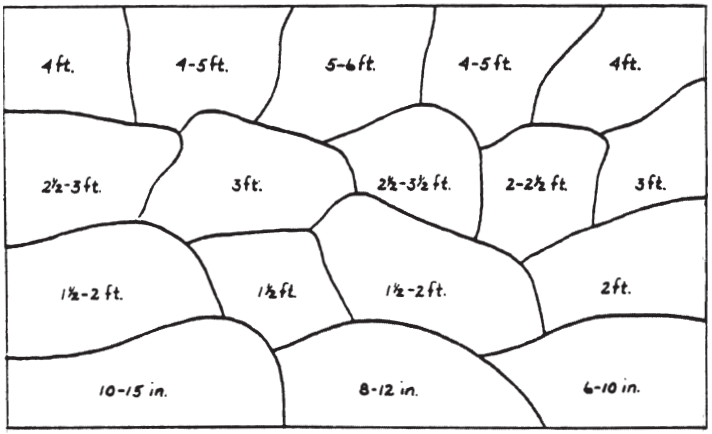


Figure 18.1. Flower border divided into bold plant groupings according to height. Background: large groups of tall plants. Foreground: shallower, wider groupings of small plants.

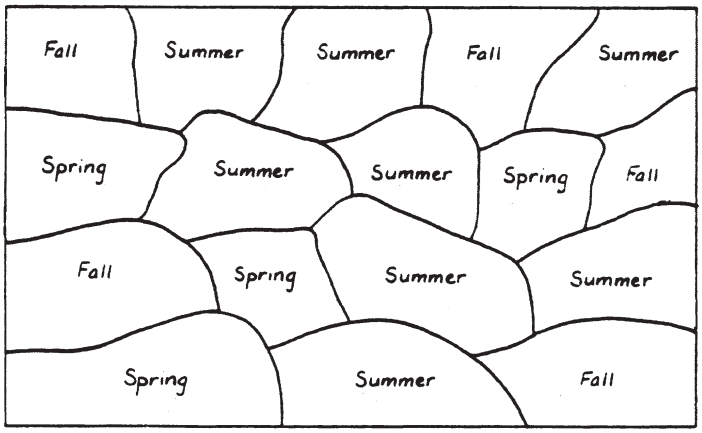
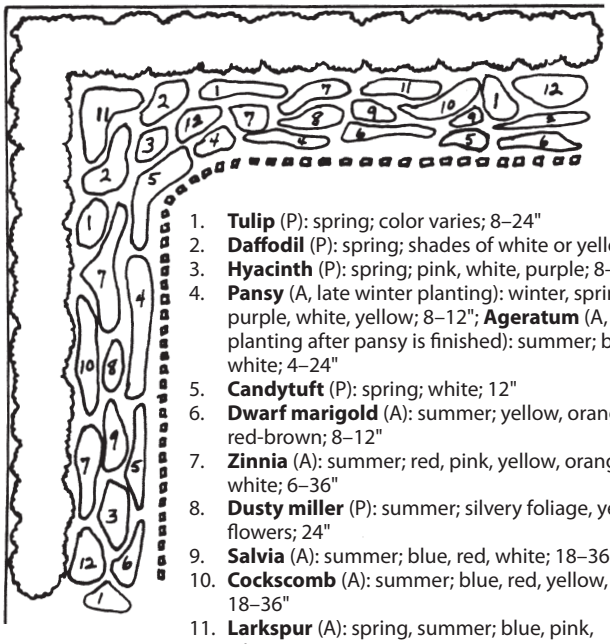


Figure 18.2. Flower border designed for continuous bloom from spring through fall.



1. **Tulip** (P): spring; color varies; 8–24"
2. **Daffodil** (P): spring; shades of white or yellow; 8–24"
3. **Hyacinth** (P): spring; pink, white, purple; 8–12"
4. **Pansy** (A, late winter planting): winter, spring; blue, purple, white, yellow; 8–12"; **Ageratum** (A, June planting after pansy is finished): summer; blue, white; 4–24"
5. **Candytuft** (P): spring; white; 12"
6. **Dwarf marigold** (A): summer; yellow, orange to red-brown; 8–12"
7. **Zinnia** (A): summer; red, pink, yellow, orange, white; 6–36"
8. **Dusty miller** (P): summer; silvery foliage, yellow flowers; 24"
9. **Salvia** (A): summer; blue, red, white; 18–36"
10. **Cockscomb** (A): summer; blue, red, yellow, orange; 18–36"
11. **Larkspur** (A): spring, summer; blue, pink, white; 18–36"
12. **Globe amaranth** (A): summer; white, pink, purple; 15–30"

Figure 18.3. Sample perennial/annual bed with a mix of bloom seasons, flower colors, and heights. In spring, blocks 1, 2, 3, 4, and 5 will bloom. In summer, blocks 4, 6, 7, 8, 9, 10, 11, and 12 will bloom. A=Annual; P=Perennial.

This practice increases air and nutrients available to roots and can produce a fine garden site capable of sustaining plants for many years.)

Spread three to four inches of organic material across the soil surface and dig it in well. This addition will help increase the soil's water-holding capacity and improve root penetration and aeration. Commercial compost, homemade compost, chopped or composted leaves, composted sawdust, fine bark, and composted manure make good amendments.

Recognize that many perennials form large, heavy root structures, which can rot if the site isn't well-drained, particularly if there is a high water table in winter. If you face this situation, improve drainage or choose plants suitable for damp conditions (for instance, cardinal flower [*Lobelia cardinalis*]).

Soil testing is helpful when starting a garden on an unfamiliar site or when expanding an existing garden. Many herbaceous perennials grow well in slightly acid soil, but some need supplemental lime if the soil pH is below 6.0. A soil test will provide a recommendation for adjusting the pH if it is required. Generally, sulphur can be added to lower the pH and lime can be added to increase the pH.

Propagation

Annuals and biennials

These flowers generally are started from seed or are purchased as small plants. Many annual seeds can be sown directly in the garden. For annuals that are hard to transplant, such as Shirley poppies (*Papaver rhoeas*), direct seeding is necessary. When choosing flowers for children's gardens, seeds such as nasturtiums (*Tropaeolum majus*) and sunflowers (*Helianthus annuus*), which sprout quickly and are large enough to handle, inspire satisfaction.

Many other annuals and biennials do best if started in a propagation bed or tray and then transplanted as small plants. Marigolds (*Tagetes* spp.), violas and pansies (*Viola* spp.), and snapdragons (*Antirrhinum majus*) transplant well. Start seedlings indoors four to six weeks before they will be planted in the garden. Provide ample light, using auxiliary light if necessary, to grow stocky, healthy transplants. Beware of starting seedlings too early; they grow poorly if left too long in low light and crowded indoor conditions.

Buying seedlings from nurseries is very convenient, especially for annuals with very fine seeds, notably petunias, impatiens, and fibrous begonias. Unless you have excellent propagation facilities, plants are difficult to grow from fine seed.

Perennials

Perennials grow more slowly than annuals, and many do not bloom the first year, although some will. You can start them from seed in a nursery bed and transplant them to a final location when they are sturdy enough. Often they are ready to transplant late in their first season.

Keep in mind that starting perennials from seed can be a slow process and may require waiting several years before any blooms appear. The cost of purchasing perennials is often directly related to the number of years the plant has been in production. While some of the newer cultivars of certain perennials have been bred to produce blooms the first season from seeding, others require several years of growth before any blooms will be produced.

Division—As herbaceous perennials develop established root systems, they spread into large clumps, so many can be propagated by division.

Divide perennials as part of your general garden maintenance, because growth and performance decrease when plants get crowded. Centers die out on many plants, such as Siberian iris (*Iris siberica*). Division rejuvenates plants and results in extra plants to share with friends or donate to plant sales.

The proper time to divide perennials depends on the particular plant. In general divide fall-blooming plants such as aster (*Aster* spp.) in very early spring. Spring bloomers such as iris (*Iris* spp.) can be divided in late summer or early fall.

Select vigorous shoots from the outer part of a clump. Discard the center. Divide the plant into several sections of three to five shoots each. Make large divisions, because small pieces will not bloom much the first year after planting. Before replanting, add compost or other organic materials to the soil.

Cuttings—Many plants can be propagated from either tip or root cuttings. Generally, tip cuttings are easier to grow than root cuttings.

Take two- to six-inch-long tip cuttings from perennials such as candytuft (*Iberis sempervirens*) or lavender (*Lavandula angustifolia* and others). Remove all foliage from the lower one-third of the cutting. Insert cuttings in a clean planting mix such as one-half sharp sand and one-half peat moss.

Professional growers supply bottom heat and provide moisture through automatic misting systems that keep cuttings moist while roots form. If you don't have these systems, rooting will be slower and require more care, but you still can be successful. Cover cuttings with a sheet of clear plastic to retain moisture. Support the plastic to keep it from touching the foliage. Place the cuttings in a light area but out of direct sun. In direct sun, high temperatures can build up under the plastic on warm days and can kill cuttings.

When cuttings resist a slight tug, they have begun to root. The plants then start to take up water and nutrients. Poke holes in the plastic to provide more air circulation to the rooting plants, gradually adding holes as more roots grow. When the plants have formed good root balls, transplant them to a nursery bed or container and begin fertilizing.

Root cuttings also work to propagate some plants, such as Oriental poppies (*Papaver orientalis*), phlox (*Phlox paniculata*), and baby's breath (*Gypsophila paniculata*). Dig plants in late summer after they have bloomed and are going dormant. Choose pencil-sized roots and cut them into four-inch sections. Shoots will not appear until the following growing season.

Flower Garden Maintenance

Regular, planned maintenance keeps plants healthy and a garden looking attractive.

Fertilizing

Annuals need regular fertilizing. Well-prepared soil and organic mulch help make nutrients available to plants, but annuals grow so rapidly that supplemental fertilizer helps. When planting, incorporate about five pounds per 100 square feet of 5–10–5 or 5–10–10 fertilizer. Then fertilize at regular intervals, about every three weeks. Don't add fertilizer to dry soil; be sure to water before and after fertilizing.

When planting a new perennial garden, add about five pounds of 5–10–5 or 5–10–10 per 100 square feet and dig it in thoroughly before planting. Fertilize established herbaceous perennials as they start growth each year. Perennial plants that bloom in late summer or fall, such as asters, need regular fertilization before bloom, so feed them monthly until September. Perennials such as peonies that complete their bloom and growth by June do not need fertilizer in midsummer. In general, two light applications of fertilizer per year are sufficient for supplying extra nutrients if soil conditions are good. Always water after applying fertilizer.

Weeding

Keep annuals and perennials free of weeds. A combination of hand weeding and mulch is effective. Weed regularly to prevent seeds from becoming established. Herbaceous plants shade out some weeds when mature but require extra vigilance while they are too small to compete.

Use herbicides with great care in herbaceous plantings, if at all. Always read the label of any herbicide before using. The label will list plants that will not be damaged as well as list those plants that may be severely damaged by that particular chemical. Use them only around woody plants established in the landscape for more than six months.

It's best to remove annual weeds at the seedling stage by hoeing lightly, avoiding the roots of desired plants. You can spot-treat persistent perennial weeds such as morningglory with a postemergent herbicide such as glyphosate (sold as Roundup and many other trade names), but take great care to keep herbicides off the leaves of all desirable plants.

Watering

Most annuals need regular water because they don't make deep root systems. However, some annuals, such as cosmos (*Cosmos bipinnatus*), tolerate summer dry spells.

Do not allow herbaceous perennials to dry out in their first season. Many tolerate dry soils once established, however. Interest in water conservation causes many gardeners to choose plants that need little supplemental water. Plants such as artemisia, echinacea, Jerusalem sage (*Phlomis* spp.), and santolina use only moderate amounts of water.

To use water efficiently, group plants according to water needs. Till the soil deeply and amend it with compost or other organic material.

When you water, use efficient methods such as soaker hoses or drip irrigation systems, and apply water slowly and deeply.

Mulching

Organic mulch is useful in perennial and annual flower beds. Use compost (commercial or homemade), composted sawdust, chopped or composted leaves, or other materials for mulching.

Two applications of mulch each year are helpful. Apply two to three inches in spring after weeding and fertilizing to retain soil moisture, suppress annual weed seeds, and improve the bed's appearance. Apply mulch again in late fall. As it breaks down over winter, this material will provide some winter protection and weed suppression.

Do not cover a perennial plant's crown (the central growing area above the roots) with winter mulch, but do bring it up to the edge of the crown. In cold locations, you can cover the entire plant after the soil freezes or after several freezing nights. If you cover plants too soon, they may begin to grow under the mulch and may be killed by severe cold. Evergreen boughs make a good mulch, particularly in cold winter areas.

Pull mulch off plants in early spring when weather warms, allowing new growth to emerge.

Staking

Many tall herbaceous flowering plants must be tied to stakes or provided with another support system, especially in windy and exposed areas. Dahlias, for example, may require support. Wind, rain, or the weight of foliage and blossoms will bend or break these plants' stems and ruin the display. Broken stems also can lead to disease problems.

Many short perennials such as peonies require support to keep flower heads upright. A plant that flops over onto adjoining plants will smother its neighbors and destroy a garden's attractiveness.

Commercial systems such as grates with legs work fine, but you also can improvise supports from bamboo stakes, twigs, or branches. Choose staking material that is about six inches shorter than the plants' ultimate height.

Whatever method you use, put support systems in place while plants are small and tie plants loosely to the stake as they grow (Figure 18.4). Rapid growth will hide the stake, wires, or strings.

Deadheading and Disbudding

Regular maintenance for annuals includes removing flowers before they go to seed. This process is called deadheading. By preventing seed formation, you can extend the bloom period on many plants, such as pansies, marigolds, and petunias.

Deadheading not only might prolong the bloom period, but it improves a garden's appearance. Some early summer-blooming perennials such as certain daylilies (*Hemerocallis* spp.) produce a second flush of flowers in fall if stems are cut to the ground after bloom and before seeds set. In other cases, however, seeds may be part of the garden show. Gladwin iris (*Iris foetidissima*), for example, is grown for its showy seed pods.

Plants such as dahlias produce larger flowers if disbudded. A stalk may have five or six buds; to disbud, snap off all but one on each stem.

Fall Cleanup

Late fall maintenance generally includes cutting back dead stems of herbaceous perennials and pulling out annuals after they are killed by frost. Some gardeners leave seed heads for birds. Goldfinches love cosmos seeds, and chickadees eat sunflower seeds right off the plants if squirrels don't get them first. The seeds of many perennials, such as purple coneflower (*Echinacea purpurea*), attract birds in late summer and fall.

Pest Management

All flower gardens eventually have some pests or diseases. Learn to use the principles of integrated pest management and concentrate on growing healthy plants. Strong plants resist disease and insect problems better than weak ones. To reduce disease infestations and cut down on hiding places for insects and other pests such as slugs, space plants properly to allow good air circulation, clean up litter and dead leaves, and control weeds.

Several diseases commonly affect annuals, bulbs, and herbaceous perennials. Powdery mildew (a fungus) attacks peonies, zinnias, roses, pansies, and many other flowering plants, producing a gray, fuzzy coating on leaves and blossoms. Tulips, lilies, and peonies contract botrytis, which affects buds and stems and destroys flowering. Pruning out diseased plant parts can help control this disease.

Whenever possible, choose disease-resistant cultivars. Check with nurseries for new cultivars of phlox and bee balm (*Monarda*) with powdery mildew resistance.

Some insects damage a wide variety of plants. For example, aphids suck juices from many flowering plants. Learn the life cycles of garden pests so that you can protect beneficial predators and minimize use of broad-spectrum insecticides. Aphids, for example, have many natural enemies, including lady beetles, lacewings, wasps, and birds.

Slugs and snails attack tender shoots of bulbs, lilies, and young transplants and are often a problem where hostas are planted. Hand picking and selective use of baits can help you manage slugs. Place baits in traps rather than broadcasting them.

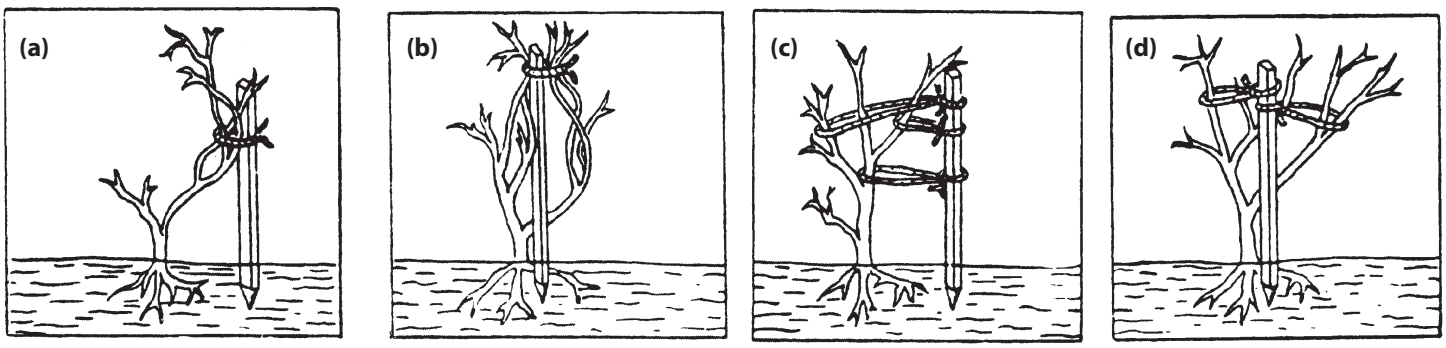


Figure 18.4. Staking plants: In (a) and (b), plants are tied too tightly. In (c) and (d), principal branches are tied loosely, which is better.

Consult relevant publications and experts for specific controls. Make sure you have properly identified the problem before applying any control.

Bulbs, Corms, Rhizomes, Tubers, and Tuberous Roots

Many garden plants are classified botanically as bulbs, corms, rhizomes, tubers, or tuberous roots. All of these have underground organs that store food for the plant. Many, such as hyacinths, tulips, and crocuses, can survive for a time without soil around their roots, which enables them to be stored and shipped easily. Figure 18.5 illustrates flowers of several types of bulbs and corms.

Bulbs are composed of a thin, flattened stem surrounded by fleshy, dried leaf bases called scales. Roots grow from a basal plate. Onions, garlic, narcissus, tulips, and lilies are examples of plants that form bulbs. Slicing an onion vertically and observing the interior gives a good look at a bulb's anatomy.

Corms have solid interiors, developed from swollen stems. If you cut one, you see a homogenous mass inside. Roots form at the base. Some examples of plants that form corms are crocus, watsonia, and gladiolus.

Tubers are swollen, modified, underground stems. They don't have basal plates where the roots originate. Tubers come in various shapes and include caladium.

Tuberous roots are composed of root tissue. Dahlias and tuberous begonias are examples of plants with tuberous roots.

Rhizomes are specialized stems that grow horizontally at or just below the soil surface. German iris, lily-of-the-valley, and bamboo have rhizomes.

Gardeners often lump these different botanical structures under one heading, calling them all "bulbs." This loose classification works for general purposes, but the distinctions between the types make a difference in how each is propagated and stored.

Like other herbaceous ornamentals, bulbs, corms, and tubers are classified as hardy or tender. Most hardy bulbs and corms are planted in fall for early spring bloom. Crocuses, narcissus, tulips, hyacinths, and grape hyacinths define spring for many people. Lilies, which bloom in early or midsummer, may be planted in fall or early spring.

Tender bulbs, tubers, and corms generally bloom in mid-to-late summer. Examples are dahlias, tuberous begonias, and gladiolus. Plant them when the ground warms after the last frost. To keep these plants for more than one season, dig them up in the fall and store them in a frost-free location.

Selection and Storage

Choose solid, healthy plants. With lilies, tulips, and narcissus, larger bulbs yield larger blossoms. Some bargain bulbs are not worth the price, no matter how inexpensive, because they are too small to bloom well.

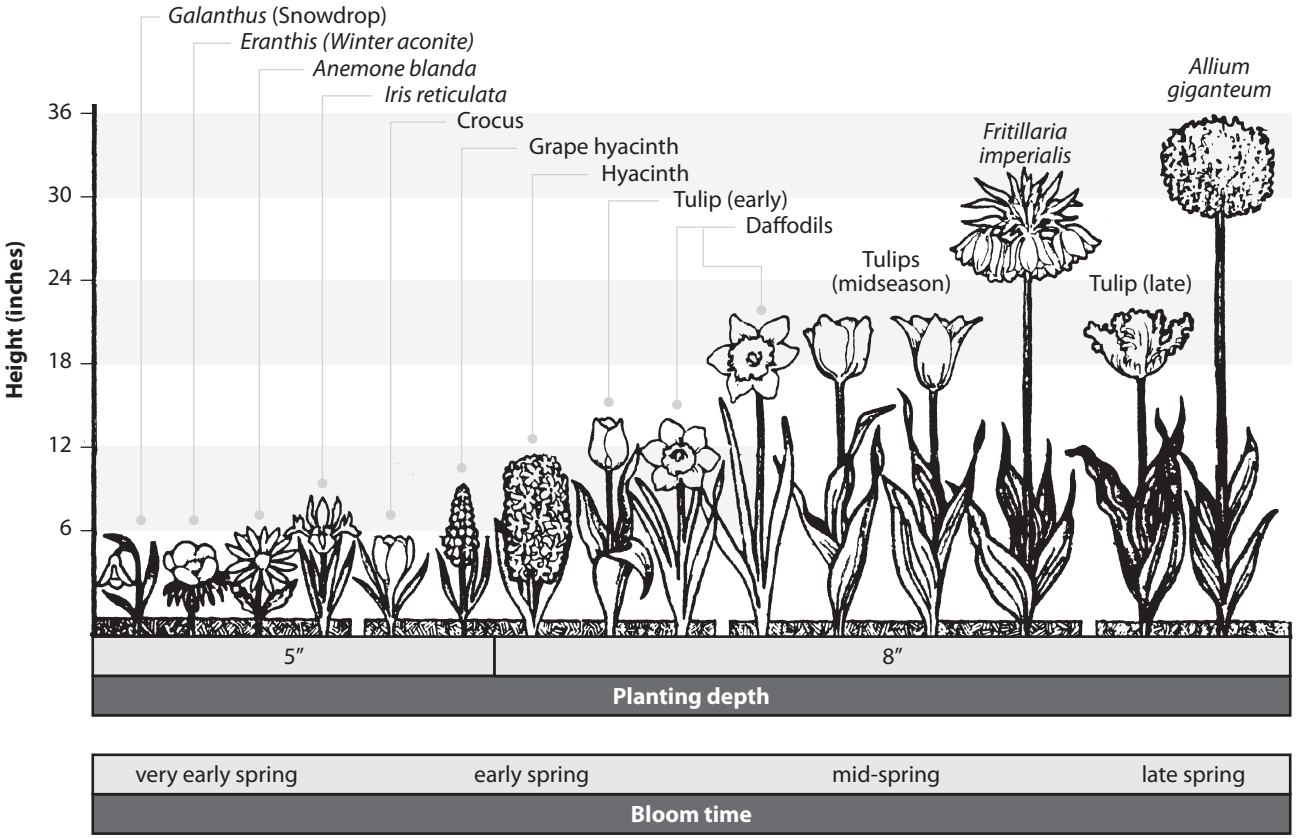


Figure 18.5. Bulbs and corms offer a variety of blossoms.

Purchase hardy bulbs in the fall. Don't leave bulbs in a hot car trunk while shopping; the plants may be damaged or killed. If you can't plant bulbs immediately, keep them cool and dry. Temperatures below 65°F are best for storage. Use paper sacks rather than plastic bags, since mold may develop if moisture accumulates inside the package.

After digging plants such as dahlias and cannas in the fall, store them in slightly damp peat or perlite. Do not let them completely dry out; check them regularly and dampen them if necessary.

Site Preparation and Planting

Drainage is vital for most bulbs, corms, tubers, rhizomes, and tuberous roots. With a few exceptions, such as Japanese iris (*Iris ensata*), they rot in wet soil. Snowdrops (*Galanthus nivalis*), crocuses, narcissus, tulips, and lilies must have excellent drainage. If your garden site drains poorly, place bulbs in containers or raised beds.

Dig the soil as for annual or perennial flowers and add organic amendments such as compost. Remove all perennial weeds before planting, and watch for emerging annual weed seedlings after planting.

When planting, excavate the planting area, place fertilizer below the root level, and mix it thoroughly with soil. Slow-release fertilizers or general 5–10–10 formulations work well for fall-planted bulbs. Do not place bulbs directly on fertilizer.

Don't plant bulbs and tubers in dry soil; roots cannot begin to grow without moisture. If the soil is very dry during fall planting, dig a hole for the bulbs, fill it with water, and allow it to drain before planting.

Planting depth depends on soil conditions. Kentucky Extension publications or local nurseries can give you specific suggestions. Many growers suggest planting about three times the depth of the bulb.

Shallow-planted bulbs may frost-heave and are easily dug out by rodents, which munch on them. To prevent rodent damage, plant them in a hardware cloth "cage."

Mulch hardy bulb and corm plantings lightly with two to four inches of composted leaves, shredded fir bark, or composted sawdust. Keep mulches open and light enough to allow shoots to emerge in spring.

Watering and Fertilizing

After planting, be sure to water the planting bed thoroughly and continue to water during periods of dry weather in the fall. Fall-planted bulbs begin to produce a root system, and lack of water may severely damage the bulbs.

Fertilize spring bloomers when they are about an inch tall, using a 5–10–10 granular formula or a liquid fertilizer. In dry areas, water spring-blooming bulbs after flowering ends. Let the leaves wither naturally and don't pull them out until they are brown. Move spring-blooming bulbs and corms only after all foliage has ripened (usually in late summer).

Specialized Herbaceous Flower Gardens

Specialized herbaceous flower gardens include container plantings, bog gardens, and water gardens.

Container Plantings

Almost all gardeners have some form of container plantings, often in addition to other types of gardens. Containers allow even those with limited space such as a rooftop, balcony, or front stoop to have vigorous gardens.

The potting material contributes vitally to the success of container plants. Plant roots must get sufficient air. If the soil is too dense, it packs down, contributing to root rot or other difficulties. Be sure to use a potting material that contains sufficient gritty particles in the form of pumice, perlite, or vermiculite. Garden soil doesn't work well in containers because watering packs it and reduces available oxygen.

Choose a container suited to the plant's eventual size, and be sure it has sufficient drainage holes in the bottom. Scrub pots well. Do not add a layer of gravel or other material to the bottom of the pot; this practice actually reduces drainage. Fill the clean pot full of potting soil.

You can reuse potting mixes year after year unless the plants in them were seriously diseased. Before replanting, dump the mix out of the pot, aerate it, and add new grit if necessary.

Annuals grown in containers will require more frequent fertilization. Regular watering will leach the initially applied nutrients from the soil. Follow the package directions for slow-release fertilizers. An additional application may be necessary midway through the growing season. If water-soluble fertilizers are being applied, follow the label recommendations for how frequently this should be applied. Remember, plants grown in containers will require regular watering. When watering plants, be sure to water thoroughly and then allow the plants to dry out before watering again. Smaller containers such as hanging baskets may require watering twice a day to maintain vigor during the heat of the summer. Generally, the larger the container, the less frequently it will need to be watered.

Bog and Water Gardens

Small fountains, pools, and other water features are increasingly popular in gardens. Many herbaceous perennials adapt well to water gardening. A pool can be surrounded with Japanese iris (*Iris ensata*), ligularia (*Ligularia dentata*), rodgersia (*Rodgersia podophylla*), and adapted native plants. A barrel with a fountain bubbler can hold water lilies, many of which are winter-hardy, even in cold climates.

Some gardeners place a simple, shallow bowl of water in the garden to reflect the sky. Water features also attract wildlife, especially birds.

For More Information

UK Extension Publications

Annual Flowers (HO-65)
Perennials for Sunny Locations (HO-76)
Perennials for Shady Locations (HO-77)
Spring, Summer, and Fall Bulbs (HO-80)

Books

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Periodicals

Fine Gardening, www.finegardening.com
Garden Design, www.gardendesign.com
Gardens Illustrated, www.gardensillustrated.com
Horticulture, www.hortmag.com

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Lexington, KY 40506 Revised 01-2024