

Flowers and Flowering Plants

NC COOPERATIVE EXTENSION
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Flowers and Flowering Plants Contents

All of the leaflets in this booklet can be found via the internet. The link for each leaflet is listed beside the title. Horticulture Information Leaflets can be found at <http://www.ces.ncsu.edu/Publications/lawngarden.php> There are many more leaflets and useful information found on our State Urban Horticulture Site at <http://www.ces.ncsu.edu/depts/hort/consumer/> Or on our local county websites at <http://www.forsyth.cc/ces> or <http://forsyth.ces.ncsu.edu> .

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Annual Flowers: Preparing the Soil –

<http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/annuals/text/prepare.html>

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<http://www.ces.ncsu.edu/depts/hort/hil/hil-644.html>

Perennials: Selection –

http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/perennials/text_selection.html

Perennials: Propagation –

http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/perennials/text_propagation.html

Perennials: Purchasing –

http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/perennials/text_purchasing.html

Perennials: Transplanting –

http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/perennials/text_transplanting.html

Perennials: Maintaining –

http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/perennials/text_maintaining.html

Perennials: Winter Protection –

http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/perennials/text_winter.html

Select Perennial Flowers for North Carolina (Growing Requirements) –

http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/perennials/perennial_table.html

EDIBLE FLOWERS

Cyndi Lauderdale, Extension Agent, Wilson County Center
Erv Evans, Extension Associate

Flowers have traditionally been used in many types of cooking: European, Asian, East Indian, Victorian English, and Middle Eastern. Early American settlers also used flowers as food. Today, there is a renewed interest in edible flowers for their taste, color, and fragrance. Edible flowers can be used fresh as a garnish or as an integral part of a dish, such as a salad. Squash flowers can be fried in light batter or cornmeal. Some flowers can be stuffed or used in stir-fry dishes. Edible flowers can be candied; frozen in ice cubes and added to beverages; made into jellies and jams; used to make teas or wines; or minced and added to cheese spreads, herbal butters, pancakes, crepes, and waffles. Many flowers can be used to make vinegars for cooking, marinades, or dressings for salad. Herbal flowers normally have the same flavor as their leaves, with the exceptions of chamomile and lavender blossoms, where the flavor is usually more subtle.

Cautions

Not all flowers are edible: some may taste bad; and some are poisonous. Eat flowers only if you are certain they are edible. Consult a good reference book. An extensive list of poisonous plants can be found at the following Web site: <http://www.ces.ncsu.edu/depts/hort/consumer/poison/poison.htm>. A flower is not necessarily edible because it is served with food. A partial list of edible flowers can be found in Table 1. The flowers of most culinary herbs are safe to use.

Additional flowers that have been reported to be edible include: Black locust, *Robinia pseudoacacia*; Cattails, *Typha* spp.; Clary sage, *Salvia sclarea*; Common milkweed, *Asclepias syriaca*; Coriander, *Coriander sativum*; Fuchsia, *Fushia x hybrida*; Gardenia, *Gardenia jasminoides*; Garlic, *Allium sativum*; Garlic chives, *Allium tuberosum*; Gladiolus, *Gladiolus hortulanus*; Hyssop, *Hyssopus officinalis*; Leek, *Allium porrum*; Lemon, *Citrus limon*; Marjoram, *Origanum vulgare*; Marsh mallow, *Althaea officinalis*; Mustard, *Brassica* spp.; Nodding onion, *Allium cernuum*; Peony, *Paeonia lactiflora*; Orange, *Citrus sinensis*; Oregano, *Origanum vulgar*; Pineapple guava, *Acca sellowiana*; Plum, *Prunus* spp.; Radish, *Raphanus sativus*; Redbud, *Cercis canadensis*; Rose of Sharon, *Hibiscus syriacus*; Safflower, *Carthamus tinctorius*; Spiderwort, *Tradescantia virginia*; Strawberry, *Fragaria ananassa*; Water hyacinth, *Eichhornia crassipes*; Water lily, *Nymphaea odorata*; Winter savory, *Satureja montana*; Yucca, *Yucca* spp.

Pesticides for use on fruits and vegetables have undergone extensive testing to determine the waiting period between treatment and harvest and potential residuals on food. Pesticides used on flowers and ornamentals have not been evaluated to determine their safety on food crops. Do not eat flowers from

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florists, nurseries, garden centers, or flowers found on the side of the road. Consume only flowers that you or someone else has grown specifically for that purpose. If you have hay fever, asthma or allergies, it's best not to eat flowers since many allergies are due to sensitivity to pollen of specific plants. It's best to introduce flowers into your diet one at a time and in small quantities.

Growing Edible Flowers

Growing edible flowers is essentially the same as growing flowers for ornamental purposes. Most flowers require a well-drained soil with a pH ranging from 5.5 to 6. Soil test. Use a 2-to-3-inch layer of mulch to reduce weeds, conserve soil moisture, maintain uniform soil temperature, and reduce the amount of soil splashed onto the plant during a heavy rain. Irrigate to keep plants actively growing and flowering; most plants will need 1 inch of water per week. If possible, avoid overhead irrigation because moisture on the leaf surface for extended periods can increase the chances of disease development. Irrigating with a soaker hose works well.

Chemicals for pest control should be avoided, if possible. Hand-pick harmful insects. Beneficial insects, such as lady beetles and praying mantises, can be used to decrease insect populations. Growing different flowers together provides diversity to support a good beneficial insect population and keeps pest problems low. Many gardeners locate their edible flower garden away from other plants to avoid chemical spray drift. Many edible flowers can be successfully grown in containers.

Harvesting Flowers

Flavor can vary with growing conditions and cultivars. Conduct a taste test before harvesting large amounts of a particular flower. Flowers should be picked in the cool of the day, after the dew has evaporated. For maximum flavor choose flowers at their peak. Avoid

flowers that are not fully open or that are past their prime. To maintain maximum freshness, keep flowers cool after harvest. Long-stem flowers should be placed in a container of water. Short-stemmed flowers, such as borage and orange blossoms, should be harvested within 3 to 4 hours of use, placed in a plastic bag, and stored in a refrigerator. Damp paper towels placed in the plastic bag will help maintain high humidity.

Because pollen can detract from the flavor, it's best to remove the pistils and stamens. Pollen may cause an allergic reaction for some people. Remove the sepals of all flowers except violas, Johnny-jump-ups, and pansies. For flowers such as calendula, chrysanthemum, lavender, rose, tulip, and yucca, only the flower petals are edible. The white base of the petal of many flowers may have a bitter taste and should be removed from flowers such as chrysanthemums, dianthus, marigolds, and roses.

For Further Reading

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- Kowalchik, Claire, and William H. Hylton, editors. 1987. *Rodale's Illustrated Encyclopedia of Herbs*. Rodale Press, Inc.; Emmaus, Pennsylvania.
- Peterson, Lee Allen. 1977. *Edible Wild Plants*. Houghton Mifflin Company; New York.
- Shaudys, Phyllis V. 1990. *Herbal Treasures*. Garden Way Publishing; Pownal, Vermont.

Table 1. Edible Flowers.

Common Name	Scientific Name	Flavor	Color	Comments
Anise hyssop Apple	<i>Agastache foeniculum</i> <i>Malus</i> spp.	Anise Floral	Lilac White to pink	Self seeding perennial <i>Eat in moderation since flowers contain cyanide precursors</i>
Arugula	<i>Eruca vesicaria sativa</i>	Spicy	White	Annual; once flowers form the leaves become bitter
Basil	<i>Ocimum basilicum</i>	Herbal	White, lavender	Annual
Bachelor's button	<i>Centaurea cyanus</i>	Vegetal	White, pink, blue	Annual; petals are edible; the calyx is bitter
Bee balm	<i>Monarda didyma</i>	Minty, sweet, hot	Wide range	Perennial
Borage	<i>Borago officinalis</i>	Herbal	Blue	Annual; use with nasturtium; <i>use sparingly — diuretic effects</i>
Broccoli	<i>Brassica officinalis</i>	Spicy	Green	Annual
Calendula	<i>Calendula officinalis</i>	Slightly bitter	Yellow, orange	Annual; most often used for color rather than flavor
Chamomile	<i>Chamaemelum nobilis</i>	Sweet apple	White	Perennial; <i>drink tea in moderation — contains thujone; ragweed sufferers may be allergic to chamomile</i>
Chervil	<i>Anthriscus cerefolium</i>	Herbal	White	Annual
Chicory	<i>Cichorium intybus</i>	Herbal	Blue	Perennial
Chives	<i>Allium schoenoprasum</i>	Onion	Lavender-pink	Perennial; avoid eating whole flower; taste can be overwhelming
Chrysanthemum	<i>Chrysanthemum</i> spp.	Strong	Perennial	Use the florets; strong flavor
Dandelion	<i>Taraxacum officinale</i>	Sweet, honey-like	Yellow	Perennial; use young flowers, mature flowers become bitter; flowers close after picking
Daylily	<i>Hemerocallis</i> spp.	Vegetal, sweet	Wide range	Perennial; <i>may act as a diuretic or laxative; eat in moderation</i>
Dianthus	<i>Dianthus</i> spp.	Sweet clove flavor	Wide range	Perennial; remove the narrow base of the petals (bitter)
Dill	<i>Anethum graveolens</i>	Herbal	Yellowish-green	Annual

Table 1. Edible Flowers. (continued)

Common Name	Scientific Name	Flavor	Color	Comments
Elderberry	<i>Sambucus canadensis</i>	Sweet	White	Perennial; do not wash flowers since it removes much of the flavor
English daisy	<i>Bellis perennis</i>	Mildly bitter	Pink	Perennial; ray flowers have a mildly bitter taste
Fennel	<i>Foeniculum vulgare</i>	Mildly anise	Yellow-green	Normally grown as an annual
Hibiscus	<i>Hibiscus rosa-sinensis</i>	Mildly citrus	Rose, red	Showy edible garnish
Hollyhock	<i>Althea rosea</i>	Vegetal	White, pink, red	Showy edible garnish
Honeysuckle	<i>Lonicera japonica</i>	Sweet	White to pale yellow	Perennial; <i>do not use other honeysuckle flowers</i>
Johnny-jump-up	<i>Viola tricolor</i>	Wintergreen	Purple and yellow	Annual; the petals have little flavor unless the green sepals are included; <i>contain saponins and may be toxic in large amounts</i>
Lavender	<i>Lavendula</i> spp.	Sweet, perfumed flavor	Lavender	Perennial; use sparingly due to intense flavor; <i>lavender oil may be poisonous</i>
Lilac	<i>Syringa vulgaris</i>	Varies	Lavender	Wide variation in flavor — from no flavor to green and herbaceous to lilac
Linden	<i>Tilia</i> spp.	Honey-like	White	<i>Frequent consumption of linden flower tea can cause heart damage</i>
Lovage	<i>Levisticum officinale</i>	Celery	White	Perennial
Marigold	<i>Tagetes patula</i>	Bitter	Yellow, orange	Annual; Lemon Gem and Tangerine Gem have the best flavor
Mint	<i>Mentha</i> spp.	Minty	Purple	Perennial; each type of mint has its own unique flavor
Nasturtium	<i>Tropaeolum majus</i>	Spicy, peppery	Wide range	Annual
Okra	<i>Abelmoschus esculentus</i>	Vegetal	Yellow	Annual
Pansy	<i>Viola x witrockiana</i>	Vegetal	Wide range	Annual; has a slightly sweet green or grassy flavor; petals have a mild flavor; whole flower has a wintergreen flavor
Passion flower	<i>Passiflora</i> spp.	Vegetal	Purple	Vine; showy flowers best used as a garnish
Pineapple sage	<i>Salvia elegans</i>	Sweet, fruity	Red	Perennial; flavor has a hint of mint and spice

Table 1. Edible Flowers. (continued)

Common Name	Scientific Name	Flavor	Color	Comments
Red clover	<i>Trifolium pratense</i>	Sweet	Red	Annual; raw clover flowers are not easily digestible
Rose	<i>Rosa</i> spp.	Perfumed	Wide range	Perennial: remove the white, bitter base of the petal
Rosemary	<i>Rosmarinus officinalis</i>	Herbal	Blue	Perennial
Sage	<i>Salvia officinalis</i>	Herbal	Purple-blue	Perennial
Scarlet runner bean	<i>Phaseolus vulgaris</i>	Vegetal	Purple	Annual; flowers last only one to two days
Scented geraniums	<i>Pelargonium</i> spp.	Varies	Wide range	Perennial; the flavor is usually similar to the scent of the leaves
Signet marigold	<i>Tagetes signata</i>	Spicy, herbal	Yellow	Annual; <i>may be harmful if eaten in large amounts</i> ; other marigolds are edible but have a tangy to bitter flavor
Snapdragon	<i>Antirrhinum majus</i>	Bitter	Wide range	Annual; use as a garnish
Squash	<i>Cucurbita pepo</i>	Vegetal	Yellow	Annual
Sunflower	<i>Helianthus annuus</i>	Varies	Yellow	Annual; flower is best eaten in bud stage when it has an artichoke flavor; petals of open flowers have a bitter-sweet flavor; <i>pollen can cause a reaction for some people</i>
Sweet woodruff	<i>Galium odoratum</i>	Sweet, nutty, vanilla	White	<i>Can have a blood thinning effect if eaten in large amounts</i>
Thyme	<i>Thymus</i> spp.	Herbal	White	Perennial herb
Tulip	<i>Tulipa</i> spp.	Vegetal	Wide range	Bulb; good stuffed
Violet	<i>Viola odorata</i>	Sweet, perfumed	Purple, white	Perennial; use candied or fresh

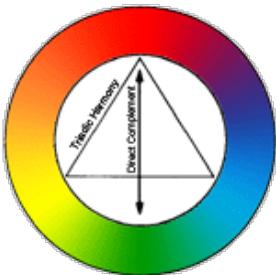
Designing a garden with plants exhibiting many different colors requires some coordination. Consider the color of the house and any other fixed structures such as fences or utility buildings. Using pink flowers against a brick house with orange tones would not produce a pleasant combination. Try to use masses of a single color instead of mixing colors in a flower bed. A mass planting of a single color or planting in bands of colors will produce a stronger impact.

Consider location and how the flowers will be viewed. Bright colors stand out, while dark colors fade into the background. For example, a bed of red flowers can easily be seen from a distance, but blue and purple flowers can only be enjoyed up close. Bright colors draw attention to an area, so do not use red and yellow flowers near an eyesore or unattractive area. Bright colors appear closer, while dark colors make the area appear further away. White is the last color to fade from sight as darkness falls and thus is good for areas used at night.

Colors that look good together are said to be in harmony. There are four basic color schemes to choose from: complementary, monochromatic, analogous, and triadic. Colors opposite on the color wheel are complementary and look good when used together. Examples include red and green, yellow and violet, orange and blue. Monochromatic color schemes use lighter and darker shades of a single color. For an analogous harmony, use any three colors next to each other on the color wheel; for example, orange, yellow-orange, and yellow. A triadic harmony can be achieved by combining three colors that are equal distance apart; for example, yellow, red, and blue.

Colors also have an effect on how people feel. Colors on the right hand side of the color wheel are considered warm colors (yellow to red); colors on the left side are considered cool colors (green to violet). Planting warm-colored flowers around a deck or patio will make it seem warmer. Red tends to excite people. Research has also shown that food tastes better around red colors. Pink is perceived as being sweet and fragrant. Yellow is associated with liveliness and exuberance. White gives the feeling of neatness, cleanliness, and orderliness. Green is a color that helps eyes recover quickly from strain. Blue is perceived as cool and calming. Gray is said to promote creativity.

Figure 14-3: click to see a larger version



Prepared by: [Erv Evans](#), Consumer Horticulturist

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The key to growing garden flowers successfully is to match the planting site with the needs of each specific flower. Before selecting plants, analyze the site. A plant that needs good soil drainage will not perform well in a site that drains slowly. Before selecting plants for any site, consider the amount of sunlight, microclimate temperature, competition from tree roots, and soil drainage and aeration.

Sunlight - Plants vary in the amount of sunlight they require for optimum growth. Too little sunlight can lead to reduced flowering and leggy plants. Too much sunlight can burn or fade the foliage of shade-loving plants. Light, temperature, and water are closely interrelated. Plants listed as preferring partial shade may tolerate more sunlight if temperatures are moderate and adequate water is provided.

When evaluating light exposure, note the duration and intensity of sunlight the site receives. Four hours of full sun during the morning is very different from four hours of stronger, more intense afternoon sun. There are also many types of shade, and the amount of light in shaded locations will vary with the type, number, and size of trees in the area. If the site receives more than three hours of unfiltered midday sun, it should be treated as a “full sun” site. “Partial shade” can be defined as receiving unfiltered morning sun, but shade during the afternoon hours, or moderate shading throughout the entire day. A “heavily shaded” site would receive very little direct midday light and less than 60 percent of the sun’s intensity during the remainder of the day. Few flowering plants do well in deep shade. Introducing more light to a shaded location can greatly increase flower production. Removing some tree limbs can allow more light to reach the ground below.

Temperature - Very few flowers look attractive and flower profusely from early spring through late fall. Cool-season flowers such as dianthus, pansies, and snapdragons grow best when the temperatures are mild; they slow or stop flowering when exposed to high summer temperatures. It is possible to extend the flowering season of cool-season annuals by placing them in a protected location, shaded from direct sunlight from about noon to 4:00 p.m. Plants adjacent to a paved surface or brick wall will experience warmer temperatures and their flowering period will be shortened. Heat-loving flowers such as gaillardia, portulaca, verbena, and vinca do not begin to flower until early summer, and they should be planted in high-temperature situations. Planting them on the north side of the house in light shade will delay and reduce their flower production.

Soil moisture - Examine the interrelated factors of drainage, moisture retention, and soil aeration of the site (refer to Chapter Three). Frequent heavy rains in combination with poorly drained soils will cause excessive soil moisture and limited air space in the soil, thus reducing plant growth and increasing the chances of root rot problems. One way to check for adequate drainage is to dig a hole 10 inches deep and fill it with water. After it drains, refill it with water. If the water drains in 8 to 10 hours, the site is adequately drained for most flowers. Subsoil compaction or the presence of a hard pan beneath the bed can affect water drainage and soil aeration. It may be necessary to deep till beds to break up the subsoil and increase the drainage rate.

The amount of air in the soil depends on the type of soil, soil compaction, and how quickly water drains from the soil. Clay soils normally have poor drainage and aeration, but excellent water retention. Water does not always enter clay soil easily; it often puddles on the surface rather than soaking in. Sandy soils have good drainage and aeration, but retain little water. The addition of organic matter such as pine bark or composted

Drought Tolerant Annuals

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Common Name	Scientific Name
Ageratum	<i>Ageratum houstonianum</i>
<u>Blanket flower</u>	<i>Gaillardia pulchella</i>
<u>Calendula</u>	<i>Calendula officinalis</i>
<u>California poppy</u>	<i>Eschscholzia californica</i>
<u>Cockscomb</u>	<i>Celosia cristata</i>
<u>Cosmos</u>	<i>Cosmos bipinnatus, C. sulphureus</i>
<u>Creeping zinnia</u>	<i>Zinnia linearis</i>
Dusty miller	<i>Senecio cineraria</i>
<u>Flowering tobacco</u>	<i>Nicotiana alata</i>
Foxglove	<i>Digitalis purpurea</i>
<u>Geranium</u>	<i>Pelargonium x hortorum</i>
<u>Globe amaranth</u>	<i>Gomphrena globosa</i>
<u>Madagascar periwinkle</u>	<i>Catharanthus roseus</i>
<u>Marigold</u>	<i>Tagetes erecta, T. patula</i>
<u>Melampodium</u>	<i>Melampodium paludosum</i>
<u>Moss rose</u>	<i>Portulaca grandiflora</i>
<u>Ornamental kale</u>	<i>Brassica oleracea</i>
Ornamental pepper	<i>Capsicum annuum</i>
<u>Pansy</u>	<i>Viola x witrockiana</i>
<u>Petunia</u>	<i>Petunia x hybrida</i>
<u>Salvia</u>	<i>Salvia splendens, S. farinacea</i>
<u>Snapdragon</u>	<i>Antirrhinum majus</i>
<u>Spider flower</u>	<i>Cleome hasslerana</i>
<u>Statice</u>	<i>Limonium</i>
<u>Sweet alyssum</u>	<i>Lobularia maritima</i>
<u>Verbena</u>	<i>Verbena spp. and hybrids</i>
<u>Zinnia</u>	<i>Zinnia elegans</i>
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Common name	Scientific name
Ajuga	<i>Ajuga reptans</i>
Alyssum	<i>Lobularia maritima</i>
Aster	<i>Aster</i> spp.
Bearded tongue	<i>Penstemon</i> spp.
Bee balm	<i>Monarda</i> spp.
Bell flower	<i>Campanula</i>
Black-eyed Susan	<i>Rudbeckia hirta</i>
Brown-eyed Susan	<i>Rudbeckia triloba</i>
Butterfly weed	<i>Asclepias tuberosa</i>
Calendula	<i>Calendula</i> spp.
Cardinal flower	<i>Lobelia cardinalis</i>
Columbine	<i>Aquilegia</i> spp.
Coneflower, Purple	<i>Echinacea purpurea</i>
Coral bells	<i>Heuchera sanguinea</i>
Coreopsis	<i>Coreopsis</i> spp.
Cosmos	<i>Cosmos</i> spp.
Dame's rocket	<i>Hesperis matronalis</i>
Daylily	<i>Hemerocallis</i> spp.
Evening primrose	<i>Oenothera</i> spp.
Forget-me-not	<i>Myosotis</i> spp.
Four O'Clock	<i>Mirabilis jalapa</i>
Foxglove	<i>Digitalis grandiflora</i>
Gaillardia	<i>Gaillardia</i> spp.
Gentian	<i>Gentiana</i> spp.
Geranium, Wild	<i>Geranium maculatum</i>
Goldenrod	<i>Solidago</i> spp.
Hibiscus	<i>Hibiscus</i> spp.
Hollyhock	<i>Alcea rosea</i>
Indian paintbrush	<i>Castilleja coccinea</i>
Joe-pye weed	<i>Eupatorium maculatum</i>
Lantana	<i>Lantana montevidensis</i>
Larkspur	<i>Consolida ambigua</i>
Liatris	<i>Liatris</i> spp.
Mallow	<i>Malva</i> spp.

Marigold	<i>Tagetes</i> spp.
Mexican blue sage	<i>Salvia leucantha</i>
Mexican sunflower	<i>Tithonia rotundifolia</i>
Milkweed	<i>Asclepias</i> spp.
Mullein	<i>Verbascum</i> spp.
Nicotiana	<i>Nicotiana alata</i>
Partridge pea	<i>Cassia fasciculata</i>
Penstemon	<i>Penstemon</i> spp.
Pentas	<i>Pentas</i> spp.
Petunia	<i>Petunia hybrida</i>
Phlox	<i>Phlox</i> spp.
Pineapple sage	<i>Salvia elegans</i>
Poppy, Oriental	<i>Papaver orientale</i>
Primrose	<i>Primula</i> spp.
Red hot poker	<i>Kniphofia uvaris</i>
Sage	<i>Salvia</i> spp.
Scabiosa	<i>Scabiosa</i> spp.
Sedum	<i>Sedum</i> spp.
Snapdragon	<i>Antirrhinum majus</i>
St. John's wort	<i>Hypericum</i> spp.
Sunflower	<i>Helianthus</i> spp.
Sunflower, Swamp	<i>Helianthus angustifolius</i>
Sweet William	<i>Dianthus barbatus</i>
Thickseed	<i>Bidens</i> spp.
Thistle	<i>Cirsium</i> spp.
Verbena	<i>Verbena rigida</i>
Yarrow	<i>Achillea</i> spp.
Zinnia	<i>Zinnia</i> spp.

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Attracting Hummingbirds: Flowers

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Common name	Scientific name	Life cycle	Flower color	Height	Exposure	Comments
Ajuga	<i>Ajuga reptans</i>	Perennial	Blue violet	2 to 6"	Sun to partial shade	Flowers in spring; can be used as a ground cover
Aster	<i>Aster spp.</i>	Perennial	Blue, pink, violet, white	12 to 48"	Sun	Flowers late summer, fall
Balsam	<i>Ipomoea balsamina</i>	Annual	Pink, purple, red, rose, white	12 to 36"	Sun to partial shade	Flowers in summer; low drought tolerance
Beard tongue; Penstemon	<i>Penstemon spp.</i>	Perennial	Orange, pink, red, rose, violet, white	18 to 36"	Sun	Well drained soil; flowers late spring to summer
Bee balm	<i>Monarda didyma</i>	Perennial	Pink, red, rose, violet, white	24 to 48"	Sun to partial shade	Moist soil; flowers in summer
Begonia	<i>Begonia semperflorens</i>	Annual	Pink, red, white	6 to 12"	Sun to heavy shade	Late spring to early fall; low drought tolerance
Bleeding heart	<i>Dicentra spectabilis</i>	Perennial	Rose pink, white	14 to 24"	Partial shade	Rich, moist, well drained soil; flowers in spring
Blue lobelia	<i>Lobelia siphilitica</i>	Perennial	Blue	2 to 4'	Partial shade	Bright blue flowers summer to fall; prefers moist soil
Bouncing bet	<i>Saponaria officinalis</i>	Perennial	Pink	1 to 2'	Sun	Flowers in summer; moist but well drained soil
Buttercup	<i>Ranunculus spp.</i>	Annual or perennial	Yellow	6 to 12"	Sun to partial shade	Flowers spring, summer
Butterfly weed	<i>Asclepias tuberosa</i>	Perennial	Orange, red, yellow	24 to 36"	Sun	Well drained soil; flowers spring, summer
Canna	<i>Canna generalis</i>	Perennial	Red, pink, orange	24 to 84"	Sun	Flowers summer to fall; needs good drainage; semihardy in zones 6, 7
Cardinal flower	<i>Lobelia cardinalis</i>	Perennial	Red	36 to 48"	Partial shade	Moist soil high in organic matter; flowers late summer
Clemone	<i>Clemone hasslerana</i>	Annual	Yellow, pink, white, crimson	12 to 36"	Sun	Flowers summer to early fall
Columbine, Wild	<i>Aquilegia canadensis</i>	Perennial	Red and yellow	1 to 3'	Partial shade	Flowers in spring; moist well drained soil
Coralbells	<i>Heuchera</i>	Perennial	Deep pink, red	12 to	Partial	Well drained; high

	<i>sanguinea</i>			18"	shade	organic matter Late spring
Crocosmia	<i>Crocosmia</i>	Perennial	Red	34 to 36"	Sun	Flowers in spring; semi-hardy mulch in zones 6, 7
Dahlia	<i>Dahlia</i> spp.	Perennial	Pink, white, yellow, red, orange	4 to 6'	Sun	Flowers summer to fall; semihardy in zones 6, 7
Evening primrose	<i>Oenothera</i> spp.	Perennial	Pink, white	12 to 24"	Sun	Well drained, infertile soil
Fire pink; Indian pink	<i>Silene virginica</i>	Perennial	Red	12 to 18"	Sun to partial shade	Flowers spring, summer; well drained soil
Flowering tobacco	<i>Nicotiana sanderae, N. alata</i>	Annual	Lime green, red, white, yellow	12 to 24"	Sun to partial shade	Flowers summer to fall; moderate drought tolerance
Forget-me-not	<i>Myosotis sylvatica</i>	Annual	Blue, pink, white	6 to 18"	Sun to partial shade	Flowers in spring; low drought tolerance
Four O'Clocks	<i>Mirabilis jalapa</i>	Annual	Mahogany, red, pink, purple, yellow	20 to 24"	Sun to partial shade	Summer to fall; moderate drought tolerance
Foxglove	<i>Digitalis grandiflora</i>	Perennial	Purple, white	24 to 60"	Partial shade	
Gentain	<i>Gentiana</i> spp.	Perennial	Purple, blue, white	1 to 2'	Sun to partial shade	Flowers in late summer; prefers moist soil
Geranium	<i>Pelargonium x hortorum</i>	Annual	Bicolors, pink, red, salmon, white	12 to 24"	Sun	Flowers late spring to early fall
Ginger, Butterfly	<i>Hedychium coronarium</i>	Perennial	White	3 to 5'	Sun to partial shade	Fragrant flowers in summer; prefers moist soil
Gladiolus	<i>Gladiolus</i> spp.	Perennial	White, red, pink, yellow, orange	36 to 48"	Sun	Flowers in summer; semihardy - dig and store corms
Hibiscus	<i>Hibiscus</i> spp.	Perennial	Red, white, pink	3 to 8'	Sun to partial shade	Flowers midsummer to fall
Hollyhock	<i>Althea rosea</i>	Perennial	Apricot, pink, purple, white yellow	24 to 60"	Sun	Spring to fall; Well drained
Hosta	<i>Hosta</i> spp.	Perennial	Lilac, white	18 to 24"	Partial shade	Flowers in summer; rich, well drained, soil high in organic matter
Impatiens	<i>Impatiens</i>	Annual	Orange, pink, purple, red,	8 to 24"	Partial shade to	Late spring to fall; low drought tolerance

			white		shade	
Indian pink	<i>Silene virginica</i>	Perennial	Red with yellow	24"	Sun to partial shade	Flowers late spring to early summer
Indian paintbrush	<i>Castilleja coccinea</i>	Annual or biennial	Red orange	12 to 18"	Sun	Flowers in spring
Iris, Crested	<i>Iris cristata</i>	Perennial	Lavender, blue, purple	6"	Partial shade	Flowers in spring; moist, well drained soil
Iris, Copper	<i>Iris fulva</i>	Perennial	Coppery red to orange	18 to 60"	Partial shade	Flowers early spring; prefers moist to damp soil
Iris, Louisiana	<i>Iris laevigata</i>	Perennial	Blue, white	24 to 30"	Sun to partial shade	Flowers mid to late summer; requires moist soil
Jewelweed; Touch me-not	<i>Impatiens</i> spp.	Perennial	Orange, yellow	3 to 5'	Shade	Flowers summer to fall; moist soil
Lantana	<i>Lantana camara</i>	Perennial	Orange, pink, yellow	6 to 12"	Sun	Summer to fall; well drained soil; tolerates drought
Larkspur	<i>Consolida spp.</i> <i>delphinium spp.</i>	Annual	Blue, pink, purple, white	18 to 36"	Sun to partial shade	Flowers in spring; moderate drought tolerance
Liastris	<i>Liastris</i> spp.	Perennial	Lavender, pink	1 to 5'	Sun	Flowers summer, fall; well drained soil
Lily, Turk's cap	<i>Lilium superbum</i>	Perennial	Orange	6 to 10'	Partial shade	Flowers in summer; best suited for western NC
Lily, Peruvian; Alstromeria	<i>Alstromeria psittacina</i>	Perennial	Pink, yellow, orange, red	24 to 48"	Sun to partial shade	Flowers in spring; semihardy
Lily of the Nile; Agapanthus	<i>Agapanthus</i> spp.	Perennial	White, blue, lavender	2 to 3'	Sun	Flowers in summer; semihardy
Loungwort	<i>Pulmonaria</i> spp.	Perennial	Pink turning blue, white	9 to 18"	Partial shade to shade	Flowers in spring; cool; moist soil high in organic matter
Lousewort	<i>Pedicularis canadensis</i>	Perennial	Red, yellow	6 to 12"	Partial shade to shade	Flowers in spring; best suited for western NC
Lupine	<i>Lupinus</i> spp.	Annual /perennial	Orange, blue, white, purple	12 to 20"	Sun to partial shade	Prefer cool temperatures
Mallow	<i>Malva</i> spp.	Perennial	Red, white, pink	2 to 3'	Sun	
Mallow, Seashore	<i>Kosteletzkyia virginica</i>	Perennial	Pink	2 to 4'	Sun to partial shade	Flowers summer to fall; prefers moist to damp soil

Maltese cross	<i>Lychnis chalcedonia</i>	Perennial	Scarlet	18 to 24"	Sun to partial shade	Late spring to early summer; Moist; well drained; fertile
Marigold	<i>Tagetes erecta, T. patula</i>	Annual	Gold, orange to red-brown, yellow	8 to 48"	Sun	Flowers late spring to fall; moderate drought tolerance
Mexican blue sage	<i>Salvia guaranitica</i>	Half hardy perennial	Violet blue	4 to 8'	Sun to partial shade	
Monkey flower	<i>Minulus spp</i>	Annual	Yellow, pink, red	18 to 24"	Partial shade	Trumpet shaped flowers summer to fall; prefers moist soil
Nasturtium	<i>Tropaeolum majus</i>	Annual	Orange, pink, red, speckled, yellow, white	12"	Sun to partial shade	
Obedient plant	<i>Physostegia virginiana</i>	Perennial	Pink, rose-purple	3'	Sun to partial shade	Late summer to early fall; moist, well drained; moderately fertile
Partridge pea; Senna	<i>Cassia fasciculata</i>	Annual	Yellow	6 to 36"	Sun	Flowers summer to fall
Penta	<i>Pentas lanceolata</i>	Annual	Lilac, red, pink, white	12 to 36"	Sun	Flowers summer to fall; moderate to high drought tolerance
Periwinkle; Vinca	<i>Vinca major, Vinca minor</i>	Perennial	Blue, white, lavender	3 to 6"	Partial shade	Can be used as a ground cover; flowers in early spring
Petunia	<i>Petunia x hybrida</i>	Annual	White, pink, red, purple, yellow	6 to 18"	Sun to partial shade	Spring to summer; moderate drought tolerance
Phlox, Creeping	<i>Phlox stolonifera</i>	Perennial	Pink, violet-purple	4 to 10"	Sun to partial shade	Flowers in spring
Phlox	<i>Phlox spp.</i>	Perennial	White, pink, red, blue, purple	2 to 4'	Sun to partial shade	Flowers in summer
Poppy, California	<i>Eschscholzia californica</i>	Annual	Yellow, orange	12 to 15"	Sun to partial shade	Flowers early summer to fall
Primrose	<i>Primula spp.</i>	Perennial	Yellow, pink	6 to 12"	Partial shade	Flowers in spring; prefers moist, high organic soil
Red hot poker	<i>Kniphofia uvaria</i>	Perennial	Red, yellow	36 to 60"	Sun	Flowers in summer; well drained soil
Sage, Mexican bush	<i>Salvia leucantha</i>	Perennial	Magenta and white	36"	Sun	Flowers summer to fall
Sage, Texas	<i>Salvia coccinea</i>	Annual	Red	2 to 3'	Sun	Flowers in summer

Sage, Autumn	<i>Salvia greggii</i>	Annual	Red, purple, pink, white	24 to 30"	Sun	Flowers summer to fall
Sage, Lyre-leaved	<i>Salvia lyrata</i>	Perennial	Blue, violet	1 to 2'	Sun to partial shade	Flowers spring to early summer
Scarlet sage	<i>Salvia splendens</i>	Annual	Blue, red, white	12 to 36"	Sun to partial shade	Flowers late spring to fall; moderate to low drought tolerance
Snapdragon	<i>Antirrhinum thurberi</i>	Annual	Lavender, orange, pink, red, yellow, white	6 to 36"	Sun to partial shade	Spring to early summer, fall; low drought tolerance
Solomon's seal	<i>Polygonatum biflorum</i>	Perennial	Yellowish green maturing to cream	24 to 36"	Partial shade to shade	Flowers late spring; cool, moist, well drained soil
Spiderlily; Hymenocallis spp.	<i>Hymenocallis</i> spp.	Perennial	White, yellow	12 to 24"	Partial shade	Some species can be used in aquatic gardens; flowers in summer
Sundrops	<i>Oenothera tetragona</i>	Perennial	Yellow	6 to 24"	Sun to partial shade	Flowers in summer
Sunflower	<i>Helianthus annuus</i>	Annual	Gold, red-brown, yellow	12 to 108"	Sun	Moderate to high drought tolerance
Sweet Williams	<i>Dianthus barbatus</i>	Annual	Pink, red, scarlet	18"	Sun	Flowers in spring
Tiger lily	<i>Lilium lancifolium</i>	Perennial	Orange	3 to 5'	Sun to partial shade	Flowers in summer
Tithonia; Mexican sunflower	<i>Tithonia rotundifolia</i>	Annual	Orange, yellow	36 to 60"	Sun	Flowers summer to fall; moderate drought tolerance
Verbena	<i>Verbena x hybrida</i>	Annual	Apricot, blue, pink, salmon, red, white	6 to 12"	Sun to partial shade	Flowers late spring to early fall; moderate drought tolerance
Virginia bluebells	<i>Mertensia virginica</i>	Perennial	Pink to blue	1 to 2'	Partial shade	Flowers in spring; prefers rich moist soil
Zinnia	<i>Zinnia elegans</i>	Annual	Orange, pink, red, white, yellow	6 to 36"	Sun	Late spring to early fall; high drought tolerance
Zinnia, Creeping	<i>Zinnia angustifolia</i>	Annual	Orange, yellow, white	6 to 12"	Sun to partial shade	Late spring to early fall; high drought tolerance

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Annuals and biennials can be started indoors from seeds, sown directly in the garden, or purchased as transplants. If you start plants from seeds indoors, the seeds are usually sown eight to ten weeks before the last spring frost. If you raise your own transplants, be sure to harden them off by exposing them to outside conditions before planting in their intended site.

Annuals seeded in the garden sometimes fail to germinate properly because the soil surface crusts and prevents entry of water. One way to overcome this is to make a furrow in the soil about 1/2-inch deep and fill with vermiculite (if the soil is dry, water the furrow before filling with vermiculite). Then make a shallow furrow in the vermiculite and sow the seed at the rate recommended on the package. Cover the seeds with vermiculite and use a nozzle adjusted to a fine mist to water the seeded area thoroughly. Keep the seed bed well watered or cover with a mulch such as newspaper to prevent excessive evaporation and soil drying. Remove the mulch promptly after germination begins so young seedlings will receive adequate sunlight.

When most outdoor-seeded annuals develop their first pair of true leaves, they should be thinned to the recommended spacing. Excess seedlings can often be transplanted to another spot. This is especially true for seedlings growing in vermiculite-filled furrows. Zinnias are an exception to this rule of thinning. In many cultivars of zinnias, some flowers may appear with a large, nearly naked corolla and few colorful petals. This phenomenon is sometimes referred to as "Mexican hats." To eliminate such plants, sow two or three seeds at each location, wait until the plants start flowering, and then remove plants with this undesirable characteristic. Thin the remaining plants to the recommended 8- to 12-inch spacing. Another exception is sweet alyssum, which is particularly susceptible to damping-off fungal disease. To insure a good stand of alyssum, sow seeds in hills.

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Transplants will produce a display of flowers several weeks earlier than direct-seeded plants. This is especially true for annuals such as scarlet sage and verbena, which germinate slowly or need several months to bloom from seeds.

Annual flowers can be purchased at a variety of retail businesses in the spring. Buy only healthy plants, free of insects and diseases. Retailers often purchase flowers from a wholesale grower instead of growing the plants themselves. While the quality of plants is often excellent when they first arrive, some retailers are not plant experts or are not equipped to properly care for plants. Do not purchase plants that have not been watered properly or that have been stored under stressful conditions (hot, paved surfaces) for extended periods. It is a good idea to ask when the plants arrived or if a new shipment will be arriving soon. Freshly stocked plants are preferable to plants that have been held for several weeks. Choose plants with compact foliage, side branches, and good color. It may be tempting to select the plants that are in bloom, but younger, nonflowering plants are often a better choice, since they will establish in the landscape more quickly.

Wait until the proper planting time to purchase plants. Transplants are often available before the correct planting time, but tender annuals should not be planted before the danger of frost has past. Hardy annuals, such as pansies, should not be planted until the soil has cooled in the fall. Planting too early can result in cold damage in the spring or heat damage and disease in the fall.

Sometimes new plants cannot be set out immediately after purchase. Keep plants outdoors in a partially shaded location and check them daily and water as needed. Since the soil volume is limited in the small containers, they will dry out quickly. While plants may appear to recover fully, wilting can stunt their potential growth.

Plants in cell packs or containers should be watered thoroughly and allowed to drain before removal from the container. A damp root ball is less likely to fall apart. Do not pull plants from their containers. Remove plants from individual containers by tipping the container and tapping the bottom. To remove plants from cell packs, turn the container upside down and squeeze the bottom of the container to force the root ball out of the pack. If the plants are in fiber pots, remove the paper from the outside of the root mass. When setting out plants in peat pots remove the upper edges of the pot so that the lip of the peat pot is not exposed above the soil level where it will act as a wick and pull water away from the plant.

Figure 14-1: click to see larger version



Dig a hole for each plant large enough to accept its root system comfortably. Set the plants at the same depth or just slightly deeper than they were growing in the container. When filling the hole, firm the soil lightly and water thoroughly. A starter solution made from 1 tablespoon of a high grade phosphate fertilizer in 1 gallon of water can be used to water transplants.

Space plants so that they will fill in but not be crowded; crowding increases the likelihood of disease development. Tall, upright plants such as snapdragons should be spaced about one-fourth as far apart as their mature height. Tall, bushy plants should be spaced about one-half as far apart as their mature height. Rounded, bushy annuals should be spaced about as far apart as their mature height. To make beds look more uniform, use a staggered spacing plan instead of setting plants in straight rows. Transplant in the cool part of the day or on an overcast day to minimize stress and check newly planted transplants for moisture stress frequently until new roots have had time to grow into the surrounding soil. Remember that the root mass is initially only as large as the original container, so apply irrigation water toward the base of the plant until it becomes established.

A mulch should be applied after planting. Mulches help keep the soil surface from crusting, reduce soil temperature, conserve moisture, and prevent weed seed germination. Organic mulches can add humus to the soil. Use a 2- to 3-inch layer of material such as pine bark nuggets or pine straw. Apply only 1/2 inch of mulch at the plant crown; excessive mulching around the crown can create disease problems.

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Incorporating soil amendments

The best amendments for clay soils are pine bark (less than 1/2 inch in diameter), composted leaf mold, or small pea gravel (less than 3/8 inch in diameter). Be careful when selecting leaf mold, making certain that the material is fully composted and not merely “aged.” Partially decomposed materials will compete with plants for nutrients, especially nitrogen and sulfur, resulting in nutrient deficiencies and poor plant growth. Peat moss, sand, hardwood bark, wood chips, and pine straw are not recommended because they do not adequately improve the physical properties of a clay soil. Organic matter content must be increased to 25 percent, by volume, to be effective as a soil conditioner. For example, to achieve approximately 8 inches of amended soil, a minimum of 2 inches of material should be incorporated into the top 6 inches of soil. This also raises the bed which improves drainage and makes bedding plants more visible. Incorporating over 50 percent organic matter may have a negative effect on plant growth, while incorporating less than 25 percent is a waste of time and material.

Amendments such as pine bark, composted leaf mold, or peat moss will improve water retention in sandy soils. These amendments need to be added at a minimum of 25 percent by volume and a maximum of 50 percent.

Soil testing and fertilizing

After any amendments to improve aeration and drainage have been incorporated into the bed, have the soil analyzed to determine fertilizer needs and pH. A soil test is the only way to determine if phosphorus, potassium, calcium, or magnesium must be added or if pH should be adjusted. Overapplication or application of unneeded fertilizer could result in salt injury to plants and cause nutrient imbalances. It is also environmentally unsound since runoff of excess nutrients degrades water quality. If soil test results indicate that nutrient or pH adjustments are needed, the materials should be mixed into the soil uniformly since bedding plants have a very limited root system.

The soil pH for bedding plants should be between 5.5 and 6.5. Lime should be thoroughly tilled into the soil prior to planting. If the pH must be lowered, elemental sulfur can be incorporated into the soil. If only a small decrease in pH is required, acid-forming fertilizer such as ammonium nitrate can be used to provide nitrogen and to slightly lower the soil pH.

If a soil test is not made, incorporate 2 to 3 pounds of 10-10-10 fertilizer per 100 square feet of bed area. An easy conversion to remember is that 1 pound of fertilizer is equal to about 2 cups (or 96 teaspoons). Use 2 pounds (4 cups) of dry fertilizer per 100 square feet or about 2 teaspoons per square foot. An alternative to 10-10-10 is a slow-release fertilizer such as 16-4-8 or 12-4-8.

It is impossible to tell how much calcium and phosphorus are required without a soil test. However, because most North Carolina soils are low in phosphorus, it is usually safe to add 2 to 4 pounds of triple superphosphate (0-46-0) per 1,000 square feet. Phosphorus and calcium move very slowly through the soil profile so they should be incorporated into the top 6 to 10 inches.

It is not a good idea to guess at the amount of calcium to apply, first, because it is possible to get too much calcium in the soil which can lead to potassium and magnesium deficiency; and second, because some sources of calcium such as calcitic and dolomitic limestone raise soil pH so high that some nutrients become unavailable to plants. If a soil test shows that calcium is low but a pH change is undesirable, gypsum can be incorporated into the soil prior to planting.

Magnesium may be deficient, especially in low pH soils. If a soil test shows that magnesium levels and soil pH are low, dolomitic limestone can be used to raise the pH and to supply the needed magnesium. To add magnesium without changing the pH, apply Epsom salts. The general rate for Epsom salts is 1 pound per 100 square feet.

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Fertilizing

Nitrogen is the nutrient that most frequently limits plant growth. Unfortunately, nitrogen is the most difficult nutrient to manage. Soil tests for nitrogen are not dependable and nitrogen is easily leached from the soil. The challenge is to maintain adequate nitrogen levels to meet the plant requirements without damaging the plants or the environment.

Growth rate and foliage color are the primary guides for determining the need for additional fertilizer applications during the growing season. However, some general guidelines can be used. Nitrogen can be applied in a quick-release, water soluble form using a liquid or granular fertilizer or in a slow-release, granular form. Make applications of a quick-release fertilizer (such as 10-10-10), every four to eight weeks throughout the season at the rate of 1 pound per 100 square feet; liquid, water-soluble fertilizers should be applied about every two weeks.

With slow-release fertilizers, make only two applications. The first application should be incorporated into the bed just before planting, and the second should be broadcast over the bed midway through the growing season. The total seasonal application of slow-release fertilizer should not exceed 4 to 6 pounds of nitrogen per 1,000 square feet.

Watering

Although some flowers will tolerate moderate periods of dry weather, others must have a continuous supply of water. Flowering of most annuals will slow or stop during extended hot, dry summer weather. To minimize the need for watering, select drought-tolerant annuals such as globe amaranths, blue blaze, Dahlberg daisy, gazania, gomphrena, portulaca, and creeping zinnia.

Supplemental irrigation will probably be required at some point during the growing season. Soil type as well as growth stage and temperature influence watering frequency. Bedding plants grown in a clay soil that has been properly watered may need to be watered only once a week. Bedding plants grown in a sandy soil may have to be watered several times a week. This will vary with the time of year, amount of sunlight or shade, plant growth, and other environmental factors. Most plants need 1 inch of water per week, but may require more when flowering or when exposed to high temperatures or windy conditions. Moisten the entire bed thoroughly, but do not water so heavily that the soil becomes soggy. After watering, allow the soil to dry moderately before watering again.

A soaker hose is excellent for watering flowerbeds. Water seeps directly into the soil without waste and without wetting leaves and flowers. The slow-moving water does not disturb the soil or reduce its capacity to absorb water. Sprinklers wet the flowers and foliage and make them more susceptible to diseases. The impact of water drops falling on the surface may change soil structure and cause it to puddle or crust, preventing free entry of water and air.

The least effective method for watering is with a hand-held nozzle. Watering with a nozzle has all the

disadvantages of watering with a sprinkler. In addition, gardeners seldom are patient enough to do a thorough job of watering with a nozzle so they do not apply enough water and do not distribute it evenly over the bed.

Weed Control

Using mulch and spacing plants so they produce a solid canopy are the best ways to minimize weed problems. Weeds can also be controlled by cultivation or use of a herbicide, but some weeds will still need to be pulled by hand. Weeds are easier to pull after a rain or irrigation.

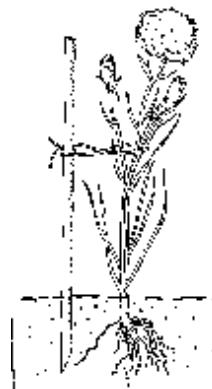
Weeds can only be controlled by cultivation early in the season. As annual flowers grow, the feeder roots that spread between plants are likely to be injured by cultivation. In addition, cultivation stirs the soil and uncovers weed seeds that can then germinate.

Any herbicide used in flower beds must be chosen carefully. Read the label: no one herbicide can be used safely on all annual flowers. Herbicides that are labeled for some but not all flowers include: Betasan, Enide, Surflan, and Treflan. Time and rate of application will vary with the herbicide selected. A preemergence herbicide can be used to prevent many weed seeds from germinating. Some preemergence herbicides are applied before planting, others are applied after planting but before weeds emerge. The flower bed should be weed-free when the herbicide is applied. Only a few postemergence herbicides can be used to control grassy weeds after flowers have become established.

Staking

Many tall annuals such as cosmos and celome may need support to protect them from strong winds and rain. Begin staking when plants are about one-third their mature size. Many materials can be used for staking: wire cages, bamboo stakes, tomato stakes, twiggy brushwood, or wire rings. The staking material should be 6 to 12 inches shorter than the height of the mature plant. Place stakes close to the plant, but take care not to damage the root system. Sink them into the ground far enough to be firm. Loosely tie plants to the stakes, using paper-covered wire, plastic, or other soft material. Tie the plant by making a double loop with one loop around the plant and the other around the stake to form a figure-eight. Never loop the tie around both the stake and plant. The plant will hang to one side and the stem may become girdled. Plants with delicate stems (like cosmos) can be supported by a framework of stakes and strings in crisscrossing patterns.

Figure 14-2: click to see larger version



Deadheading/Pruning

Deadheading is the removal of dead or faded flowers and seed pods. When annuals expend energy to produce seeds after the flower fades, flower production often decreases. To maintain vigorous growth and assure neatness, remove spent flowers and seed pods. Although this step is not necessary for all flowers, it is a good practice with ageratum, calendula, celosia, coleus, cosmos, geraniums, marigolds, scabiosa, salvia, rudbeckia, and zinnias. Check plants weekly. Many modern cultivars are self-cleaning—their spent flowers disappear quickly. Some cultivars are sterile and do not produce seeds.

Some bedding plants such as polka dot plant and impatiens, may benefit from pruning back for size control and rejuvenation. Others such as gomphrena can be pruned or sheared into shapes. Pruning can stimulate greater flowering of some cultivars of petunias. Cut back plants as needed leaving approximately one-half of the shoot.

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Weed Management in Annual Color Beds

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Establishing and maintaining quality annual color beds requires a plan to prevent and control weeds. Weeds compete with ornamental plants for water, light, and nutrients reducing aesthetic quality and plant growth. To minimize these problems, a weed management program should be developed and implemented prior to planting. A successful weed management program involves the following:

- Understanding weeds (identification and life cycle)
- Understanding the available weed management options
- Site preparation - eliminate perennial broadleaf weeds and sedges before planting
- Implementing a combination of effective methods to prevent and control weeds

Know Your Enemy

The first steps in developing a successful weed management program is to identify your weeds and to determine how difficult they may be to control after planting. This requires knowledge of their life cycles, methods of reproduction and spread, and susceptibility to different control strategies. Several pictorial guides are available for identifying weeds (refer to suggested references).

Most weeds found in color beds have one of three life cycles: summer annual, winter annual, or perennial. The weed's life cycle provides information on timing of germination and method of reproduction. Annual weeds live for one growing season and are divided into two types - summer annuals and winter annuals.

Summer annual weeds germinate in the spring (about when the dogwoods bloom) and continue throughout the summer months. They flower and produce seed prior to the first frost. Common summer annual weeds include grasses such as barnyardgrass, crabgrass, and goosegrass; and broadleaves such as annual lespedeza, carpetweed, common purslane, morningglories, pigweed and spurge.

Winter annual weeds germinate in late summer and early fall, overwinter as small dormant but green plants, then flower and produce seed in spring or summer. Winter annual weeds usually die with the onset of warm weather. Common winter annual weeds include annual bluegrass, annual sowthistle, common chickweed, hairy bittercress, and henbit.

Perennial weeds live longer than two years and are classified according to their method of reproduction as simple or creeping. Simple perennials spread by seed, they have no natural means of spreading vegetatively. The roots are usually fleshy and can grow very large. Examples include common dandelion, curly dock, buckhorn and broadleaf plantain, and pokeweed. Creeping perennials reproduce by above ground stems (stolons) or below ground stems (rhizomes). Of course, most perennial weeds can also reproduce by seed. Examples include nutsedge, bermudagrass, red sorrel, ground ivy, and pennywort (dollarweed)..

Annual weeds are generally more easily controlled in landscape beds than are perennials. Therefore, before planting it is important to document the weed species present in the landscape beds and adjacent areas. If difficult to control weeds are present, efforts should be made to control them before planting.

Pre-Plant Site Preparation

When perennial weeds or difficult-to-control annual weeds are present in the landscape bed, they should be controlled before planting. By far, the most common site preparation measure is to treat the bed with glyphosate about 2 weeks before planting then rototill before planting. This will control most emerged weeds, but does not affect seeds in the soil nor will it control weeds that are not actively growing at the time of treatment. Some particularly hard to control weeds such as nutsedge, mugwort and Florida betony will not be controlled by these treatments

Although labor-intensive and expensive, manual removal of simple perennial weeds is practical because they do not spread by underground structures. Cultivation (rototilling) will kill many simple perennial weeds and kills emerged annual weeds. However, soil cultivation stimulates weed seed germination. Repeated cultivation can be used to deplete the soil seedbank by repeatedly stimulating weed seed germination then killing the emerged weeds before they can set new seed. This process takes time and is generally not practical for landscape beds. Manual removal of creeping perennials is difficult to impossible. Therefore, creeping perennial weeds are generally best controlled by the application of a non-selective, systemic herbicide such as glyphosate.

When particularly difficult-to-control weeds are present in beds and other measures have not or will not provide acceptable control, soil pasteurization may be an option. There are two options to kill weed seeds in the soil - solarization and chemical fumigation. Solarization is a process that uses energy from the sun to heat the soil in an effort to kill weed seeds. In the summer when days are longest and sunlight (and temperatures) is at a maximum, rototill the bed then cover with clear plastic. Leave the plastic in place for six to eight weeks. Small-seeded annual weeds can be reduced by solarization but it does not work as well on larger weed seeds or perennial weed propagules that are often deeper in the soil and avoid the killing temperatures.

If the site is heavily infested with perennial broadleaf weeds or sedges, soil fumigation may be considered. Because fumigation kills by using toxic chemicals, this is an option of last resort. If chemical fumigation is to be done, it is important that care be given to each stage of the fumigation process to ensure the safety of the fumigator and the effectiveness of the treatment. Soil preparation is the key to successful fumigation. Kill living vegetation with glyphosate, then cultivate to a depth of 6 to 8 inches several weeks before you intend to fumigate. Cultivate again immediately before fumigation. At treatment time, the soil should be free of clods and fresh organic debris, moist enough for seed germination, and have a temperature greater than 50°F at the 6-inch depth. Since most fumigants are inactivated by high levels of undecomposed organic material (such as leaves or grass), organic debris should be removed or allowed to decompose before fumigation. If the soil is not moist, properly prepared and free of fresh organic matter, there may be weeds that the fumigant will not kill. While the soil should be moist, wet soils are not sufficiently aerated to allow free movement of the fumigant within the soil and will result in poor control.

Two fumigants are available: metham sodium (Metham) and dazomet (Basamid). Metham Sodium is a liquid while Basamid is in granular form; however, the active ingredient in both products is methylisothiocyanate which is released as a gas after the material is applied to the soil. Since Metham Sodium is a liquid and may be applied as a spray, injected or as a drench. Basamid is a granule and is applied with a spreader then rototilled into the soil. After application, irrigate the soil with sufficient water to saturate the surface. To increase effectiveness, cover the area with plastic sheeting. Seven days later, remove the plastic and cultivate to a depth of 2 inches. Do not plant until 14 to 20 days after treatment. If the soil is cold and wet you will have to wait longer. Always refer to product label for details and precautions. Your County Cooperative Extension Agent is a good source of advice concerning which technique would be best for you. If you have never fumigated soil before, have an experienced pesticide applicator help the first time you fumigate. Fumigants are highly toxic chemicals that must be handled properly to be both safe and effective.

Keep It Clean

After preparing the planting bed, try not to re-introduce weeds. Clean equipment such as tillers or tractors before using them in the area. Do not add top soil unless it is absolutely necessary. Use only well composted organic amendments. Composts coming from certified composting facilities are generally weed-free. Also, control weeds around the beds to prevent weed introductions and encroachment.

At Planting

Weeds occupy open spaces. Designing the color bed to utilize all the bed space will increase competition and reduce the sunlight reaching the soil surface which will decrease the weed population. Proper soil conditioning and amendments, in concert with quality plant selection and maintenance will minimize seedling weed emergence later in the season.

An essential part of a weed management program is use of mulch. Mulches control weeds by depriving them of light. Organic mulches e.g., pine needles, pine bark, hardwood bark, leaf mold (old leaves), etc. may be used. For bedding plant areas that are to be transitioned two or three times a year, relatively fine-textured mulch is generally used and incorporated into the soil before re-planting.

What about toxic mulch? Organic matter left in piles and not turned to provide proper aeration will become anaerobic -- producing many compounds that are toxic to bedding plants. Such mulches have a "bad" odor. Do not use anaerobic mulches in landscape beds. Additionally do not use pine straw as a mulch for pansy and viola beds. Pine straw mulch reduces the growth and quality of pansies; but it has not been reported to reduce growth of other bedding plant species - just pansies.

After Planting

Regardless of how carefully a bed is prepared and planted, weeds will emerge, even through the mulch. Consequently, sanitation is an essential part of any weed management program. Remove weeds when they are young, before they go to seed. Remove or

control perennial weeds before they can spread. Control weeds in areas around the bed to reduce weed seed and vegetative spread into landscape beds. To reduce the need for hand weeding, it is often desirable to use a preemergence herbicide to control annual weeds.

Preemergence Weed Control

Preemergence herbicides are applied after planting but before weeds emerge and provide residual control of weed seedlings. Since preemergence herbicides will not control emerged weeds, they should be applied before weeds germinate or all existing weeds must be killed prior to herbicide application. With annual flower beds, preemergence herbicides should be applied after transplanting to weed-free soil. It is generally best to mulch the bed before herbicide application. Granular formulations of herbicides are safer to bedding plants than spray formulations. Bedding plant foliage should be dry at the time of application to prevent herbicide granules from sticking to the foliage. Irrigate after treatment to wash granules off of the plants and to "activate" the herbicide. When bedding plants establish quickly only one herbicide application is typically needed. A dense plant canopy will deter weed growth. However, if bedding plants do not provide complete ground coverage, or if yellow nutsedge is the target weed, a second herbicide application may be necessary about eight weeks after the initial treatment.

Choosing the Right Herbicide

The proper herbicide for each situation will be dictated by the plant species located in the bed, weed species, and future use. Table 1 provides some general information about herbicides commonly used in landscape color beds. Table 2 provides guidelines on which bedding plants are listed on preemergence herbicide labels. Use this chart to select possible herbicides for use, then check herbicide labels for specific use-instructions, precautions, and weeds controlled.

Postemergence Weed Control

As stated previously, hand weeding will be a part of any landscape weed management program. However, some weeds can be controlled after emergence with herbicides. Postemergence herbicides are applied to weeds after they have emerged.

Characteristics of postemergence herbicides that should be considered before selection and use are:

1. Systemic versus Contact
2. Selective versus Non-selective
3. Timing

Postemergence herbicides can be classified as systemic or contact, and selective or non-selective. Systemic herbicides such as Roundup-Pro and Finale are absorbed and move through the plant. These are useful for controlling perennial weeds. For best control, the weeds must be actively growing so the herbicides can move throughout the plant. Contact herbicides such as Reward and Scythe kill only the portion of the plant that is actually contacted by the herbicide. Contact-type herbicides control small annual weeds but only burn-back perennial or large annual weeds. Thus, good spray coverage is important.

Selective herbicides only kill specific plants. The only selective herbicides recommended for use in bedding plants are the postemergence, grass control herbicides, Sethoxydim, Fusilade II, Acclaim and Envoy. These herbicides only kill grasses while broadleaves are unharmed. Check the labels for each herbicide for labeled bedding plants, susceptible weeds and special precautions. For example: Envoy controls annual bluegrass, whereas the other products do not. Acclaim will control crabgrass and other annual grasses but will not control most perennial grasses. For perennial grass control Fusilade II, Sethoxydim or Envoy are preferred. Generally, these herbicides may be applied directly over the top of bedding plants, but check the label for precautions as certain species and varieties have shown sensitivity to one or more of these herbicides. Careful attention to application uniformity and dose are needed because over-dosing plants (or too high a concentration of spray adjuvant) can result in damage to bedding plants. Additionally, some surfactants can injure tender foliage and flower petals, especially if applied during hot weather. Read the label carefully and use only recommended spray adjuvants or surfactants.

Non-selective postemergence herbicides such as glyphosate (Roundup-Pro, Touchdown, and many other trade names), Finale (glufosinate), Reward (diquat) and Scythe (pelargonic acid) have the potential to kill or injure any plant they contact. However, they may be used as spot sprays around color beds, avoiding contact with desirable vegetation. If tall weeds emerge in beds, and hand weeding is not feasible, it is sometimes possible to wipe them with a concentrated solution of glyphosate (33% by volume in water). Of course care must be taken to avoid glyphosate contact with the bedding plants.

Following these 7 rules will help ensure that you get maximum effectiveness from postemergence herbicides.

1. Apply the correct dose
2. Multiple applications are may be required to control perennial weeds
3. Use the type and amount of surfactant specified on the label, if needed
4. Apply when air temperature and humidity are favorable

5. Treat weed at proper growth stage
6. Avoid mowing 3 or 4 days before and after herbicide application
7. Allow plenty of drying time (check the label for specified times)

It is important to develop a weed management strategy that encompasses all 12 months of the year and utilizes all available options. These include preventative measures such as organic and inorganic mulches, preemergence herbicides, and sanitary practices that prevent weed seeds and vegetative parts from spreading. Weed management in color beds can be accomplished with mulch, preemergence herbicides and/or hand weeding, if perennial weeds are controlled before planting.

Note: Always use pesticides according to directions on the label. Use of trade names does not imply endorsement by the N.C. Cooperative Extension Service or the N.C Agricultural Research Service of the products named nor criticism of similar products not mentioned.

Suggested References

Weed Identification Guides--Weeds of Southern Turfgrass

Publication Distributions Center
IFAS Building 664 P. O.
Box 110011
University of Florida
Gainesville, Florida 32611
(904-392-1764)
call for cost and shipping information

Turfgrass Pest Management Manual

North Carolina State University
Department of Crop Science
Box 7620
Raleigh, NC 27695-7620
\$12.00 Make check payable to: *Crop Science Extension*

Weeds of the Northeast
Cornell University Press
P. O. Box 6525
Ithaca, NY 14851-6525
607-277-2211
\$29.95 plus \$5.00 shipping

Table 1. Preemergence herbicides commonly used in landscape beds.

Trade Name	Active Ingredients	Comments
Barricade 65 DG, or Regalkade 0.5G	prodiamine	Fairly broad spectrum weed control including annual grasses, spurge, chickweed, henbit, oxalis and others. Granule (Regalkade G) is much safer than the spray (Barricade). Only a few bedding plants are on the label.
Pendulum 2G	pendimethalin	Fairly broad spectrum weed control including annual grasses, spurge, chickweed, henbit, oxalis and others. Granular formulation much safer than spray. Safe on many herbaceous ornamentals.
Dacthal 75WP	DCPA	Preemergence control of crabgrass, spurge, dodder, and several other annual weeds. Shorter residual control than other herbicides listed here.
Devrinol 2G or 50DF	napropamide	Somewhat narrow spectrum of weeds controlled - annual grasses primarily. Safe on many herbaceous ornamentals but labeled for few.
Snapshot TG	isoxaben + trifluralin	Broader weed control spectrum, but can injure many bedding plant species. Check the label carefully before use in color beds.
Surflan, XL	oryzalin, oryzalin + benefin	Broad spectrum weed control. Injurious to many bedding plants. The granular formulation (XL) is much safer than the spray.
Pennant		Preemergence control of yellow nutsedge, annual grasses and a few broadleaf weeds. Labeled

Magnum	s-metolachlor	for use on only a few bedding plant species.
Preen	trifluralin	Controls annual grasses and a few broadleaf weeds. The weakest weed control of the herbicides listed here but also the safest herbicide on herbaceous ornamentals.

Table 2. Preemergence Herbicides Registered for Use on Common Bedding Plants

Legend:

- R = Registered for this species. Can be applied over the top.
- R* = Registered for some species; check label for details.
- I = Registered, but research indicates injury can occur. x = research or label indicates that injury is likely.
- No entry indicates the herbicide is not labeled for use on that species

Common Name	Genus	Barricade	Dacthal	Devrinol	Pendulum 2G	Pennant Magnum	Snapshot TG	Surflan	Treflan / Preen	XL
Ageratum	<i>Ageratum</i>		R		R	R			R	
Balsam	<i>Impatiens</i>				R	R	x		R	
Begonia, fibrous	<i>Begonia</i>	x			R		x	x	R	
Cabbage, Ornamental	<i>Brassica</i>				R					
Chrysanthemum	<i>Chrysanthemum</i>	R		R	R	R	R	R	R	R
Cockscomb	<i>Celosia</i>				R*		x			
Coleus	<i>Coleus</i>		R				x			
Cosmos	<i>Cosmos</i>		R						R	
Dusty miller	<i>Senecio</i>				R	R			R	
Geranium	<i>Pelargonium</i>		R	R		R			R*	R
Globe amaranth	<i>Gomphrena</i>	x					x	x		x
Impatiens	<i>Impatiens</i>				R	R	x	R*	R	R*
Kale, Ornamental	<i>Brassica</i>									
Lantana	<i>Lantana</i>	x	R	R	R*		x		R	
Marigold	<i>Tagetes</i>		R		R*	R	R*	R	R	R
Melampodium	<i>Melampodium</i>	x						x		
Moss-rose	<i>Portulaca</i>		R		R				R*	R
Nicotiana	<i>Nicotiana</i>								R	R
Pansy	<i>Viola</i>	x	x		R	R	x	x		R*
Pepper, ornamental	<i>Capsicum</i>									
Periwinkle (vinca)	<i>Catharanthus</i>				R		R		R	
Petunia	<i>Petunia</i>			R	R	R	R	R	R	R
Salvia (scarlet sage)	<i>Salvia</i>				R			R	R	R*
Snapdragon	<i>Antirrhinum</i>		R		R	R		R	R	R
Strawflower	<i>Helichrysum</i>		R							
Sunflower	<i>Helianthus</i>		R							R
Sweet alyssum	<i>Lobularia</i>						R			R
Sweet potato	<i>Ipomoea</i>									

Sweet William	<i>Dianthus</i>	X	R	R	R	R	R
Verbena	<i>Verbena</i>		R*		R*	R*	R
Zinnia	<i>Zinnia</i>	R	R	R	R*	R*	R

Updated June 2007. Human errors can occur and labels change. Check the herbicide label before use.

Recommendations for the use of chemicals are included in this publication as a convenience to the reader. The use of brand names and any mention or listing of commercial products or services in this publication does not imply endorsement by the North Carolina Cooperative Extension Service nor discrimination against similar products or services not mentioned. Individuals who use chemicals are responsible for ensuring that the intended use complies with current regulations and conforms to the product label. Be sure to obtain current information about usage and examine a current product label before applying any chemical. For assistance, contact an agent of the North Carolina Cooperative Extension Service in your county.



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The term perennial is frequently used by gardeners to refer to herbaceous perennial flowers. Most herbaceous perennials grow and flower for several years. Some perennials are short-lived -- surviving for only three or four years. In the fall, the tops of herbaceous perennials (leaves, stems, and flowers) die down to the ground while the root system persists through the winter. In the spring, the plant grows new leaves from its crown or roots. Plants that grow from bulbs and bulb-like structures are also herbaceous perennials but are often classified separately as flowering bulbs.

An advantage of perennials is that they do not have to be planted every year. Many perennials only flower for a few weeks each year, however, with careful planning you can have some perennials in bloom most of the season. Some consideration should be given to how a plant looks when it is not in bloom. Perennials with colorful or interesting foliage can provide interest even when they are not in bloom. Annuals can be combined with perennials to produce a continuous colorful show.

Site Selection

Consider the same aspects of site selection for perennials as you do for annuals; sunlight (sun or shade), slope, soil type, moisture requirement, drainage, and the roles plants will play in the garden. This is especially important with perennials since they are usually left in the site for several years or indefinitely. Shaded sites pose the additional problem of tree roots competing for moisture. Even when you do an excellent job of preparing the site, tree roots tend to grow back.

Select a site that does not have a severe weed problem. This is especially true for hard-to-control weeds such as bermudagrass and nutsedge. A site that has been cultivated for several years often has fewer weeds. You may decide to use a nonselective herbicide or to cover the site with clear plastic the summer before planting to reduce weed problems (referred to as soil solarization).

Many perennials need a well-drained soil. While plants will tolerate a wet site for a short period of time, most will be killed by extended periods of "wet feet". Avoid locating the perennial border in low lying areas that are subject to standing water. Incorporate a 3- to 4-inch layer of organic matter, such as pine bark mulch or compost, before planting.

Soil pH requirements vary among perennials but most prefer a pH between 5.5 and 6.5. Lime can be applied individually to those that need a higher pH. Fertilize according to a soil test or incorporate 5 pounds of 5-10-10 per 100 square feet before planting.

Selecting Plants

Observe the bloom period for perennials in your neighborhood. Choose plants that will bloom together as well as those that will be showy when little else is in bloom. To obtain details on particular plants, consult plant societies, specialty books, nurseries, and local botanical gardens.

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Starting Plants from Seeds

If you plant seeds, some off-types of color, flower form, and plant habit can be expected. Perennials seeded in the garden frequently fail to germinate properly because the surface of the soil crusts and prevents entry of water. To avoid this, sow the seed in vermiculite-filled furrows. While you can sow perennial seeds directly in beds where they are to flower it is usually best to start plants indoors or in a cold frame and set them outdoors after the weather warms. An alternative to spring seeding is to sow seeds in flats or seedling beds during the summer for fall transplanting. Perennials started in spring frequently will not flower their first year.

Dividing

Many perennials will need dividing after three years. Some perennials are best left in place and not divided; examples include: baby's breath, blue wild indigo, gas plant, goat's beard, globe thistle, and sea holly.

The best time to divide most perennials is in the spring when new shoots are 2 to 3 inches tall, or in the fall when the foliage starts to die back. Plants divided during an active growth period in the summer are slower to become reestablished. Some perennials can be divided following their flowering period even during the summer, examples include daylily and bearded iris. Division is normally done by digging and dividing the clump into several smaller clumps. An alternative for vigorous clumps is to slice off a section with a sharp spade while leaving the main clump in the ground.

Some perennials (chrysanthemums, bearded iris) exhibit a decline in vigor as a clump grows. Transplants from the clump's center often grow poorly and bloom sparsely. To divide mature clumps, select only the vigorous outer edges of the clump and discard plants from the center. Divide the plant into clumps of three to five shoots each. Do not put all the divisions back into the same space that contained the original plant --- that would place too many plants in a given area. Exchange extra plants with a friend, plant them elsewhere in the yard, or discard them.

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Perennials can be obtained from a wide variety of sources including nurseries, garden centers, and mail order companies. Buy named cultivars instead of seedlings, if possible. Plants come in a vary of container sizes and are often in bloom when offered for sale, which allows you to select the colors you want and gives a more instant look in the garden. While perennials can be transplanted in flower, this is not the best time for planting.

Plants sold in cell packs are less expensive and the roots will usually grow into the surrounding soil quicker than larger, container grown plants. Select plants that are compact and have normal color. Plants in cell packs dry out quickly; so keep them moist until they are planted.

Discount chain stores and grocery stores often sell plants in cardboard boxes, tubes, or plastic bags. They were dormant when shipped but may have started growing while on display. If purchased soon after the plants arrive at the merchant, the plants often grow satisfactorily, but seldom do well if they have dried out or have produced new thin, yellow or pale green leaves and stems. If only a small amount of new tender growth has occurred, they may grow satisfactorily but should be hardened off before planting outdoors.

Mail order companies frequently offer a wider selection of perennials than most local nurseries. While most mail order companies are reputable, a few tend to be misleading in their claims and specialize in offering small, lower-grade plants. Most companies guarantee their plants and will replace those that arrive in poor condition or fail to grow properly. Most companies ship plants bare root or in small containers. Shipping dates will vary with the location of the company; northern nurseries often ship only in the spring. When the plants arrive check to ensure that they are moist.

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Bare root plants are normally transplanted in early spring. Container grown plants can be transplanted any time of the year but plants set out during hot, dry weather will require more attention in order to survive. Late summer or fall-flowering container grown perennials are normally planted in the spring, while spring-flowering perennials are planted in late summer or early fall. Regardless of the time of planting, perennials should be allowed sufficient time to establish themselves before flowering or before the onset of cold or hot, dry weather. Many gardeners prefer fall planting since the plants will develop an extensive root system before new foliage growth occurs.

The ideal weather to transplant is when it is cool and overcast. Avoid planting during hot or windy periods or provide some shading after planting. Soak bare root plants in water for about a half hour before planting. Water container grown plants before removing them from their container. Turn the pot upside down and slide the root ball out. Roots may have difficulty growing into the surrounding soil unless the roots and soil mixture are cut, loosened, and spread out. Fill the hole and firm the soil lightly around the plant. Be sure the crown is at the soil line.

Drench the soil around the planting hole with a liquid fertilizer (16-12-10 or 20-20-20 mixed 1 tablespoon per gallon of water) to stimulate root growth. Check reference books to determine optimum spacing between plants. After planting, apply a 2- to 3-inch layer of mulch without covering the crown. Plants will need to be watered frequently after transplanting until new roots are produced into the surrounding soil.

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Mulching

Mulching gives an orderly look to the garden, cuts down on weeding, and helps maintain uniform soil moisture. Organic mulches add some nutrients and humus to the soil as they decompose and improve soil tilth and moisture holding capacity. Most organic mulches should be applied after plants are well established and when there is reasonably good soil moisture. Pine bark nuggets, pine needles, compost, and shredded leaves are commonly used organic mulches for perennial beds. A 2- to 3-inch layer of mulch is applied at planting. Additional mulch is added in early spring to maintain the desired mulch depth. A word of caution --- heavy mulches that hold moisture can be detrimental, particularly to plants subject to crown rot.

Watering

Soil type, plant species as well as growth stage and temperature influence watering frequency. Plants grown in a clay soil that has been properly watered may need to be watered only once a week. Plants grown in a sandy soil may need watering several times a week. Water requirements will vary with the time of year, amount of sunlight or shade, plant growth, and other environmental factors. Most plants need 1 inch of water per week, but may require more when flowering or when exposed to high temperatures or windy conditions. After watering, allow the soil to dry moderately before watering again.

A soaker hose is excellent for watering. Water seeps directly into the soil without wetting the leaves and flowers. Sprinklers wet the flowers and foliage and makes the plant more susceptible to diseases.

Weed Control

Mulch and proper plant spacing are the best ways to minimize weed problems. A preemergence herbicide can be used to control many weeds. Some preemergence herbicides are applied before planting, others are applied after planting but before weeds emerge. Any herbicide used in flowerbeds must be chosen carefully. Read the label: no one herbicide can be used safely on all flowers. Herbicides that are labeled for some but not all flowers include: Betasan, Surflan, and Treflan. Time and rate of application will vary with the herbicide selected. The bed should be weed-free when the preemergence herbicide is applied. Only a few postemergence herbicides can be used to control grassy weeds after flowers have become established. Some weeds will still need to be pulled by hand -- weeds are easier to pull after a rain or irrigation.

Fertilizing

Most perennials are not heavy feeders. A light fertilization of 2 to 3 pounds of 5-10-10 or 10-10-10 per 100 square feet should be applied in early spring. A second application is often made in mid-summer at the rate of 1 1/2 to 2 pounds per 100 square feet. Take into consideration the amount of plant growth -- if growth is adequate you may not need to fertilize. Too much fertilizer will promote foliage and possibly diseases without necessarily promoting flower production. It is not necessary to remove the mulch before fertilizing.

Water after applying fertilizer; this will wash fertilizer off the foliage, prevent foliage burn, and will make the fertilizer available more quickly.

Deadheading

After perennials have bloomed, spent flowers and seed pods should be removed. Keep in mind that some perennials do not require deadheading since the seed pods are either not very visible or are quite attractive. Cut the flower stem down to a healthy leaf or side branch. This will keep the plants looking neater and will prevent them from wasting energy by producing seeds. Some plants produce so many seeds and volunteer plants that they become overcrowded and invasive. Deadheading will reduce the problem. Some perennials will rebloom if cut back after the first flush of flowers.

Pinching

Some plants will grow thicker and fuller if the terminal growth is pinched. This reduces the height and reduces the likelihood that the plant will be blown over by wind and rain or from the weight of large, heavy flowers. The result is a more compact plant with more but sometimes smaller flowers. Pinching often delays flowering. Plants that respond to pinching include chrysanthemums, asters, and phlox. Start pinching in early spring when the shoots are several inches long and discontinue by early July.

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Perennials can be classified based on their hardiness. Hardy-perennials will normally survive the winter with little or no protection. Hardy does not, however, refer to the ability of the plant to withstand heat and drought. Tender or half-hardy perennials will survive a mild winter but may not survive a severe winter without protection.

In colder parts of the country perennial beds are often mulched to provide winter protection. For most areas of North Carolina this is not necessary. Many gardeners prefer to leave the dead foliage as a form of winter protection, however, old foliage can harbor disease and insect problems. If left over the winter, the dead foliage should be removed quite early in the spring.

A mulch should be applied to plants that are growing at the upper limits of their normal growing area. The purpose of the mulch is to help the plants remain dormant. Apply mulch only after the soil temperature has decreased following several killing frosts. If a winter mulch is applied too early, the warmth from the protected soil could cause growth to continue and become more subject to winter injury. Be careful not to pile mulch heavily over the crowns, as this would encourage rotting. Remove the winter mulch from the crown as soon as growth starts in the spring.

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Select Perennial Flowers for North Carolina

Name	Bloom Season	Sun Exposure	Soil Requirements	Height (inches)	Hardiness Zone	Flower Color	Propagation
Ageratum, Hardy <i>Eupatorium coelestinum</i>	Late summer to frost	Sun to partial shade	Moist; tolerates poor drainage	12 to 36	6 to 10	Blue, violet, white	Division in spring
Alumroot, 'Palace Purple' <i>Heuchera</i> 'Palace Purple'	Foliage: spring to fall	Sun to partial shade	Well drained	12 to 24	4 to 8	Purple (foliage)	Division; seeds
Anemone, Japanese <i>Anemone x hybrida</i>	Late summer to fall	Partial shade	Well drained	24 to 48	4 to 8	Pink, white	Division in spring; root cuttings in winter
Artemisia <i>Artemisia absinthium</i>	Late summer	Sun	Dry	24 to 36	3 to 9	Yellow	Seeds; division
Aster Aster spp.	Late summer, fall	Sun	Well drained	12 to 48	5 to 8	Blue, pink, violet, white	Spring or fall division; cuttings
Astilbe <i>Astilbe x arendsii</i>	Early to mid summer	Sun to partial shade	Moist; fertile	24 to 48	4 to 9	Pink, red, white	Spring or fall division; seeds
Baby's breath <i>Gypsophila paniculata</i>	Summer	Sun	Well drained; alkaline	18 to 36	3 to 8	Pink, rose, white	Seeds; grafting
Balloon flower <i>Platycodon grandiflorus</i>	Late spring to summer	Sun to partial shade	Well drained, slightly acidic	12 to 36	3 to 8	Blue, white	Seeds; division in spring
Bearded tongue <i>Penstemon</i> spp.	Late spring to summer	Sun	Well drained	18 to 36	5 to 8	Orange, pink, red, rose, violet, white	Seeds sown late summer; cuttings in summer; division
Bear's breeches <i>Acanthus spinosus</i>	Midsummer	Partial shade	Well drained	36 to 48	7 to 10	Purple and white	Root cuttings in spring
Bee-balm <i>Monarda didyma</i>	Summer	Sun to partial shade	Moist	24 to 48	4 to 9	Pink, red, rose, violet, white	Division in spring; cuttings; seeds
Begonia, Hardy <i>Begonia grandis</i>	Summer to fall	Partial shade	Rich; moist	24	6 to 9	Pink	Bulbils formed in leaf axils; seeds

								seeds
Bellflower <i>Campanula</i> spp.	Summer	Sun	Well drained	9 to 60	3 to 7	Blue, lavender white	Seeds	
Bergenia <i>Bergenia cordifolia</i>	Early spring	Partial shade	Rich; moist	12 to 18	3 to 8	Deep pink	Seeds; division in spring	
Black-eyed Susan <i>Rudbeckia fulgida</i> var. <i>Sullivantii</i>	Late summer	Sun to partial shade	Well drained	18 to 30	3 to 9	Gold with black center	Division in spring or fall; seeds	
Blanket flower <i>Gaillardia x grandiflora</i>	Summer, long flowering	Sun	Dry; sandy; well drained	12 to 36	2 to 10	Red and yellow	Seeds, division in spring	
Bleeding heart <i>Dicentra spectabilis</i>	Spring	Partial shade	Rich; moist; well drained	14 to 24	2 to 9	Rose pink, white	Seeds sown late summer; division in fall or spring	
Bleeding heart, Fringed <i>Dicentra eximia</i>	Early summer	Partial shade to shade	Rich; moist; well drained	12 to 18	3 to 9	Deep pink	Seed sown late summer; division in spring	
Blue wild indigo <i>Baptisia australis</i>	Spring	Sun to partial shade	Well drained	36 to 48	3 to 9	Blue	Seeds sown when fresh in mid-summer	
Butterfly weed <i>Asclepias tuberosa</i>	Spring, summer	Sun	Dry; well drained	24 to 36	4 to 9	Orange, red, yellow	Seeds	
Candytuft <i>Iberis sempervirens</i>	Spring	Sun	Well drained; alkaline	9 to 18	3 to 9	White	Cuttings in midsummer; seeds	
Cardinal flower <i>Lobelia cardinalis</i>	Late summer	Partial shade	Moist; high in organic matter	36 to 48	3 to 9	Cardinal red	Remove offshoots in late summer; seeds; cuttings	
Chrysanthemum <i>Deudranthuna x grandiflora</i>	Fall	Sun	Well drained	12 to 36	5 to 9	Lavender, orange, red yellow, white	Division in spring	
Columbine <i>Aquilegia canadensis</i>	Spring	Partial shade	Moist; well drained	12 to 24	3 to 8	Red and yellow	Seeds	
Coneflower, Purple <i>Echinacea purpurea</i>	Summer	Sun to partial shade	Well drained; drought tolerant	24 to 36	3 to 8	Rose pink or white with gold centers	Division in spring; root cuttings	
Coral bells	Late spring	Partial	Well drained:	12 to 18	3 to 8	Deep pink, red	Division	

<i>Heuchera sanguinea</i>		shade	high organic matter				
Coreopsis, Lanceleaf <i>Coreopsis lanceolata</i>	Late spring	Sun to partial shade	Well drained to dry	12 to 24	3 to 8	Gold, yellow	Seeds; division in spring or fall
Coreopsis, Threadleaf <i>Coreopsis verticillata</i>	Summer	Sun to partial shade	Well drained; dry	9 to 18	3 to 9	Yellow, gold	Division in spring or fall; seeds
Daisy, English <i>Bellis perennis</i>	Spring	Sun to partial shade	Cool; moist; fertile	3 to 6	4 to 10	Pink, red, white	Seeds; division in spring
Daisy, Shasta <i>Leucanthemum x superbum</i>	Spring, summer	Sun	Well drained	12 to 36	4 to 9	White, yellow centers	Division in fall
Evening primrose <i>Oenothera speciosa</i>	Summer	Sun	Well drained; infertile	12 to 24	5 to 8	Pink, white	Seeds; division
Flax, Perennial <i>Linum perenne</i>	Spring, summer	Sun to partial shade	Well drained	12 to 18	4 to 9	Blue, white	Seed; cuttings in summer
Foamflower <i>Tiarella cordifolia</i>	Spring	Partial shade to shade	Moist; cool	6 to 12	3 to 8	White	Division in spring; seeds sown spring
Foxglove <i>Digitalis purpurea</i>	Late spring	Partial shade	Moist; well drained	24 to 60	4 to 9	Purple, white	Seeds sown in late summer
Foxtail lily <i>Eremurus</i> spp.	Summer	Sun	Rich, well drained	24 to 60	5 to 8	Bronze, pink, white, yellow	Division in fall every 3 to 4 years
Gas plant <i>Dictamnus albus</i>	Early summer	Sun	Well drained	36 to 48	3 to 8	White	Seeds
Gaura, White <i>Gaura lindheimeri</i>	Summer to fall	Sun to partial shade	Rich; well drained	24 to 48	5 to 9	White fading to light pink	Seeds; division seldom necessary
Geranium, Cranesbill <i>Geranium sanguineum</i>	Spring, summer	Sun to partial shade	Moist; drought tolerant	9 to 12	3 to 8	Magenta	Division in spring or fall; cuttings; seeds
Gerbera daisy <i>Gerbera jamesonii</i>	Early summer to frost	Sun	Well drained	12 to 18	8	Peach, pink, red, yellow	Seeds; division in spring
Geum <i>Geum</i>	Late spring	Partial	Well drained	9 to 18	5 to 7	Orange,	Annual

spp.	to early summer	shade				scarlet, yellow	division in late summer; seeds
Globe thistle <i>Echinops ritro</i>	Summer	Sun to partial shade	Well drained	24 to 48	3 to 8	Deep blue	Division or root cuttings in spring
Goat's beard <i>Aruncus dioicus</i>	Late spring	Partial shade	Moist; rich	48 to 60	3 to 7	Creamy white	Seeds; division in spring
Goldenrod <i>Solidago</i> spp., <i>S. hybrids</i>	Late summer to fall	Sun	Well drained; high organic matter	18 to 72	2 to 8	Gold, yellow	Division in spring; cuttings of cultivars
Green and gold <i>Chrysogonum virginianum</i>	Spring, sporadically in summer	Partial shade to shade	Moist; well drained	6 to 9	5 to 9	Gold	Division in spring
Heliopsis <i>Heliopsis helianthoides</i>	Summer	Sun	Well drained	48 to 60	3 to 9	Orange, yellow	Division; seeds
Hibiscus, Red <i>Hibiscus coccineus</i>	Mid to late summer	Sun	Moist; tolerates poor drainage	6 to 8	5 to 9	Deep red	Division; seeds
Hollyhocks <i>Alcea rosea</i>	Spring to fall	Sun	Well drained	24 to 60	5 to 9	Apricot, pink, purple, white yellow	Seeds sown during winter
Hosta <i>Hosta</i> spp.	Summer	Partial shade	Rich; well drained; high in organic matter	18 to 24	3 to 8	Lilac, white	Division early in spring as leaves emerge
Hyacinth bletilla <i>Bletilla striata</i>	Spring	Partial shade	Moist; rich	8 to 12	5 to 9	Deep rose, white	Division in fall
Ice plant <i>Delosperma cooperi</i>	Summer	Sun	Dry; sandy or rocky	3 to 6	6 to 9	Purplish pink	Seeds
Iris <i>Iris cristata</i>	Spring	Partial shade	Well drained	6	3 to 9	Lilac	Division in fall; seeds
Iris, Japanese roof <i>Iris tectorum</i>	Summer	Sun to partial shade	Acidic; moist; high in organic matter	12 to 18	4 to 9	Lilac	Division in spring or fall
Jacob's ladder <i>Polemonium reptans</i>	Late spring to early summer	Sun to partial shade	Well drained	18 to 36	3 to 7	Blue, white	Seeds; cuttings; division in late summer
Lamb's-ears <i>Stachys byzantina</i>	Early summer	Sun	Well drained	12 to 15	4 to 8	Purplish pink	Division in early spring; seeds

Lantana <i>Lantana camara</i>	Summer to fall	Sun	Well drained; tolerates drought	6 to 12	8 to 10	Orange, pink, yellow	Cuttings
Larkspur <i>Delphinium</i> spp.	Spring	Sun	Well drained	12 to 24	5 to 9	Blue	Seeds
Lavender <i>Lavandula angustifolia</i>	Summer	Sun	Well drained; alkaline	24 to 36	5 to 9	Lavender	Stem cuttings in summer; seeds; division
Leadwort <i>Ceratostigma plumbaginoides</i>	Late summer	Sun to partial shade	Well drained	8 to 12	5 to 9	Blue	Cuttings; spring division; seeds
Lenten rose <i>Helleborus orientalis</i>	Early spring	Partial shade to shade	Rich; moist; well drained	12 to 18	4 to 9	Rose, white	Division in spring; seeds
Leopard's bane <i>Doronicum</i> spp.	Spring	Partial shade	Cool; moist soil	12 to 24	4 to 7	Yellow	Seeds; division in spring
Ligularia <i>Ligularia stenocephala</i>	Summer	Partial shade	Moist; high in organic matter	48 to 60	5 to 7	Yellow	Division
Loosestrife, Gooseneck <i>Lysimachia clethroides</i>	Summer	Sun to partial shade	Moist; well drained	24 to 36	3 to 8	White	Division; seeds
Loosestrife, Yellow <i>Lysimachia punctata</i>	Summer	Sun	Moist	18 to 30	4 to 8	Yellow	Cuttings; seeds
Lungwort <i>Pulmonaria saccharata</i>	Spring	Partial shade to shade	Cool; moist, high in organic matter	9 to 18	3 to 8	Pink turning blue, white	Division in fall; seeds sown early spring
Maltese cross <i>Lychnis chalcedonica</i>	Late spring to early summer	Sun to partial shade	Moist; well drained; fertile	18 to 24	6 to 8	Scarlet	Division spring or fall; seeds
Monkshood <i>Aconitum</i> spp.	Mid to late summer	Sun to partial shade	Moist; well drained	36 to 48	3 to 7	Blue to violet	Division in fall
Mullein <i>Verbascum</i> spp.	Late spring	Sun to partial shade	Well drained	24 to 48	6 to 8	Rose pink, purple, white, yellow	Root cuttings in late winter; seeds
Obedient plant <i>Physostegia</i>	Late summer to	Sun to partial	Well drained; moderately	36 to 48	2 to 9	Pink	Division in spring; seeds

<i>virginiana</i>	early fall	shade	fertile					
Pearly everlasting <i>Anaphalis</i> spp.	Late summer	Sun	Well drained	12	3 to 8	Grayish white	Seeds; division in fall or spring	
Phlox, Garden <i>Phlox paniculata</i>	Summer	Sun to partial shade	Moist; well drained	24 to 36	4 to 8	Blue, magenta, pink, white	Division in fall	
Phlox, Creeping <i>Phlox subulata</i>	Spring	Sun	Well drained	6 to 9	2 to 9	Blue, pink, red, rose, violet, white	Division after flowering; cuttings	
Pincushion flower <i>Scabiosa caucasica</i>	Early summer	Sun to partial shade	Well drained; near neutral in pH	18 to 24	3 to 7	Blue, deep blue, lavender, white	Seeds sown in spring or summer	
Pinks <i>Dianthus</i> spp.	Late spring to early summer	Sun	Well drained; alkaline	6 to 24	4 to 9	Pink, rose, white	Seeds; cuttings; division in spring	
Poppy, Oriental <i>Papaver orientalis</i>	Spring to early summer	Sun to partial shade	Well drained	18 to 24	2 to 7	Orange, pink, white, yellow	Seed; root cuttings	
Primrose <i>Primula x polyantha</i>	Spring	Partial shade	Cool; moist; high organic matter	6 to 12	3 to 8	Blue, red, violet, yellow	Division in spring; seeds	
Primrose, Cowslip <i>Primula veris</i>	Spring	Partial shade	Moist; well drained; acidic	12	5 to 8	Yellow	Division in spring; seeds	
Pyrethrum <i>Pyrethrum roseum</i> = <i>C. coccineum</i>	Early summer	Sun to partial shade	Well drained	12 to 24	3 to 7	Pink, red with yellow center, white	Division early spring or fall; seeds	
Red hot poker <i>Kniphofia uvaria</i>	Summer	Sun	Well drained	36 to 60	5 to 9	Red, yellow	Division in spring, seeds	
Red valerian <i>Centranthus ruber</i>	Spring	Sun	Well drained; alkaline	36	5 to 8	Pink, red, white	Seeds, division in fall or spring	
Rose campion <i>Lychnis coronaria</i>	Spring	Sun to partial shade	Well drained	24 to 36	4 to 8	Magenta, red, white	Seeds	
Rose mallow <i>Hibiscus moscheutos</i>	Summer to frost	Sun to partial shade	Moist; high in organic matter	18 to 24	4 to 9	Pink, red, white	Seeds; division in spring or fall	
Sage, Hybrid <i>Salvia x superba</i>	Summer	Sun	Moist; well drained	24 to 36	3 to 10	Violet blue	Stem cuttings; division	
Sage, Mealy-	Summer	Sun	Well drained;	24 to 36	8b to 10	Blue, white	Softwood	

cup Sage <i>Salvia farinacea</i>			moist					cuttings in summer; seeds; division not advised
Sage, Sky-blue <i>Salvia uliginosa</i>	Summer	Sun	Moist; boggy to well drained	48 to 60	6 to 10	Sky blue		Division of offshoots, cuttings
Sage, Russian <i>Perovskia atriplicifolia</i>	Mid to late summer	Sun	Well drained	36 to 60	3 to 9	Light blue		Tip cuttings in summer; seed
Sage, Velvet <i>Salvia leucantha</i>	Summer, fall	Sun	Well drained	36	7b to 10	Magenta and white		Softwood cuttings in summer
Sea holly <i>Eryngium</i> spp.	Summer	Sun	Dry; sandy	24 to 36	2 to 8	Blue		Separate plantlets from base of mother plant
Sea lavender <i>Limonium latifolium</i>	Summer	Sun	Well drained; slightly acidic	36	3 to 9	Blue		Seeds in late fall
Sea thrift <i>Armeria maritima</i>	Spring, summer	Sun	Sandy; well drained	6 to 12	4 to 8	Pink		Seeds; clump division
Sneezeweed <i>Helenium autumnale</i>	Summer to fall	Sun	Moist; well drained	24 to 60	3 to 8	Orange, reddish brown, yellow		Division in fall
Soapwort <i>Saponaria officinalis</i>	Summer	Sun	Moist; well drained	12 to 30	2 to 8	Pink, red, white		Division of stolons in spring or fall; seeds; cuttings
Solomon's seal <i>Polygonatum biflorum</i>	Late spring	Partial shade to shade	Cool; moist; well drained	24 to 36	3 to 9	Yellowish green maturing to cream		Division of rhizome in spring, seeds
Spiderwort <i>Tradescantia x andersoniana</i>	Late spring to summer	Sun to partial shade	Moist to boggy	18 to 24	3 to 9	Pink, purple, violet, white		Division in spring or fall every 3 to 4 years; seeds sown spring
Spurge <i>Euphorbia</i> spp.	Spring	Partial shade	Moist to dry	12 to 18	4 to 8	Yellow bracts (true flowers not showy)		Division; cuttings in summer
Statice <i>Limonium</i> spp.	Summer	Sun	Well drained; slightly acidic	12 to 18	4 to 9	Pink, red, white, yellow		Seeds
Stokes' aster <i>Stokesia laevis</i>	Early summer	Sun to partial	Well drained	12 to 24	5 to 9	Lavender blue		Division in spring;

		shade					cuttings in spring; seeds
Stonecrop <i>Sedum</i> spp.	Summer	Sun to partial shade	Well drained to moist	3 to 12	3 to 8	Yellow	Tip cuttings taken in spring and summer
Sundrops <i>Oenothera fruticosa</i>	Summer	Sun	Well drained to dry	6 to 12	4 to 8	Yellow	Division in summer; seeds
Sunflower <i>Helianthus</i> spp.	Late summer and fall	Sun to partial shade	Moist; some species tolerate poor drainage	60 to 84	6 to 9	Yellow	Division; cuttings; seeds
Turk's turban <i>Malvaviscus arboreus</i>	Summer to fall	Sun to partial shade	Well drained	36 to 48	8 to 10	Red	Cuttings; division; seeds
Verbena, Brazilian <i>Verbena bonariensis</i>	Summer to frost	Sun	Well drained	36 to 48	7 to 9	Violet	Root cuttings in spring; seeds
Verbena, Clump <i>Verbena canadensis</i>	Late spring to fall	Sun	Well drained	8 to 18	6 to 10	Pink, purple, red, white	Root cuttings in spring; seeds
Verbena, Rigid <i>Verbena rigida</i>	Summer	Sun	Well drained	12 to 24	8 to 10	Violet	Root cuttings in spring; seeds
Veronica <i>Veronica</i> spp.	Late spring to early summer	Sun to partial shade	Well drained	12 to 24	4 to 8	Bluish, pink, violet, white	Division fall or spring; cuttings in summer; seeds
Violet <i>Viola</i> spp.	Spring	Sun to partial shade	Moist; well drained	4 to 8	4 to 9	Blue, violet, white	Offsets; division; seed
Yarrow <i>Achillea</i> spp.	Late spring to summer	Sun to partial shade	Well drained	24 to 36	3 to 9	Cerise red, gold, pink, white	Seeds; division in spring or fall



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