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Annual Flowers: Culture and Maintenance

Authored by Edward Olsen, Consumer Horticulture Specialist, School of Plant and Environmental Sciences, Virginia Tech

Introduction

Annual flowers live only for one growing season, during which they grow, flower, and produce seed, thereby completing their life cycle. Annuals must be planted or seeded every year since they don't persist. Warm-season annuals do not tolerate cold or freezing temperatures, while cool-season annuals can withstand colder conditions and grow best during the cooler parts of the year.

Some perennials, which are plants that live from year to year, are classified with annuals because they are not winter-hardy and must be set out every year. Examples include begonias and snapdragons.

Annuals have many positive features. They are versatile, sturdy, and relatively inexpensive. Annuals are easy to grow, produce instant color, and, most importantly, bloom for most of the growing season. Many annuals can thrive without grooming due to their "self-cleaning" ability.

Some tropical or subtropical plants—though botanically perennial in their native climates—are also grown as annuals in Virginia because they cannot survive freezing temperatures. These plants, which include many popular foliage and flowering species such as hibiscus, sweet potato vine, and mandevilla, are typically propagated vegetatively rather than by seed. Gardeners often value them for their dramatic color or form and may even make special efforts to overwinter them indoors. However, in the landscape they function much like true annuals: they complete only one season outdoors and must be replanted each year.

There are a few disadvantages to annuals. They must be set out as plants or sown from seed every year, which involves some effort and expense. For some annuals, removal of spent flower heads weekly is necessary to "clean" the plant and promote continuous bloom. If they are not removed, the plants will produce seeds, complete their life cycle, and die.

Some annuals, such as petunias and snapdragons, begin to look scraggly by late summer and need to be cut back for regrowth or replaced.

Some varieties will self-sow or naturally reseed themselves. This may be undesirable in many flowers because the parents of this seed are unknown, and any hybrid characteristics will be lost. Plants can scatter everywhere instead of growing in their designated spot. Examples are alyssum, petunias, and impatiens.

Annuals give gardeners the freedom to experiment with color, height, texture, and form. If a design doesn't work out, it's only for one season. They're perfect for filling gaps until permanent plants are established, extending perennial beds, or covering spaces where early-blooming perennials have faded. Annuals also brighten planters, window boxes, and hanging baskets, adding vibrant color wherever it's needed.

Figure 1: Brightly colored Zinnias spill over a walkway in full sun. Photo Credit: Edward Olsen.

Typically, we think of annuals as loving the heat of summer, but some popular annuals prefer the cool of spring and fall. Such plants, called cool-season plants, include pansies, violas, snapdragons, along with ornamental cabbage and kale. These plants actually grow more lush and vigorous when the weather is cool; therefore, they are often offered for sale in early spring and in the fall.

For detailed information on the performance of specific plants or plant groups, consult reliable local sources such as your local Extension office, Extension Master Gardeners, university Extension publications, and/or botanical gardens. These resources provide research-based recommendations tailored to your region.

Location and Establishment of Annual Beds

Site Selection

Before choosing annuals, evaluate the site carefully. Consider factors that affect plant growth, including light, temperature, soil characteristics, and drainage. Depending on species, they may require full sun, partial shade, or heavy shade, so note how much sunlight the area receives each day. The slope of the site can influence both temperature and water movement. Soil texture, fertility, and pH also play a major role in plant performance.

Analyze the site by asking: How warm or cool is it during the growing season? How much rain typically falls, and how often? Does the soil drain quickly or stay wet for long periods? Understanding these conditions will help you select plants that can thrive and reduce stress in the landscape. There is no "stress-free" environment, and no totally stress-resistant bedding plant, but proper planning and preparation can minimize problems.

Temperature

Warm-season annuals bloom reliably through summer, but very few annuals perform well from spring through fall. For continuous color, gardeners can rotate plantings and include cool-season annuals—such as dianthus, snapdragons, and pansies—during the cooler months. It is possible to extend the flowering season of cool-season annuals by placing them in a protected location, shaded from direct sunlight between about 12:00 noon and 4:00 pm. Heat-loving flowers such as vinca, gaillardias, portulaca, and garden verbena do not begin to flower until early summer and should be used for summer color and high temperature situations.

Another temperature consideration is frost tolerance. Avoid early planting of tender species to prevent frost damage. Tender species will be the first to be killed by frost in the fall.

Light

Light and temperature are closely related, and plants listed as preferring lower light may tolerate more sun if temperatures are moderate. When evaluating light exposure, note the duration and intensity of light the site receives. Four hours of full sun in the morning is very different from four hours of afternoon sun. Also, in a shaded location, the degree of light filtration can vary.

Generally, a site that receives six or more hours of direct sunlight per day is considered "full sun." However, if a site gets more than three hours of unfiltered midday sun, it should also be treated as a full-sun location when selecting plants.

"Partial shade" can be defined as receiving unfiltered morning sun, with either afternoon shade or moderate shading throughout the day. A "heavily shaded" site would receive very little direct mid-day light and less than 60% of the sun's intensity during the remainder of the day.

Placing full-sun plants in low light—or shade plants in intense sun—can lead to reduced flowering, a leggy growth habit, burning of plants, or stunted growth.

Water

Water availability and movement through the soil are critical to plant performance. Proper bed preparation helps prevent both excess moisture and drought stress. Ensure adequate drainage to reduce the risk of root rot and restore soil oxygen between irrigations. Recognize that soil type drives water behavior: clay soils retain moisture longer; sandy soils drain rapidly and may require more frequent irrigation. If underlying hard pan or compaction limits drainage and aeration, address it before planting (e.g., deep tilling or raised beds).

Plan for supplemental irrigation during dry periods, but avoid setting fixed schedules that ignore weather. Many issues result from excessive watering frequency rather than from applying a large volume of water at one time to a well-prepared bed. For sites with limited irrigation, select drought-tolerant species and use mulch to moderate soil moisture and temperature. Integrate these decisions with your soil test results and fall bed preparation, so that amendments and organic matter have time to improve soil structure and water-holding capacity before spring.

Soil and Site Preparation

Healthy soil is essential for strong annuals because it provides water, nutrients, and root support. Poor drainage can lead to root rot, especially after heavy rain. Without adequate drainage between irrigations, there will be little oxygen in the soil. Clay soil will take longer to drain and re-aerate than sandy soil. When bedding plants are grown in clay soil that has been appropriately prepared and deeply watered, they may not need additional irrigation more than once a week. Bedding plants grown in sandy soil may have to be watered 2 to 3 times a week.

Simply put, clay soils hold water longer, whereas sandy soils dry out faster and need more watering. However, this can vary with time of year, amount of sun or shade, plant growth, and other environmental factors. Subsoil compaction or a hard pan beneath the bed can also affect water drainage and soil aeration. It may be necessary to deep till beds to break up the subsoil and increase the drainage rate.

Nutrient deficiencies and toxicities are common in the landscape, though they can be easily avoided with proper management. Do not guess at fertility levels - **take a soil test**. Ideally, the fall before you plan to plant, have the soil tested. The results will indicate how much lime or acidifier to add during fall preparation, how much fertilizer to add in the spring, and the pH level, which should be adjusted if needed.

When creating an annual bed for the first time, **the best time to prepare the soil is in the fall**. This timing takes advantage of natural decomposition over winter and allows soil amendments to adjust pH and nutrient levels. It also improves soil structure and fertility by spring. In contrast, preparing the bed in spring often leads to compaction because soils are wetter after seasonal rains, and amendments have less time to influence soil chemistry before planting. After preparing the bed in fall, cover it with a 2–4-inch layer of organic mulch—such as shredded leaves, straw, wood chips, or compost—to insulate the soil, regulate moisture and temperature, suppress weeds, and prevent erosion through the winter months.

Check and Adjust Drainage

If drainage is poor, plan to plant in raised beds. Dig to a depth of 12 or 18 inches, add 4 to 6 inches of organic matter (OM) to heavy clay to improve soil textures, and leave "rough" in fall or early spring. (Note: 2 to 3" of OM should be applied if the bed can only be turned 6 to 8" deep.) Finally, in spring, add fertilizer per soil test recommendations, spade again, and rake the surface smoothly.

How to Check Drainage

Dig a hole about 10-12 inches deep and fill it with water. The next day, fill it with water again and see how long it remains. If it remains for more than 8 hours, you have poorly drained soil.

Culture

Seed Selection

Use current-year seed from reputable sources to ensure vigor and uniform germination. As seeds age, viability and seedling vigor decline, leading to slower, uneven germination. Store unused seeds, cool and dry, in an airtight container with a desiccant (e.g., silica gel) and refrigerate if possible.

When choosing varieties, understand the difference between hybrid (F1) and open-pollinated (OP) seed:

Controlled crosses produce hybrid (F1) seed. Hybrids often offer greater uniformity, vigorous growth, and sometimes enhanced disease resistance. Seed saved from hybrid plants will not be true-to-type (the next generation segregates), so hybrids are not suitable for reliable seed saving.

Open-pollinated (OP) seed is pollinated naturally (by wind or insects) and can be saved from year to year if plants are properly isolated and selected to maintain the variety. OP varieties typically exhibit greater within-variety variation than hybrids, a trait many gardeners appreciate for diversity and resilience. "Heirlooms" are a subset of OP varieties that have been maintained for a very long time.

Figure 2: *Amaranthus tricolor* Joseph's Coat, Summer Poinsettia. Photo Credit: Edward Olsen.

Seed Starting Indoors

Gardeners who need full, in-depth guidance on starting seeds indoors should consult VCE Publication 426-- 001, Plant Propagation From Seed (pubs.ext.vt.edu/426/426-001/426-001.html). The following section offers a concise overview of the basic steps.

Choose the Right Medium

The best medium for starting seeds is loose, well-drained, fine-textured, low in nutrients, and free of disease-causing fungi, bacteria, and unwanted seeds. Many commercial products meet these requirements.

Prepare Containers and Sow Seeds

Fill clean containers about two-thirds full of potting medium. Level the surface and moisten the medium evenly. It should be damp but not soggy. Make a furrow 1/4 inch deep. For large seeds, sow them directly at the bottom of the furrow. For small seeds, first fill the furrow with vermiculite, then sow the seeds on top of the vermiculite. Cover all furrows with a thin layer of vermiculite after sowing. Seeds can be started in flats following package directions or in individual peat pots or pellets, placing two seeds per pot. After the seed is sown, cover all furrows with a thin layer of vermiculite, then water with a fine mist.

Provide Warmth and Humidity

Cover containers with plastic or a humidity dome and keep them in a location away from direct sunlight at 60–75°F. Use bottom heat to improve germination if desired.

After Germination

Remove the cover as soon as the seeds sprout and move the seedlings into bright light. If natural light is poor, use LED grow lights and keep seedlings close to the light source. Begin watering and fertilizing lightly, as most seed-starting mixes contain little or no nutrients. After watering the plants, apply a mild fertilizer solution mixed at half the label-recommended rate.

Thinning and Transplanting

When seedlings develop two true leaves, thin plants in individual pots to one seedling per pot. Transplant those in flats to other flats, spacing 1 ½ inches apart, or to individual pots.

Sowing Seed Outdoors

Prepare Soil and Sow Seeds. Annuals seeded in the garden often fail to germinate properly because the soil surface crusts, preventing water from reaching the seeds. To avoid this, sow seed in vermiculite-filled furrows. Make furrows in the soil about ½-inch deep. If the soil is dry, water the furrow first, then fill it with fine vermiculite and sprinkle with water. Then make another shallow furrow in the vermiculite and sow the seed in this furrow. Sow at the rate recommended on the package. Cover the seed with a layer of vermiculite, and using a nozzle adjusted for a fine mist, water the seeded area thoroughly. Keep the seedbed evenly moist during germination. A light mulch of straw or fine compost can help reduce evaporation without hindering seedling emergence.

If needed, remove mulch after germination starts, so that small, young seedlings will receive adequate sunlight.

Thinning

When most outdoor-grown annuals develop the first pair of true leaves, they should be thinned to the recommended spacing. This spacing allows plants enough light, water, nutrients, and room to develop fully above and below ground. If they have been seeded in vermiculite-filled furrows, excess seedlings can be carefully transplanted to another spot.

Planting Times

Do not be in a rush to start seeds outdoors or to set out started plants. For indoor transplants, start seeds indoors 4 to 8 weeks before your last expected frost date. Starting too early can result in leggy, overgrown seedlings that are weak when transplanted.

As a general rule, delay sowing seeds of warm-weather annuals outdoors or setting out transplants until after the last frost date. Most such seeds will not germinate well in soil below 60˚F. If the soil is too cold when the seeds are sown, they will remain dormant until the soil warms and may rot instead of germinating. Some cold-loving annuals, like larkspur and Shirley poppies, should be direct-sown in fall or very early spring. In Virginia, this typically means sowing in mid- to late September for fall planting, or from mid-March through early April in spring.

Setting Out Transplants

By setting started plants in the garden, you can have a display of flowers several weeks earlier than if you direct- sow seeds. This is especially useful for annuals (such as verbena and scarlet sage), which germinate slowly or need several months to bloom. If you are buying annual plants, choose only healthy plants free of pests and diseases. Before setting out transplants, harden them off for 5 to 7 days by exposing them to outdoor conditions during the day and bringing them inside at night, which will provide more light and cooler temperatures than they receive indoors. After the last frost date, warm-season annual plants may be set out.

To Plant: Dig a hole for each plant large enough to accept its root system comfortably. Lift out each plant from its flat with a block of soil surrounding its roots. Set the soil block in a planting hole and backfill it so the plant sits at the same level. Water the plant in to settle the soil and remove air pockets. Then fertilize with a starter solution (half-strength) water-soluble fertilizer. If plants are in fiber pots, remove the fiber material from the outside of the root mass and set the plant in a prepared planting hole. When setting out plants in peat pots, place the entire pot in the planting hole, but remove the upper edges of the pot so that the entire peat pot is covered when the soil is firmed around the transplant. If the lip of the peat pot is exposed above the soil line, it may create a wick effect, drawing water away from the plant and into the air. After setting the plants, water them with a starter solution as described above. Protect against excessive sun, wind, or cold while the plants settle into their new locations. Inverted pots, tunnels, or cloches can be used.

Figure 3: Colorful caladiums, a tropical plant used as an annual in a shade garden. Photo credit: Edward Olsen

Maintenance

Watering

Do not rely on rainfall alone to meet plant needs. When you water, apply enough water to achieve deep penetration (approximately 6–8 inches), then allow the soil to dry moderately before the next irrigation. This cycle encourages deeper rooting and reduces disease risk compared with frequent, shallow watering.

Use delivery methods that place water directly into the soil without wetting foliage—drip irrigation or soaker hoses are preferred. Avoid overhead sprinklers where possible; wet leaves can encourage foliar diseases, and much of the water never reaches the soil because it evaporates or drifts away. Watering with a nozzle creates the same issues, as it applies water from above, wetting the foliage. In addition, gardeners seldom are

patient enough to do a thorough job of watering with a nozzle; not enough water is applied, and the water that is applied is usually poorly distributed over the bed. Mulch (2–4 inches of organic material) helps maintain even moisture, reduce temperature swings, and suppress weeds.

Adjust watering based on soil type, flower species, growth stage, and weather conditions. Clay soil will need less frequent irrigation; sandy soil may need more frequent irrigation. Increase the time between waterings after cool, cloudy periods, and decrease it during hot, windy weather. Always calibrate runtime to achieve uniform coverage and the target depth and modify schedules to account for rainfall so you don't overwater well-prepared beds.

Mulching

Mulches help prevent soil surface crusting and inhibit weed growth. Organic mulches can also add humus to the soil. More common mulches:

- Pine needles - baled pine needles can usually be found in garden centers for use as a mulch. They also make an excellent mulch around shrubs and trees, and in other areas where long-lasting mulch is desired, and are readily available in most areas.

- Bark - readily available in bags or bulk. Usually made from pine, cypress, or hardwood, it is resistant to decay. Research indicates that pine chips last longer than hardwood, but most bark mulches must be reapplied annually. Windblown seeds often germinate in bark mulches and necessitate cultivation or herbicide application.

- Wood chips are often available from local sources and can serve as an effective mulch in certain situations. Larger chips (greater than 3 inches) are least likely to compact, allowing for better air and water movement. However, caution is needed when using fresh, uncomposed chips, as they can damage small, tender seedlings or shallow-rooted plants such as annuals. During decomposition, a zone of nitrogen deficiency develops at the mulch–soil interface. While this can help suppress weed seed germination, it does not affect the roots of established plants deeper in the soil. For this reason, high-carbon-to-nitrogen (C: N) mulches, such as fresh wood chips, are not recommended for annual beds, where plants typically have shallow, less extensive root systems.

Weeding

Cultivate only to break crusts on the surface of the soil. When the plants begin to grow, stop cultivating and pull weeds by hand. As annual plants grow, feeder roots spread between the plants; cultivation is likely to injure these roots. In addition, cultivation stirs the soil and uncovers weed seeds that then germinate. Mulching is preferred for weed control because it makes conditions unfavorable for weed seed germination and provides a physical barrier to emerging weeds. A good mulch layer can save many hours of laborious weeding.

Figure 4: *Cleome hassleriana*, spider flower. Photo courtesy Laura Maxey-Nay.

Deadheading (removing old flowers)

To encourage vigorous growth and continuous bloom, and to maintain a neat, visually appealing display, remove spent flowers and seed pods. This step is particularly desirable if you are growing ageratum, calendula, cosmos, marigold, pansy, scabiosa, or zinnia.

Staking

Tall-growing annuals, such as larkspur, tall varieties of marigold, or cosmos, need support to protect them from strong winds and rain. Stakes of wood or bamboo can support tall plants, or reeds large enough to hold the plants upright but not large enough to be conspicuous. Stakes should be about 6 inches shorter than the mature plant, so their presence will not interfere with the beauty of the bloom. Begin staking when plants are about 1/3 their mature size. Place stakes close to the plant, but take care not to damage the root system. Secure the stems of the plants to the stakes at several points with paper-covered wire or other materials that will not cut into the stems. Plants with delicate stems (like cosmos) can be supported by a framework of stakes and strings arranged in a crisscross pattern.

Fertilizing

When preparing beds for annuals, fertilizer should be added according to recommendations from soil sample analysis or from observations of plants that have grown on the site. Lime may also be needed if the soil test results indicate it is necessary. Use dolomitic limestone rather than hydrated lime. Ideally, lime should be added in the fall so it will have time to raise the soil pH. Fertilizer should be added in the spring so it will not leach out before plants can benefit from it.

Once annuals have germinated and begin active growth, additional fertilizer may be needed to sustain healthy development. A balanced, all-purpose fertilizer such as 10-10-10 (N-P-K) is suitable for container-grown ornamentals or annual flower beds. For plants that produce flowers, such as blooming annuals, use a combination of slow-release products and liquid feed to promote flowering. Always conduct a soil test at the beginning of the season before applying fertilizer to avoid excess nutrients and ensure proper balance. Incorporating compost into the soil further improves soil structure and enhances nutrient availability. Soils naturally contain pore spaces that hold either air or water. When the soil is dry, these pores are filled with air rather than moisture. Applying fertilizer to dry soil can cause salts from the fertilizer to concentrate in these air pockets, which may burn nearby roots. To prevent this, always apply fertilizer to damp soil, ensuring that moisture helps distribute nutrients evenly and reduces the risk of root injury.

Pests and Diseases

Do not apply insecticides unless necessary to prevent damage to flowers or shrubs. Most garden insect pests cause minimal harm when their natural predators and parasites are protected by avoiding unnecessary insecticide applications.

Integrated Pest Management (IPM) is an assessment-based, ecological approach to pest control. It begins with accurate pest identification to understand the pest's biology, habitat, and life cycle. This knowledge informs management tactics that combine nonchemical and chemical methods, reducing overall pesticide use while providing practical, cost-effective solutions that protect people, animals, and the environment. Best practices include avoiding broad-spectrum insecticides, using least-toxic options first, timing applications to protect pollinators, and using only EPA-approved products.

Common pests that may require prompt treatment include spider mites, aphids, Japanese beetles, lacebugs, thrips, and other beetles; treat soil insects only if large numbers of cutworms, white grubs, or wireworms are found during soil preparation.

Diseases are generally less problematic for annuals than perennials, but selecting resistant varieties and following proper planting and maintenance practices will prevent most issues. When disease pressure is high, identify the specific disease and apply the appropriate pesticide according to label directions.

Always ensure the pest and plant are listed on the pesticide label and follow all directions and precautions. Improper handling, application, or disposal of pesticides can harm humans, animals, aquatic life, and beneficial insects. For assistance with pest or disease identification and management, contact your local Extension office for expert guidance on cultural, biological, or chemical control

options. Refer to the current year's version of Virginia Cooperative Extension's Pest Management Guide - Home Grounds and Animals, Home Ornamentals Chapter for current control recommendations (pubs.ext.vt.edu/456/456-018/456-018.html). Use pesticides only when needed and handle them with care.

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(Some sections were originally adapted from NC State University's Master Gardener Handbook)

Additional Resources

An Introduction to Integrated Pest Management. Virginia Cooperative Extension Publication ENTO-365 (pubs.ext.vt.edu/ENTO/ENTO-365/ENTO-365.html).

Don't Guess, Soil Test. Virginia Cooperative Extension Publication 452-129 (pubs.ext.vt.edu/452/452-129/452-129.html).

Myth-busting Homemade Pesticides. Virginia Cooperative Extension Publication ENTO-570NP (https://www.pubs.ext.vt.edu/ENTO/ento-570/ento-570.html).

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