June 2023-Vol.9,No.6

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The Edible Garden In June

By Ralph Morini | June 2023-Vol.9,No.6

June garden tasks include harvesting spring crops and continued planting of warm weather crops. Weed and pest management become important, and moisture requires vigilance as temperatures rise and rainfall typically decreases.

Interplanted, mulched greens. Photo: R Morini

If you follow the planting schedule for Hardiness Zone 7a in Extension Publication 426-331, "Virginia's Home Garden Vegetable Planting Guide," June is time to plant beans, cucumbers, eggplant, melons, okra, peppers, pumpkins, winter and summer squash, sweet corn, sweet potatoes, and tomatoes.

Harvests will likely be completed for spring crops including asparagus, some cabbage family members and some greens. Idled space can be managed effectively in several ways that we will discuss.

Straw mulched onions. IRC Homewood Garden. Photo: R Morini

Soil Care

Regardless of current activity, caring for the soil makes sense. If new items are planted, mulch around and between them after plants are germinated, and tall enough to catch the sun above the mulch.

Buckwheat cover crop. Photo: R Morini

If bed space will be idled, mulching is an option to protect the soil. A better one is to plant a fast-growing cover crop, like Buckwheat, that grows well in summer, draws a lot of pollinators and matures in about 6 weeks, so can be cut prior to fall planting. The cut vegetation can be used as green mulch or provide a nitrogen boost for a fall compost batch.

If the goal is a quick conversion to new crops, Interplanting, grouping plants together to cover the soil while reducing pest and disease issues, is another option.

Similarly, Intensive Gardening Methods advocates designing beds and grouping plants in ways that cover the soil and provide diversity that benefits soil health.

The *Garden Shed* article Plant Partnerships in your Garden offers advice on planting a diversity of plants together for soil enhancement, pest control, and other benefits.

We have talked many times about how using trellises can help maximize production in a given space. A good summer use is to plant greens or other cool weather plants behind active trellises to take advantage of the shade they provide, allowing the greens to stay cooler and extend their harvest season. Row covers can also slow bolting. Also try planting bolt-resistant varieties such as **Muir**, **Sierra,** and **Nevada** to extend the greens growing season.

Successive plantings of beans and corn can extend their harvest seasons.

If intending to plant fall crops, check time to maturity of June plantings to be sure that bed space will be available in time for fall planting.

Water Management

Water is an increasingly valued resource. We are all wise to minimize water waste:

- **Now that the ground has warmed, apply organic mulches** such as leaves, straw, and clean grass to conserve soil moisture while also suppressing weeds and enriching soil as it decomposes.
- Vegetables require about an inch of water per week during the summer. Soaker hoses or drip irrigation make efficient use of water during dry spells.
- The soil surface dries quickly in summer heat. **Put your finger a couple of inches into the soil** to determine whether it is truly dry. You should be able to feel moisture. Moist soil also tends to be darker and stick together better than dry.
- **Water plants in the morning and avoid splashing water and soil** on leaves to reduce the risk of mildew and soil-borne disease transmission. Remove lower leaves on tomato plants to prevent inadvertent soil contact.

Other suggestions for June garden management:

Avoid growing a single crop in the same space repeatedly. This can be done by rotating crops to different areas or by interplanting, mixing a diversity of crops together. Planting the same item in the same space in consecutive years invites pest and disease issues.

It is better to **plant corn in blocks than rows**. Corn is wind-pollinated, and bunching plants together results in more complete pollination.

Cool mornings are the **optimum time to pick vegetables** for best texture and taste.

Stop harvesting asparagus when spears become thin, usually around mid-June.

Mound soil up around **potato vines** when vines are about 12” long. New potatoes grow on thin stems called stolons. Longer underground main stems produce more potatoes. Hilling also prevents the tubers from being exposed to the sun and turning green. Repeat once or twice during the growing season, adding 6-8” of soil or mulch to the original soil level.

Imported cabbage worm on kale.. Photo: R Morini

In June, **cole crops (cabbage, broccoli, kale, collards etc.) will likely be invaded by a variety of cabbage worms,** including loopers, imported cabbage moth worms, and the dreaded cross-striped cabbage worm. They are tough to control but can be managed. Holes chewed in leaves and dark excrement piles on leaves are signs of attack. If hand picking, look for yellow eggs on the undersides of leaves as a start. Pull the caterpillars off leaves regularly; they do fast damage when uncontrolled. They can also be managed with row covers or with the organic pesticide *Bacillus thuringiensis* (Bt), available at garden centers. For more details, review Garden Shed article OMG What's Eating the Broccoli and 2023 Pest Management Guide: Home Grounds & Animals/VCE.

It's always good to have some compost cooking. If you've saved some leaves and/or yard trimmings from last fall, combine them with grass clippings and kitchen waste to generate compost that you can apply to your beds prior to winter. If you are short of "brown" inputs, torn up chemical-free papers including paper towels, napkins, pizza boxes, and corrugated boxes are good replacements. I find that roughly equal volumes of grass clippings/kitchen waste and mulched leaves/straw/wood chips are about right to achieve a hot compost batch.

Compost batch. Photo: R Morini

If your compost doesn't get hot, add more nitrogen with grass and kitchen scraps. If it is slimy or gives off an ammonia smell, add leaves, paper, wood chips, sawdust (not pressure treated) or another carbon source. Keep the pile moist but not dripping and turn it every week or so to keep it aerated. A second heap can take regular additions of materials as they become available throughout the summer. It decomposes more slowly and less uniformly than the hot pile, but still produces a beautiful product in the end. It's worth the effort! For more detailed guidance, look at the Garden Shed article Backyard Composting with Practical Tips from the Pros or Backyard Composting from the VA Cooperative Extension.

If a spring compost batch is ready for use, by all means add some to beds and scratch it into the soil surface prior to planting, to give the soil an organic matter and nutrient boost.

At our plant sale in May, several people asked if it is okay to compost **citrus peels**. The answer is that if you are "vermicomposting" — where the decomposition is done primarily by special "red wiggler" earthworms — don't include them. But if you are composting outdoors and the initial decomposition is done by bacteria, protozoans and fungi before earthworms move in, it is fine to add them.

Herbs planted in average soil need no fertilizer. Too much fertilizer may reduce flavor and pungency.

The **best time to harvest most herbs** is just before flowering, when the leaves contain the maximum essential oils. Cut herbs early on a sunny day.

Basil, a favorite summer herb, is susceptible to downy mildew. It is a fungal disease that can come from infected seeds, transplants, or via wind-blown spores from other infected plants. If your basil leaves turn yellow-brown and curl up, with a purplish fuzz on the leaf underside, remove and dispose of the plant to prevent spreading. Resistant varieties are available and work well. Look for them when purchasing seed. For more information on growing and using basil check Garden Shed article Basil: Beautiful and Aromatic.

If birds are threatening your strawberries, cover plants with netting or row cover after plants are pollinated and berries are set. Hanging aluminum pie tins or CDs above the plants may also deter birds.

For information on fruit growing in your home garden check out Tree Fruit in the Home Garden and Small Fruit in the Home Garden from the VA Cooperative Extension.

Sources:

"Strawberries in the Home Garden," NC State Extension, NC State.edu

"Vertical Gardening Using Trellises, Stakes and Cages," VA.Coop.Ext. Pub.HORT-189

"Growing Potatoes in Home Gardens", University of Minnesota Extension.

Featured photo: June Vegetable Garden. Photo: R Morini

Aster Yellows — What is it and what do I do about it?

By Patsy Chadwick | June 2023-Vol.9,No.6

As a long-time gardener, I know that sooner or later I will probably have to deal with some sort of disaster in the garden. For the most part, insect infestations don't faze me. Occasional outbreaks of minor fungal diseases are a nuisance, but they don't alarm me either. Not even the occasional snake startles me. But the sight of some distorted blossoms on my purple coneflowers (*Echinacea purpurea*) a couple of summers ago sent me into a panic. Although I had never seen this problem in my garden before, I knew from my training as a master gardener that this must be the dreaded aster yellows disease!

What is aster yellows disease?

Aster yellows is a chronic, systemic plant disease caused by microscopic organisms called **phytoplasmas**. Phytoplasmas are similar to bacteria but lack cell walls. The disease invades plant cells and can cause devastating damage to more than 300 species of herbaceous plants and food crops. It occurs throughout much of the world's temperate zones, including North America and Europe. It gets its name of aster yellows because it commonly affects members of the aster family (*Asteraceae*). **There is no known organic or**

chemical cure for this disease!

How do plants become infected with aster yellows?

Aster yellows is spread from plant to plant by an insect called a leafhopper, specifically, the aster leafhopper (*Macrosteles fascifrons* also known as *M. quadrilineatus*) or six-spotted leafhopper. To be clear, only a small percentage of leafhoppers are carriers of the aster yellows pathogen. But those that are carriers can infect a variety of plants including flowering annuals, flowering perennials, vegetables, and weeds. Without the leafhopper's intervention, the organisms cannot be transmitted so readily.

The infection cycle starts when an otherwise disease-free leafhopper dines on an infected plant. As the leafhopper uses its **piercing/sucking** mouthparts to feed on the plant, it sucks up the phytoplasma organisms. The now-infected insect then hops to other plants where it spreads the pathogen to all parts of those plants from their roots to their flowers. While the organism won't kill the host plant, it can severely disfigure it.

What are the symptoms?

Aster yellows symptoms don't present themselves until 10 to 40 days after infection. The symptoms can vary from plant species to plant species. In general, symptoms presented on **annuals and perennials** include the following:

- Small, distorted flowers that remain green and don't develop the proper color for the species.
- Green tufts of deformed leaves embedded in the flowerhead itself. This is a condition known as phyllody, which is a reversion of flowers to a leaflike form.
- Flower petals may appear as a ring of tiny greenish-yellow spoons arrayed around the base of highly deformed cones.
- Cones may appear as tightly clustered rosettes.
- Excess growth may appear at the tops or sides of flowers.
- Yellowed (chlorotic) leaves with veins that remain green.
- Twisted or curled foliage.
- Stunted plant growth, particularly on younger plants.
- Abnormally bushy growth.
- Flowers may not produce seeds.

Symptoms may vary depending on the age or size of the plant at the time it was infected. For example, plants that are small when infected tend to be stunted and have leaves that are narrower than the leaves on healthy, uninfected plants.

What are some examples of plants affected by aster yellows?

Examples of **annuals and perennials** affected by aster yellows include asters, begonias, purple coneflowers, coreopsis, daisies, marigolds, zinnias, chrysanthemums, gladiolas, petunias and snapdragons.

In addition to a wide variety of ornamental plants, Aster yellows can infect many **vegetables and field crops**, most notably carrots, celery, lettuce, spinach, tomatoes, potatoes, grains, and Jerusalem artichokes. Symptoms on vegetable crops vary from species to species. For example:

- Carrots – Stunted growth, distorted and discolored leaves, and thin, bitter-tasting roots that have an abnormal number of feeder roots.
- Lettuce – Twisted inner leaves plus the inner part of the head is pale. Tan or pink spots on

lettuce leaves.
- Potatoes – Distorted stems and rolled leaves that are a purplish color.

Some **weed species** that host this disease include clover, dandelion, horseweed, plantain, Queen Anne's lace, ragweed, and thistle.

What are some treatment options?

There is no known cure for this insect-borne bacterial infection. It is incurable, but you do have options for preventing it in the first place and for keeping it from spreading to other plants:

- Once you spot the telltale symptoms of yellow asters, promptly remove the plant, roots and all, and destroy it. **Although the pathogen can affect all parts of a plant, it cannot survive outside of plant cells. Simply put, it cannot live in the soil.**
- Clean up any dead or dying leaves or other debris from the area where the infected plant was growing to prevent other leafhopper insects from consuming the pathogen.
- Keep your garden and surrounding area weed-free. This is particularly important with perennial weeds such as dandelions, plantain and other broad leaf weed species. If infected with the aster yellows pathogen, these weeds can harbor it in their cells from one year to the next.
- The aster yellows pathogen does have an "Achilles heel." It can't tolerate prolonged periods of hot weather. Temperatures of at least 88°F for 10 to 12 days inactivate the pathogen in both the leafhopper and infected plants.
- If aster yellows is a persistent problem for you, grow other flowering plant species that aren't susceptible to this disease — flowering perennials such as hardy geranium, salvia, and verbena or flowering annuals such as cockscomb, impatiens, and nicotiana to name a few.
- For vulnerable edible crops, use floating row covers to prevent leafhopper access.

But wait — If the problem isn't aster yellows, then what is it?

Before leaping to the conclusion that your plant has aster yellows, rule out two other possibilities. The first is herbicide exposure, which can occur from misapplied weed control products. If the herbicide is applied on a windy day, it can drift from the application site onto nearby plants where the damage may not show up for several days. Depending on the plant and product used, symptoms of herbicide damage include discolored and twisted leaves, cupped foliage, or plant dieback. If multiple plant species are affected, that's another telltale sign of herbicide damage.

The second possibility is mite damage. Having encountered aster yellows on some purple coneflowers (*Echinacea*) in my own ornamental garden, I followed the generally accepted protocols for controlling the pathogen. I dug up and destroyed all parts of the affected plants, cleaned up and removed all plant debris from the soil, and removed all weeds from the immediate vicinity. Satisfied that I had done due diligence in ridding my garden of the disease, I congratulated myself on stopping this dreaded pathogen in its tracks. Only later did I learn that there's another disease that looks similar to aster yellows and is caused by the **Eriophyid mite**. Suddenly, I wasn't so sure my diagnosis of aster yellows was correct.

Eriophyid mite damage on purple coneflowers. Photo: Courtesy of Missouri Botanical Garden

How does Eriophyid mite damage compare with aster yellows on coneflowers?

Eriophyid mites are microscopic in size and often go undetected because they live unseen inside flower buds. A number of Eriophyid mites exist but the specific species of mite that affects coneflowers is the coneflower rosette mite. It gets that name because it causes abnormal rosette-like (circular) growths on the cone of the flower. As the buds develop, the mite sucks nutrients from the base of the flowers causing stunted and distorted flower parts. Characteristics of the coneflower rosette and aster yellow diseases include the following:

Coneflower Rosette Disease:

- Affects only the seed head (cone portion) of the blossom and presents as a tufted portion of the cone.
- Green to reddish-green elongated rosette-like tufts of stunted and distorted flower parts that sprout from the tops or sides of the cones.
- Foliage and stems are not affected.

Aster Yellows Disease:

- Affects all parts of the plant.
- Bizarrely distorts the entire flower. Flower petals may appear as a ring of tiny greenish-yellow spoons arrayed around the base of highly deformed cones.
- Cones may appear as tightly clustered rosettes.
- Affects the foliage with yellowed, curled foliage
- Stunted stems.

A link to an Ohio State University Extension article on *Coneflower Cleanup* is included under Sources at the end of this article. It provides several very good comparison photos of aster yellows and coneflower rosette mite symptoms.

What are the treatment options for Eriophyid mites?

While there's no cure for aster yellows, fortunately, Eriophyid mite damage can be treated. Remove damaged flowers and destroy them. Clean up all plant debris in the garden this fall. Next year, treat susceptible plants with a horticultural oil or a miticide **before** bud break.

In Conclusion

Aster yellows is a devastating disease of many herbaceous ornamental plants and edible food crops. The disease is incurable and is easily spread from plant to plant by leafhopper insects. Promptly removing the affected plant roots and all, keeping the area free of weeds, and cleaning up any infected plant debris will help control the disease. But do make sure you accurately diagnose the problem as aster yellows, which has no cure, and not Eriophyid mite damage, which does have a cure.

As for those diseased purple coneflowers in my garden two summers ago, I will never know for certain which disease they had – aster yellows or coneflower rosette disease caused by mites. But now that I know there's more than one explanation for the problem, I'll do my research first before I panic.

Featured Photo: Purple coneflowers displaying symptoms of aster yellows. Photo: Courtesy of Missouri Botanical Garden

Sources

Aster Leafhopper, University of Wisconsin-Madison Extension and Research

Aster Yellows, Missouri Botanical Garden Fact Sheet

Aster Yellows, University of Illinois Extension

Aster Yellows Disease on Flowers, University of Maryland Extension

Aster Yellows vs. Eriophyid Mites on Coneflower, Minnesota State Horticultural Society Website

Coneflower Cleanup, The Ohio State University Extension website

Upcoming Events

By Cathy Caldwell | June 2023-Vol.9,No.6

Urban Tree Walk in Belmont

Friday, June 2 @ 9:00 to 10:30 a.m. (12 participants allowed, ages 14 and up)
Register **here**
Saturday, June 3 @9:00 to 10:30 a.m. (12 participants allowed, ages 14 and up)
Register **here**

Charlottesville Area Tree Stewards, Steve Huff, Scott Syverud and David Marrs will lead this walk through the oldest area in Belmont featuring about 20 mature trees, with a focus on tree identification and noteworthy information. The walk is about one mile and mainly on level sidewalks in a mix of sun and shade with one staircase of about 20 steps to negotiate.

Invasive Plant Workshop

Friday, June 9 @ 10 am – 1 pm

Rockfish Valley Trail in Nellysford

sponsored by Blue Ridge Prism, Virginia Master Naturalists & Rockfish Valley Foundation

Register Here $25

Garden Basics: Simple to Sensational Summer Container Gardens

Saturday, June 17 *@ 2:00 pm – 4:00 pm. FREE*
Trinity Episcopal Church, 1118 Preston Avenue, Charlottesville

Learn tips and techniques for planning, creating, and caring for an attractive and healthy container garden. Participants in this free class will learn how to grow ornamentals, pollinator plants, herbs, and vegetables in containers, and will create a flowering summer container garden to take home. Space is limited. Registration will close at 5 p.m. June 16 or when the class is full. Garden Basics is a partnership with the Bread and Roses ministry at Trinity Episcopal Church.

RSVP Here

National Pollinator Week Garden Tour & Presentation at The Center

Tuesday, June 20 *@ 5:30 pm – 7:30 pm*
The Center at Belvedere 540 Belvedere Boulevard, Charlottesville, VA, United States

The Center at Belvedere and the Piedmont Master Gardeners will celebrate Pollinator Week with an open house and tour of the Center's rose and pollinator demonstration gardens, followed at 6:30 p.m. by a presentation on "How to Create a Pollinator Paradise in Your Yard." The program is free and open to all and will provide an overview of the best plants for attracting and supporting pollinators in home landscapes in our region. **To register, visit https://thecentercville.org/calendar/event/90394//3/.**

Born to Be Wild Pollinator Festival

Saturday, June 17 @ 10:00 am – 2:00 pm

Banshee Reeks Nature Preserve
21085 The Woods Road
Leesburg, Virginia

Blue Ridge PRISM's Natali Walker will be hosting a table at this event. Stop by and learn how invasive plants impact our pollinators, what you can do to support pollinators, and how to bee careful with pollinators while controlling invasive plants.

Coming up in July . . .

Garden Basics: Why Is My Plant Looking Unhealthy? – A Hands-on Workshop About Diagnosing Plant Problems

Saturday, July 15 *@ 2:00 pm – 4:00 pm. FREE*
Trinity Episcopal Church 1118 Preston Avenue, Charlottesville

Plant problems are often linked to a disease-causing organism or exposure to less-than-ideal growing conditions. This free, hands-on workshop will offer a systematic approach to uncovering the cause of a plant's problems as well as examples of common plant problems…

RSVP Here

The Ornamental Garden in June

By Cathy Caldwell | June 2023-Vol.9,No.6

Timing is critical to keeping your ornamental garden looking interesting, particularly during the hot summer months. The garden is in full bloom now in June but think ahead to what the late summer or fall garden will look like. Although planting season is basically over, it's not too late to plant annuals and perennials that will provide plenty of color up until frost.

Routine gardening chores this month

By now, we're largely done with our spring chores, such as bed preparation, seeding, dividing, transplanting, and mulching. It's now time to switch to maintenance mode to keep the garden looking fresh and inviting. Some routine maintenance tasks include:

Deadheading — As annuals become established, deadhead spent flowers to encourage the plant to produce another round of flowers. A few minutes spent deadheading each week will keep those annuals blooming well into the growing season. TIP: Many of the newer varieties of annuals are self-cleaning and don't need to be deadheaded.

Pinching – The objective of pinching back annuals, such as petunias and coleus, is to keep the plants bushy and prevent them from becoming leggy. Pinch back the stem to just above a leaf node.

Propagating – Late spring to early summer is a good time to propagate stem cuttings of woody ornamental plants such as camellia, cotoneaster, viburnum, deutzia, and lilac. Take softwood cuttings from tender new growth on woody plants, just as it begins to harden. To learn more about propagating plants, refer to Virginia Cooperative Extension (VCE) publication 426-002 on Propagation by Cuttings, Layering and Division.

Staking – Install supports for plants that tend to collapse or flop over. **Stake** taller plants, such as foxglove, yarrow, and delphiniums, and **cage** mounding plants, such as peonies or chrysanthemums. This is particularly critical if your garden is in a windy site.

Weeding – With the onset of warmer weather, stay on top of the weeds in your flowerbed. Pull weeds at least once a week or more often if you have the time and the inclination. For help with identifying weeds, try Weed Identification Photos/Maryland Ext

Watering – Water trees and shrubs deeply and infrequently at the root level to help them get through the

summer heat. This is particularly important during the first few growing seasons after a tree or shrub is planted. It's also important for all plantings during drought conditions. If you use a sprinkler system for your annuals and perennials, water them in the mornings so that foliage can dry off during the day.

For **containerized plants**, keep close tabs on their water requirements. This is particularly critical if you're planning to go away on vacation. Group containerized plants together near a hose or other water source so that it will be easier for your neighbor or other helpful person to water your plants for you in your absence. Place the plants where they will be out of the afternoon sun. This will help them conserve water.

Collecting and saving seeds – Given the rising costs of seeds these days, collecting and saving your own is both rewarding and economical. Collect seeds after flowers have faded and seeds are dark brown or black. Spread the seeds out and allow them to dry thoroughly so that they don't become moldy. Place the dried seeds in paper envelopes or air-tight glass jars and label and date them. Store the seeds in a cool, dry, dark place over winter. Some people like to store seeds in their refrigerators. Important: While open-pollinated species will come back true from seeds, hybrids will not.

Dividing daffodils – After daffodil foliage has died back, use a shovel or garden spade to dig up the bulbs. Dig several inches away from the clump to avoid damaging the bulbs and their offsets. Lift the clump of bulbs from the ground, being careful not to damage the roots. Gently twist the bulbs apart with your fingers. Discard any that look damaged or diseased. Re-plant the bulbs in a sunny spot with good drainage. Mix in a good amount of compost or other organic matter before you replant them. Plant them three times as deep in the soil as the circumference of the bulb. In other words, if the bulb measures two inches around its middle, plant it six inches deep.

Removing spent rhododendron blooms – Now that rhododendrons have finished blooming, carefully remove the old blooms within 2 to 3 weeks after they have faded. This will promote better blooming next year, give the plant a tidier appearance, and help prevent insect infestations. The technique is simple: Grasp the spent blossom cluster (called a truss) and carefully pinch it off or push it aside with your thumb. This will reveal the developing flower buds for next year's flowers. Be careful not to injure those as you remove this year's dead flower clusters.

Monitoring plants for signs of powdery mildew – Garden Phlox (*Phlox paniculata*) is one of the classic mainstays of the sunny perennial border. But powdery mildew can devastate the foliage of this native plant and turn it into an ugly, unsightly mess. To combat this disease, plant garden phlox in full sun. Space the plants about 18 to 24 inches apart to allow for good air circulation. Thin out established clumps by snipping out the weakest stems, leaving only 5 or 6 sturdy stems. Water well, particularly during dry weather, with a soaker hose at soil level and avoid wetting the foliage. Mulch around the roots to help retain moisture in the soil.

Powdery mildew on Phlox paniculata. Photo: Mary Ann Hansen, Virginia Tech Plant Problem Image Gallery, CC BY-NC. 4.0

Training vines, climbing roses, and other twining or climbing plants. Vining plants normally go through a growth spurt in early summer. As they grow, train them onto supports before they become unmanageable. As you tie them up, spread them out to the extent possible to cover trellises better and to provide better air circulation.

Monitoring houseplants to keep them from sprawling. The move outdoors into brighter light and fresh air provides just the jump start that many houseplants need for a growth spurt. Jade plant is an example of a houseplant that tends to sprawl. To keep it under control, pinch off the side shoots to keep the plant growing upright. Don't toss the side shoots that you pinched off. Pot them and start new plants.

Gardening Projects To Consider

Considering designing and installing a Rain Garden? A rain garden is an environmentally responsible way to capture rainfall and storm-water runoff. If you're in the process of planning one, choose plants that can tolerate both occasional flooding and long periods of dry weather. VCE Publication 426-043 on Rain Garden Plants recommends one plant species for every 10 to 20 square feet. In the example given, a 140-square-foot garden should have 7 to 14 different plant species consisting of a mix of tall, medium and low growing species. Some plants recommended for rain gardens include:

- **Trees**: Black gum (*Nyssa sylvatica*), Carolina silverbell (*Halesia tetraptera*) and hornbeam (*Carpinus caroliniana*)
- **Shrubs**: American beautyberry (*Callicarpa Americana*), spicebush (*Lindera benzoin*), and winterberry (*Ilex verticillata*)
- **Perennials**: Beard tongue (*Penstemon*), black-eyed Susan (*Rudbeckia*), and blue lobelia (*Lobelia siphilitica*)
- **Ferns**: Cinnamon Fern (*Osmunda cinnamomea*), holly fern (*Crytomium falcatum*), and royal fern (*Osmunda regalis*)
- **Grasses**: Feather reed grass (*Calamagrostis acutiflora*), switchgrass (*Panicum virgatum*), and foxtail grass (*Alopecurus pratensis*)

Thinking about creating a butterfly garden? If so, check out Virginia Tech's publication HORT-59NP, Creating Inviting Habitats for Birds, Butterflies, and Hummingbirds. You'll find guidance on which host plants to grow, depending on the life cycle of the butterfly. Adult butterflies require nectar, whereas caterpillars require leaves or other plant parts. Native plant species support more butterfly and moth species than introduced plants. Incorporate a wide range of plants that bloom throughout the growing season. Also, group plants of the same species together to form a mass of color or fragrance. A mass planting makes it easier for pollinators to spot your garden and encourages them to swoop in for a closer inspection. If they like what they see, they'll happily make your garden a regular stop on their daily food-foraging expeditions.

Pests, Wildlife, and Other Aggravations

Japanese beetles – The grubs of this devastating landscape pest pupate in the soil in spring and emerge as adults in June and July with voracious appetites. The best strategy for managing these beetles is prevention and early detection. When they first appear in the landscape, immediately remove them from affected plants. The logic in doing this is that the presence of the beetles on a plant attracts more beetles. A quick "organic" way to dispense with them is to pick them off plants by hand early in the morning when they are sluggish and drop them into a bucket of soapy water. VCE Publication 2902-1101 (ENTO-514NP), Japanese Beetle, provides information on this pest and strategies for controlling it. University of Kentucky Cooperative Extension Service Publication ENTFACT-451, Japanese Beetles in the Urban Landscape includes lists of landscape plants that are seldom damaged by Japanese beetles as well as plants that are likely to be attacked by them. To learn more about Japanese beetles and their control, be sure to read the recent *Garden Shed* article The Japanese Beetle.

Mosquitos — As the weather grows warmer this month, mosquitos make their appearance on the scene. It

only takes a tablespoon or so of standing water to provide a potential breeding place for mosquitos. Monitor all potential mosquito breeding places such as birdbaths, drainpipes, or saucers under potted plants and remove standing water immediately.

Rabbits – Our first impulse is to blame deer for damage to our gardens, but rabbits tend to like the same plants. Organic deer repellent sprays containing rotten eggs and hot pepper should repel both animals. The downside to repellents is that most of them need to be re-applied after heavy rains. **A better solution is to install a 3-foot tall physical barrier** constructed of chicken wire or other small gauge wire with openings no more than one inch wide. Rabbits can tunnel, so bury the bottom of the fence about 6 inches deep into the soil. If it's not possible to install a physical barrier, then use plants that are rabbit resistant. Penn State's Cooperative Extension offers some suggestions in its publication on Rabbit-Resistant Garden and Landscape plants.

Poison Ivy – "Leaves of three, leave them be" is an easy way to help you identify **poison ivy.** It takes about 2 to 3 weeks on average to recover from the itchy rash caused by contact with urushiol (pronounced u-ROO-she-ol), the active ingredient in the plant's sap. To remove this vine safely from your landscape, loosen the soil around the roots so that they will be easier to pull. Slip a plastic trash bag over your gloved hand, grasp the plant, and pull it out by its roots. Pull the trash bag up over the plant, securely tie the bag, and place it in the trash. DO NOT COMPOST OR BURN THIS PLANT. If, however, you are one of those lucky people not bothered by poison ivy, then consider leaving it alone. The berries are an important food source for many birds.

Invasive Alert: **Mile-a-minute vine** (*Persicaria perfoliata*, formerly *Polygonum perfoliatum*) gets its common name from its ability to grow 6" a day and 25' in a single season. Tiny, sharp, recurved barbs line the veins on the backs of the leaves and on the stems, which inspired its other common name of Tearthumb. This invasive annual vine forms dense mats of foliage and scrambles over other plants blocking out light and killing them. Tiny white flowers begin blooming in June, followed by showy bright blue fruits that are dispersed by birds and by waterways (because the fruits float). The plant produces flowers and fruits continually from early summer until frost. Shallow roots make the plant easy to pull up, but the recurved barbs can easily pierce skin. So be sure to wear protective gardening gloves when manually pulling this vine. **Both manual pulling and herbicide treatments should be done before seed setting in mid to late June.** For large, infested areas, apply preemergent herbicides to the soil in early to mid-March.

Mile-a-minute vine (Persicaria perfoliata). Photo: Leslie J. Mehrhoff, U. of Conn., Bugwood.org.

For information on other invasive species to watch out for in June, see the Invasive Plant Control Calendar in the May 2022 issue of *The Garden Shed*.

Featured Photo: Cathy Caldwell

SOURCES:

Monthly Gardening Tips/June, Piedmont Master Gardeners/Gardening Resources

The Well-Tended Perennial Garden: Planting & Pruning Techniques (Tracy DiSabato-Aust, 2006)

Canopy Trees

By Chris Stroupe | June 2023-Vol.9,No.6

A tree canopy is the layer of branches and leaves that "cover the ground when viewed from above." Tree canopies have many measurable benefits, for example reducing stormwater runoff and both gaseous and particulate pollution.

Tree canopies also cool the areas beneath and around them. Areas under dense tree canopy can be as much as 45°F cooler than areas covered with pavement. The key word there is "dense." A recent study by University of Wisconsin researchers found

that the cooling effect of urban trees was noticeable only when canopy coverage – the fraction of the surface covered by tree canopy – was above 40%.

Enchanted broccoli forest. Photo: Robert Kerton, CC BY 3.0

The 2022 assessment of the tree canopy in Charlottesville determined that overall tree canopy coverage in the city was 40%, down from 45% in 2014. However, the 2022 assessment found that coverage was uneven, ranging from 14% to 58% amongst the city's neighborhoods. Not surprisingly, Charlottesville's 2021 Urban Heat Island Mapping Campaign showed that areas with little tree canopy were much hotter than areas with dense canopy.

Charlottesville's tree canopy decreased twice as much on privately-owned land than on city-owned property between 2014 and 2022. Moreover, private land contains 75% of the potential tree canopy within city limits. Clearly, landowners can play a big role in increasing the tree canopy in Charlottesville, and probably in other locales.

This article starts with suggestions for canopy trees that should thrive in central Virginia, explains how to choose sites for canopy trees, then briefly describes when and how to plant trees, with links to in-depth instructions. Finally, the article discusses how to care for trees to give them the best chance of forming a canopy.

Suggested canopy trees

The following are native canopy trees recommended for Charlottesville and Albemarle County. It's important to plant native trees because they're adapted to regional soils and climate. Native trees also provide habitat and food for local animals, in particular birds and insects. The Virginia Native Plant Society and Doug Tallamy's Homegrown National Park initiative are great sources for more information about the benefits of native plants.

American beech summer foliage. Photo: Tim Ross, public domain image

American beech winter foliage. Photo: Gorillo.chimpo, CC BY-SA 4.0

- American Beech (*Fagus grandifolia*)
  Mature height: 60 – 120’; usually shorter with a wider trunk when open-grown
  Spread: 50’
  Form: single trunk, branches extend straight out
  Drought tolerance: moderate
  Light requirement: shade, partial sun, full sun; best development in moderate shade
  Bark: light gray and smooth, even in maturity
  Autumn/winter appearance: very beautiful; bright yellow-brown leaves stay on the tree all winter
  Further reading: https://edis.ifas.ufl.edu/st243

American elm, showing its graceful, upwardly-arching branches. Photo: Marty Aligata, CC BY-SA 4.0

- Jefferson American Elm (*Ulmus americana* 'Jefferson') – a Dutch elm disease-resistant variety!
  Mature height: 70 – 90'
  Spread: 50 – 70'
  Form: trunk divides 10 – 20' up, especially in bright sun. Branches arch upwards
  Drought tolerance: moderately tolerant of short, but not long, droughts
  Light requirement: full sun, partial shade
  Bark: gray; overlapping scales, narrow fissures
  Autumn/winter appearance: brilliant yellow foliage
  Further reading: https://edis.ifas.ufl.edu/st649

The straight, unbranched trunk of a tulip poplar. Photo: Chris Stroupe, CC BY-NC 4.0

- Tulip poplar (*Liriodendron tulipifera*)
  Mature height: 100 – 150’; can reach 200’ in ideal conditions
  Spread: 30 – 50’
  Form: very straight, single trunk; high canopy
  Drought tolerance: moderate
  Light requirement: full sun
  Bark: brown; intersecting ridges form diamond-shaped patterns
  Autumn/winter appearance: bright yellow foliage
  Further reading: https://edis.ifas.ufl.edu/st363

Sweetgum's spectacular autumn foliage. Photo: Ontologicalpuppy, CC BY-SA 4.0

- Sweetgum (*Liquidambar styraciflua*)
  Mature height: 60 – 75'
  Spread: 35 – 50'
  Form: single trunk with a conical canopy, more oval in maturity
  Drought tolerance: moderate
  Light requirement: full sun, partial shade
  Bark: gray-brown blocks, deep furrows
  Autumn/winter appearance: excellent autumn color – yellow, orange, red, burgundy
  Further reading: https://edis.ifas.ufl.edu/st358
  Note: Spiky spherical seedpods are messy. There is a fruitless variety, "Rotundiloba".

Black gum, or black tupelo. Rumored to be Van Morrison's favorite tree. Photo: Jean-Pol Grandmont, CC BY-SA 3.0

- Black gum, aka Black tupelo (*Nyssa sylvatica*)
  Mature height: 65 – 75'
  Spread: 25 – 35'
  Form: straight, single trunk with horizontal branches
  Drought tolerance: moderate
  Light requirement: full sun, partial shade
  Bark: dark gray, shallow furrows
  Autumn/winter appearance: excellent autumn color – orange, red, deep purple
  Further reading: https://edis.ifas.ufl.edu/st422

Maples look great in the summer too! Photo: Bruce Marlin, CC BY-SA 2.5

- Sugar maple (*Acer saccharum*)
  Mature height: 60 – 80’
  Spread: 35 – 50’
  Drought tolerance: moderate
  Light requirement: full sun, partial shade, full shade
  Bark: gray-brown; smooth in younger trees, furrowed when older
  Autumn/winter appearance: classic fall color – red, orange, yellow
  Further reading: https://edis.ifas.ufl.edu/st051

  Note: Also consider red maple (*Acer rubrum*), described in this article by Piedmont Master Gardener Sue Martin.

White oaks can become truly enormous, after a few hundred years. Photo: msact, CC BY-SA 3.0

- Oaks (genus *Quercus*):

  Fourteen oak species are native to Virginia. Six are recommended as canopy trees:

  White oak (*Q. alba*): http://edis.ifas.ufl.edu/st541, and this article by Piedmont Master Gardener Pat Chadwick.

  Swamp white oak (*Q. bicolor*): https://edis.ifas.ufl.edu/st543

  Scarlet oak (*Q. coccinea*): http://edis.ifas.ufl.edu/st545

  Southern red oak (*Q. falcata*): https://edis.ifas.ufl.edu/st546

  Pin oak (*Q. palustris*): http://edis.ifas.ufl.edu/st555

  Willow oak (*Q. phellos*): https://edis.ifas.ufl.edu/st556

  Mature height: 50 – 100’, depending on species

  Spread: 35 – 80’, depending on species

  Drought tolerance: moderate to high, depending on species

  Light requirement: full sun; white and swamp white tolerate partial shade

  Bark: depending on species, from dark brown to gray, and deeply furrowed to scaly or flaky

  Autumn/winter appearance: All have showy red foliage, except for willow, which is yellow, and Southern red, which is brown. All oaks hold their leaves over winter.

Notes: Acorns make a mess, especially in "mast years", but wildlife love them. Humans can eat acorns too, after processing to remove tannic acid. Also, Piedmont Master Gardener Ralph Morini's article on oak decline describes how to care for oaks to ensure a long lifespan.

Willow oak autumn foliage. Photo: Famartin, CC BY-SA 4.0

Pin oak fall color. Photo: Rmccrea, CC BY 3.0

Location

Plan ahead. Consider whether a mature tree will impinge on power lines. Plant at least 35’ away from houses. Keep trees away from sidewalks (minimum 8 – 10’) and septic drain fields (a distance equal to the height of the tree). Minimize the impact of soil compaction by planting where there won’t be much foot or car traffic. For the best cooling effect from shade, plant on the southern and western sides of houses.

Timing

Plant deciduous trees in late fall, winter, or early spring, while the tree is dormant. This will let their root systems develop before summer. Oaks and black gum should be planted in early spring; their roots grow slowly and might be damaged by winter temperatures.

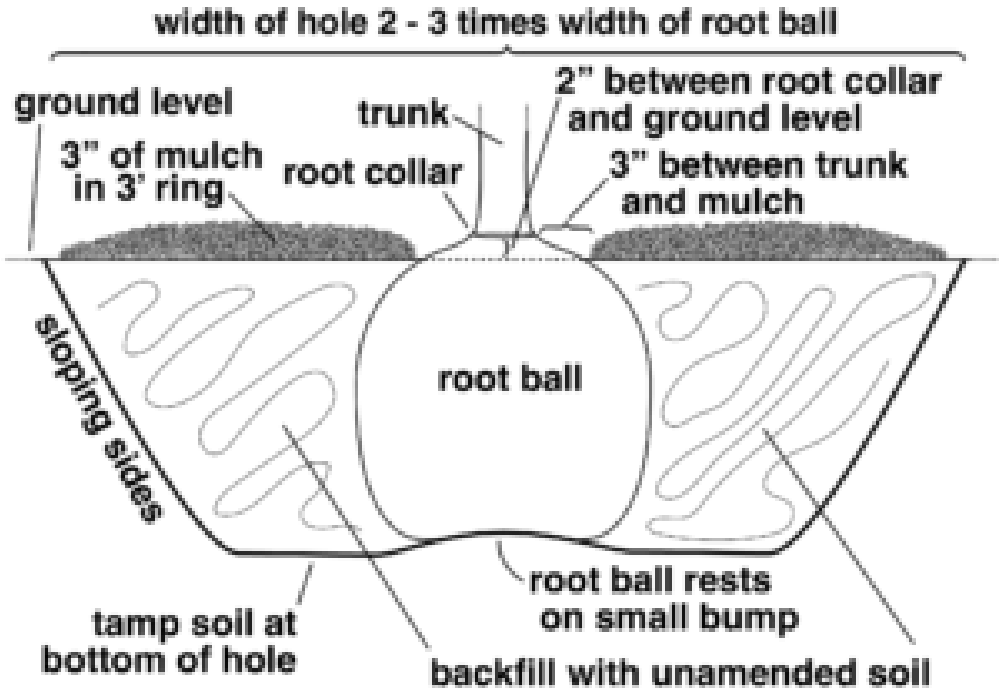
How to Plant

The following is only an overview of tree planting. These links offer detailed descriptions and videos:

- University of Maryland Extension
- Charlottesville Area Tree Stewards
- Charlottesville Area Tree Stewards (video)
- Virginia Cooperative Extension (video)

The Charlottesville Area Tree Stewards offer free classes on tree planting and many other topics.

Plant large canopy trees well away from power lines. Photo: Chris Stroupe, CC BY-NA 4.0



Plant trees in wide, shallow holes with sloping sides. Image: Chris Stroupe, CC BY-NC 4.0

Plant trees in wide, shallow holes with sloping sides. The hole should be as deep as the root ball and 2 – 3 times as wide. Tamp the bottom of the hole and pile a little dirt in the center, where the root ball will rest. The "root collar" – the ring where the trunk meets the root zone – should be 2 inches above ground level. Finding the root collar can be tricky; this document has good pictures showing how to do it.

If a tree is in potting mix in a container, gently remove as much mix as possible from around the roots before planting. (The potting mix will deplete the surrounding area of oxygen as it decays.) A flat-blade screwdriver is a great tool for this. Moistening the potting material with a gentle stream of water also helps. Don't put the potting mix in the hole with the tree; save it for mulch instead. If a tree is wrapped in burlap and/or wire, remove the wrapping from at least the top 12 inches, or top ⅔, of the root ball, whichever is greater. Free up any tangled roots so they point outwards and downwards.

Put the root ball in the hole and re-check the height of the root collar. Backfill the hole with the soil from the hole, filling a little past half-way. Don't add grass, leaves, mulch, or any other amendments to the fill. Add water to make a thick slurry and work this slurry in amongst the roots. Fill the rest of the hole with the soil from the hole, again without amendments. Add more water, so the soil is moist but not sodden. Cover the backfilled area with 2 inches of compost; it will work its way into the soil and keep it loose for optimal root growth.

Finally, spread 3 inches of mulch in a 3-foot diameter circle around the trunk. To keep the bark from rotting, push the mulch 3 inches away from the base of the trunk. Consider staking and fencing.

Maintenance

Keep newly-planted trees well-watered. A rule of thumb is that they need 1 inch of water per week. This works out to a little less than a 5-gallon bucket of water in a 3-foot diameter circle. However, avoid over-watering, which can damage the roots. Do not amend the soil.

Keep the area around the trunk well-mulched, roughly 3 inches deep. This helps the soil retain moisture and reduces soil compaction around the roots. Ideally, mulch should extend out to the drip line, i.e. the maximum extent of the tree's canopy.

After the first year or two, prune the tree to correct any problems. It's important to prune early on because it's challenging – and expensive – to prune a tall tree. Look for multiple central leaders (main trunks) and weak structures, like branches making a small angle (close to parallel) with the trunk. These links include details about pruning:

- Virginia Cooperative Extension
- University of Maryland Extension
- Texas A&M Extension

In the decades to come, your tree might need professional care. Hire a Certified Arborist.

Closing thoughts

I hope this article will encourage us to do what we can to increase the tree canopy in our communities. Natural beauty, the environment, and human health will benefit. The descriptions of the trees and methods in this article are extremely brief, so I encourage readers to learn more from the references provided here – then dig in!

References and further reading

Featured image: Andrew Preble, CC0 1.0

Charlottesville Master Tree List (PDF) – also contains great descriptions of planting and maintaining trees

Find an arborist International Society of Arboriculture

Follow proper pruning techniques Texas A&M Extension

How to plant a tree (video) Virginia Cooperative Extension

Planting a bare root tree (video) Charlottesville Area Tree Stewards

Planting a tree or shrub University of Maryland Extension

Pruning deciduous trees (PDF) Virginia Cooperative Extension publication SPES-403

Pruning trees in the home landscape University of Maryland Extension

Red maple earns its popularity Sue Martin, Piedmont Master Gardeners

Select, plant, and care for your tree (PDF) Tim Maywalt, Charlottesville Area Tree Stewards

Study suggests trees are crucial to the future of our cities University of Wisconsin

Urban Tree Canopy Assessment (PDF) City of Charlottesville, VA

Urban Heat Island Mapping Campaign City of Charlottesville, VA

Using trees and vegetation to reduce heat islands Environmental Protection Agency

Virginia Tech Dendrology Factsheets

What's killing our oak trees? Ralph Morini, Piedmont Master Gardeners

White oak – a majestic native species Pat Chadwick, Piedmont Master Gardeners

Tomato Diseases

By Chris Stroupe | June 2023-Vol.9,No.6

Editor's Note: *We have updated Cleve Campbell's excellent 2015 article with new resources on tomato diseases.*

As the days grow longer and the summer heats up, I wait anxiously for that first ripe, sun-warmed, sweet tomato. For many of my gardening friends, myself included, summer really doesn't start until that first summer-ripened tomato is plucked from the vine.

One thing I have learned about growing tomatoes over forty years of gardening is that many things can go wrong in the tomato patch; some can be fixed and some can't be fixed, and no tomato crop is perfect. Growing tomatoes is not for the gardener seeking perfection. A certain amount of loss is normal, and just like the stock market, some years are more enjoyable than others.

Over the years I have found that there is little point in chasing perfection with chemicals. Many problems can be prevented if tomato varieties are carefully chosen and properly cared for; they are less susceptible to

disease and pest problems. And one important lesson I have learned is that healthy plants don't always start, stay, or end that way. Even in the most challenging year, I try to remember: problems in the tomato patch are an opportunity to learn and to prepare for next year. And the most important thing I've learned is that even in a bad year, those garden tomatoes sure taste a lot better than those from the supermarket.

This month in *The Garden Shed* we are going to take a look at some common tomato diseases that occur in Virginia. They include: early blight, septoria leafspot, verticillium and fusarium wilts, late blight, tobacco mosaic virus and bacterial spot. One common cultural or physiological disorder — blossom end rot — will also be reviewed.

Early Blight

Early blight, which is caused by the fungus *Alteraria solani*, is common in Virginia. It occurs to some extent every year wherever tomatoes are grown. Don't be confused by the name "early" as the disease may occur at any time during the growing season. Early blight causes irregular, brown leaf spots (lesions) that range in size up to ½ inch in diameter.

The most important diagnostic indicator of early blight is the formation of dark, concentric rings within the lesion, giving the spots a target-like or bulls eye appearance, and often causing the leaf to turn yellow, dry up, and fall off. The lesions initially appear on the lower, older leaves near the base of the plant and can progress rapidly up from the lower foliage to new growth during wet weather. Early blight may also produce symptoms on the plant stems and fruit. Dark, sunken, leathery lesions appear on the stem-end of the fruit. On older fruit, these lesions reach considerable size and the rot extends deep into the flesh of the fruit. Heavily infected fruits usually drop to the ground. Other vegetables in the garden that are susceptible to early blight include: potatoes, peppers and eggplants.

One of the first symptoms of early blight is the appearance of dark spots on the lower, more mature leaves: concentric rings in a bull's eye pattern that can be seen in the center of the diseased area. Photo: Paul Bachi, University of Kentucky, Bugwood.org

The fungi responsible for this disease can survive up to a year in the soil as well as in infected vine residue, seeds, and weeds left in the garden over the winter. In the spring and summer, spores of these fungi can be splashed or blown to tomato leaves. Warm temperatures, abundant rainfall and high relative humidity favor disease development. The disease is more aggressive when plants are weakened or stressed by poor nutrition, drought or by the wounds of pests.

***Early blight** migrating from the bottom leaves to the top of the plant. Photo: Gerald Holmes, California Polytechnic State University at San Luis Obispo, Bugwood.org*

Septoria Leaf Spot

Septoria Leaf Spot is caused by the fungus, *Septoria lycopersici*, characterized by several small, gray, round leaf spots with dark borders. A few black, pinhead dots may be seen within the spots. For a very helpful introduction, watch this video: Septoria Leaf Spot on Tomato/VATech Plant Disease Clinic

Septoria leaf spot. Photo: Bruce Watt, University of Maine, Bugwood.org

Like Early Blight, the spores survive in residues from diseased plants. Septoria leaf spot can occur anytime during the growing season. Septoria leaf spot diseases first develops on the older leaves nearest the ground and continues upward on new leaves as the growing season progresses. Heavily-infected leaves may scorch and wilt, giving the plant the appearance of a wilt disease. The fruits are rarely infected; however, the leaf loss reduces fruit yield and quality, and the exposed fruits are more susceptible.

Control of Early Blight and Septoria Leafspot

1. Remove all infected plant material (including infected fruit) from the garden and destroy it. Never compost plant material suspected to be infected with Early blight or Septoria leaf spot.

2. Both early blight and septoria are soil-borne diseases, so whenever possible **do not plant tomatoes in the same place year after year.** If not possible to rotate to a different plot, rotate to a different section of the garden; if possible, avoid planting in areas where potatoes, peppers or eggplants were planted in the prior year.

3. **Consider using stakes or wire cages** to support tomato vines. By keeping the vines off the ground you can reduce the chance of diseases by reducing soil splash on the leaves and fruit. Caged plants are less prone to the spread of disease from plant-handling than staked plants. Why? Staked plants are handled more frequently than caged plants, and that handling results in more open wounds, which are a way in for diseases.

4. **Give your tomato plants space** — at least 3 feet — to allow good air circulation, which will reduce the humidity around the plant. Both early blight and septoria leaf spot are more aggressive in a humid environment.

5. **When pruning tomatoes, disinfect your pruning tools** frequently to avoid spreading spores from plant to plant.

6. **Healthy plants tend to resist diseases** better than plants stressed from lack of water or nutrients. Tomatoes planted in well-drained and properly fertilized soil, will be less prone to early blight and infection. As a general rule, at midseason, full-grown tomato plants require about 1 inch of water per week. Add water gradually, allowing the water to soak into the soil. **Avoid overhead irrigation**, which can lead to an increase in diseases. Watering early in the day will allow the plants to quickly and thoroughly dry. Do not allow the soil to become so dry that the plants wilt. Avoid fluctuations of too much and then too little water. Adding a layer of organic mulch such as straw, leaves or grass can reduce water evaporation, help reduce weeds, and reduce soil splash when it rains. Avoid using grass clippings from a lawn recently treated with herbicides.

7. **Try planting early blight-resistant tomatoes.** Tomato varieties suggested to be more tolerant of early blight include ‘Mountain Magic’, ‘Mountain Fresh Plus F1’, ‘Bush Celebrity Hybrid’, ‘Big Beef Hybrid’, ‘Celebrity Hybrid’, ‘Rutgers’, ‘Juliet F1’, ‘Tommy Toe’, ‘Old Brooks’, or ‘Cabernet F1’. When purchasing seeds or plants, look for the symbol “As” on the seed packet or plant label, which denotes resistance or tolerance to Alternaria solani or early blight. Remember, resistance or tolerance does not mean the variety is completely immune to those specific diseases. It suggests a specific variety has greater tolerance to a particular disease. Disease-resistant varieties may still be affected by the disease, but they typically have less

damage than a non-resistant variety.

Late Blight

Late blight (VCE Pub. ANR-6) is caused by the fungus-like organism *Phytophora infestans* and is a very destructive disease in tomato and potato crops. The pathogen is best known for causing the devastating Irish potato famine in the 1840's, resulting in the deaths of more than 1 million people and causing another million people to leave Ireland. For an excellent introduction, watch this video/VCE.

Late Blight. Photo: Christine Waldenmaier, VA Tech Plant Disease Clinic/Plant Problem Image Gallery

The late blight pathogen attacks all above-ground parts of the tomato plant. The first symptoms of late blight on tomato leaves are irregularly-shaped, water-soaked lesions, often with a light halo or ring around them. Unlike early blight and septoria leaf spot diseases, these lesions usually begin on the younger, more succulent leaves in the top portion of the plant canopy and then migrate down the plant to the lower leaves.

Late Blight
Photo: Gerald Holmes, California Polytechnic State at San Luis Obispo, Bugwood.org

During periods of high humidity, white cotton growth may be visible on the underside of the leaf. Spots are visible on both sides of the leaves. As the disease progresses, lesions enlarge, causing leaves to brown, shrivel, and die. Late blight can also attack tomato fruit in all stages of development. Fungal garden spores are spread between plants and gardens by rain and wind. The ideal weather for spread is temperatures in the upper 70's and high humidity. Complete defoliation can occur within 14 days under ideal conditions.

Unfortunately, there is no cure for late blight. Once you observe the symptoms, all infected plants should be removed from the garden. Never compost the plants. Instead, burn them or place them in a large plastic bag and place in the sun to bake for a few days before putting in the trash can.

Verticillium and Fusarium Wilts:

Verticillium wilt is a disease caused by a fungus — *Verticillium albo-artum* — that attacks over 200 plants, including tomatoes, potatoes, eggplants, strawberries, and raspberries. The fungus is soil-borne and can reside in the soil for many years after it is contaminated; therefore, rotating crops is essential to controlling this disease. The fungus enters the plant though the feeder roots and grows into the water-conducting vessels (xylem) in the stem. As the vessels become clogged and collapse, the water supply to the leaves is blocked. The first symptoms usually appear on the older bottom leaves. The leaves become yellow, dry up, and drop prematurely. The upper shoots may also wilt during mid-day. Leaf tips curl upward at the margin and defoliation may continue up the plant. At an advanced stage of infection, the internal portion of the stem at the base of

the plant will appear dark and discolored. The disease may continue until the plant is wilted, stunned or dead.

Verticillium Wilt
Photo: Gerald Holmes, California Polytechnic State University at San Luis Obispo, Bugwood.org

Fusarium Wilt

Like verticillium wilt, fusarium wilt is caused by a fungus that is soil-borne and passes into the feeder roots and moves upward in the xylem of the stem, blocking the water-conducting vessels and causing the wilting of the leaves. The first indication of the disease in small plants is the drooping and wilting of lower leaves, with a loss of green color, followed by wilting and death of the plant. Often leaves on only one side of the stem turn yellow at first; the yellow leaves gradually wilt and die. The stems of wilted plants show no sign of soft decay, but when the stem is cut lengthwise, the woody part next to the green outer cortex shows a dark brown discoloration of the water-conducting vessels.

Fusarium Wilt
Photo: Edward Sikora, Auburn University, Bugwood.org

Unfortunately, once a tomato plant shows symptoms of a wilt disease, it cannot be cured of the problem. It should be pulled up and removed from the garden. Removing old and diseased plant debris during the growing season and at the end of the growing season won't eliminate it the next year, but can help reduce the population of the diseases that overwinter in the soil over time. Because verticillium and fusarium wilt fungus all survive in the soil for several years, it will be hard to prevent the disease each year. Crop rotation can help but is often of limited value in the home garden because of limited space. If you experience wilt problems this year, if at all possible, avoid planting tomatoes in the same spot next year. Along with avoiding the infected area next year, you need to avoid planting plants in the same family, such as peppers, eggplant, and potatoes. These vegetables are all closely-related and can be infected by similar diseases. If you have wilt problems in a raised bed, one solution may be to remove the contaminated soil and replace it with new dirt.

Doing battle with verticillium and fusarium diseases takes some careful planning at the beginning of the growing season when selecting varieties and deciding where to plant in order to avoid infected areas. When selecting which tomato varieties to grow, select the ones that are disease-resistant. How? Well, when you look at a plant label or seed packet, look for the letters that serve as a code for which disease it is resistant to. Verticillium

wilt resistance is represented by the letter “V” and fusarium wilt resistance is indicated by the letter “F.” You will find that some varieties have resistance to more than one disease, while others may have no resistance at all.

The recent interest in growing heirloom tomatoes may result in an increased incidence of fusarium and verticillium wilts, as generally these plants are less disease-resistant than hybrid tomatoes. However, in recent years a movement has been underway to graft the tops of heirloom tomato plants to rootstock that is disease resistant. Learn more about tomato grafting in this Penn State Extension article.

Tobacco Mosaic

Tobacco Mosaic Virus
Photo: University of Georgia, Bugwood.org

Tobacco Mosaic (virus): Symptoms are intermingled patches of normal and light green or yellowish colors on the leaves of infected plants. Tobacco Mosaic damages leaves, flowers, and fruit, causing stunting of the plant. Several strains of the virus are known to cause different symptoms. The virus is highly infectious and readily spreads by any means, even in a tiny amount of sap. The most common means of transmission is by handling contaminated plants. The virus may also be present in certain types of tobacco; therefore, use of tobacco may also be a source of the virus.

Presently, there are no known efficient chemical controls that eliminate viral infection from plant tissues once they do occur. Tobacco mosaic virus is the most persistent plant virus known. It has been known to survive up to 50 years in dried plant parts. Therefore, sanitation is the single most important practice in controlling tobacco mosaic virus.

Control of Tobacco Mosaic Virus:

1. Remove and destroy infected plants. Pull plants with mosaic symptoms immediately. Remove the debris from the garden area and destroy.
2. Keep your garden weed-free. Some weeds may be harboring the virus. These represent potential sources of the disease.
3. Always wash you hands thoroughly and disinfect tools. Before handling plants, wash with soap and water, especially if you use tobacco products.
4. Plant resistant varieties of tomatoes. Varieties that are resistant to tobacco mosaic virus are labeled “T” resistant.

Bacterial Spot/Speck:

Bacterial Spot/Speck can involve several different species and strains of bacteria. Some bacteria attack both tomato and pepper while others only attack one crop or the other. Bacterial spot can lead to severe damage to tomato and pepper plants. The pathogen attacks all parts of the plant — leaves, flowers, fruits and stems — causing spots or blemishes on these plant parts; however, most damage occurs on the leaves. Outbreaks of bacterial spot can result in leaf drop and poor fruit-set in the garden. Defoliation due to leaf spotting can increase the incidence of sunscald on fruit. In addition to the poor appearance of the fruit, fruit injury allows entry of secondary fruit-rotting organisms, causing further damage to the fruit. Some scientists are working to develop a variety of tomato that is resistant to bacterial spot. See wusfnews.wusf.usf.edu.

Letters after the variety name indicate tolerance or resistance to the following:

Fusarium Wilts (F)
Early Blight (As)
Bacterial speck Pseudomonas (B)
Root-knot Nematodes (N)
Septoria leaf spot (L)
Tobacco Mosaic Virus (T)
Stemphylium Gray leaf spot (St)
Alternaria Stem Canker/Crown Wilt (A)

The disease begins on older leaves at the base of the plant. Many small dark spots may first appear; the areas between the spots often turn yellow. Leaf spots often appear on both sides of the leaves. The spots quickly spread and kill the leaves. Dead leaves usually stay attached to the tomato plant.

Bacterial Spot
Photo: Howard F. Schwartz, Colorado State University, Bugwood.org

Fruit blemishes begin on green fruit as small water-soaked spots that are 1/8 to 1/4 inch in diameter. Centers of these lesions become irregular and slightly sunken with large scabby surfaces. Often the disease extends into the seed cavity. Secondary decay organisms may invade the bacterial spot lesions, resulting in fruit decay. The disease only affects green fruit; once the fruit turns red and the acid content increases, the fruit is no longer susceptible to the disease.The bacterial spot infection often originates from contaminated seeds or transplants or plant debris remaining in the garden from previous diseased plants or on volunteer tomato or pepper plants. The bacteria can spread from plant to plant by wind, rain, overhead irrigation, tools, and humans.

Garden sanitation is an essential component to controlling bacterial infections:

1. Do not work in the garden when plants are wet; if you are moving wet leaves around, you may be spreading the disease with contaminated water from the leaves.
2. If you are pruning a plant and suspect that it may be infected, always disinfect your tools before moving to the next plant.
3. At the end of the gardening season, remove all plant material, including weeds, from the garden.
4. If you start your own plants from seeds, use a sterile mix. If you are re-using pots or trays, sanitize them with a disinfectant such as a solution of 1 part bleach to 9 parts water.
5. Whenever possible, do not plant tomatoes in the same place year after year. If not possible to rotate to a different plot, rotate to a different section of the garden. If possible, avoid planting in areas where potatoes, peppers or eggplants were planted in the last year.
6. Give your plants plenty of space. The longer leaves stay wet, the greater the risk of bacterial spot. Leaves will dry faster when there is good airflow; this helps reduce the severity of

bacterial spot.

Blossom End Rot

Blossom End Rot
Photo: David B. Langston, University of Georgia, Bugwood.org

Blossom End Rot (VEC Publication 450-703) is a troublesome cultural problem that many of my gardening friends and myself have experienced. Unlike the various other problems discussed, blossom end rot is not caused by a disease organism; rather, it is a physiological disorder that occurs when there is insufficient calcium available to the developing fruit.

Initial symptoms of blossom end rot generally appear as water-soaked areas near the blossom end of the fruit (the end opposite the stem). Initially small, the water-soaked spot enlarges and darkens rapidly as the fruit develops. The spot may enlarge until it covers as much as 1/3 to 1/2 of the entire fruit surface. As the spots grow, the tissue becomes shrunken and soon dries out, becoming flattened or concave. The infected area becomes black and leathery (See photo). The fruit does not soft rot unless the spots are invaded by a secondary fungi or bacteria, but that frequently happens. These secondary organisms are sometimes mistaken as the root cause of the problem. But as the name of the disease implies, symptoms appear only on the blossom end of the fruit and no other parts of the plant.

While the occurrence of blossom end rot may indicate a calcium deficiency, in reality, the soil may have adequate calcium; however, for various reasons, the plant may not be able to absorb enough calcium to supply the rapidly-developing fruit. **The cause of the problem may be one or a combination of the following factors:**

1. Low soil pH
2. Low calcium levels in the soil
3. Extreme fluctuations in moisture
4. Damaged roots
5. Excess nitrogen fertilizers

Prior to planting, the main preventative measure is to have a soil test done to determine if adequate calcium is present in the soil. Also, it is recommended that a pH level of approximately 6.5 be maintained. The lower or more acid the pH, the less available the existing calcium is to the plant. If the results of your soil test indicate a low pH and low calcium levels and lime is recommended, it should be worked into the soil 2-3 months before planting to allow time for it to become effective.

Maintain a uniform supply of soil moisture by watering plants during periods of drought. The general rule of thumb is that tomato plants require about 1 inch of water per week. Mulching will often help to maintain even levels of moisture. Also, weeds will compete with the plants for moisture and should be removed.

Avoid cultivating closer that 1 foot to the plant to avoid damaging roots.

Do not over-fertilize, especially with high-nitrogen fertilizer, as it can cause problems with the uptake of

calcium. Use nitrate forms of nitrogen or consider using an organic fertilizer. Also, avoid over-fertilization during fruiting.

Be sure to read about three diseases that could become problems in our area: Southern Blight, Bacterial Wilt, and Tomato Spotted Wilt Virus, all of which are discussed by Dr. Steve Rideout of Virginia Tech in **Tomato Disease Update – 2022**. As Dr. Rideout explains:

> *Tomato Spotted Wilt Virus (TSWV) is a viral pathogen* ***vectored by thrips****. Within this list, no tomato disease can present such an array of symptoms. Plants can be stunted, leaves crinkled, fruit can be misshapen or have brown lesions. In severe cases, plants can die. TSWV is worse in years where the previous winter was milder and most importantly, when drier conditions favor thrips.*

In summary: the diseases we chatted about in this article may seem a bit daunting to the new tomato-grower; however, there are many proactive things that the gardener can do to prevent the diseases. Best of all, **the preventive measures work on all the diseases discussed!** Don't be discouraged!

The first proactive step that a gardener can do is to provide the conditions the tomato plants need to be happy. Healthy and happy tomato plants are able to fend off diseases far better than stressed or weak plants. So fear not. Just be sure to follow the disease-preventive measures:

- Select a site with full sun (at least 8 hours of sun).
- Provide good soil, amended with organic mater, nutrients, and a proper pH — around 6.5.
- Select disease-free plants and varieties that are disease-resistant.
- Practice crop rotation and good sanitation in order to limit the spread of the disease.
- Provide constant levels of water, though drip irrigation and by mulching.

But if a problem develops, diagnose it. If you are not sure what disease you're dealing with, take a sample of your diseased plant (in a bag) to your local Extension Office. They will not only help with diagnosing the problem, but also offer recommendations and possible solutions. There are several diagnostic tools online that also may be of help. Texas A&M has a very user-friendly tool that may be of help. The link to that web site is: http://aggie-horticulture.tamu.edu/vegetable/problem-solvers/tomato-problem-solver/

For fungicide solutions, refer to the 2023 Pest Management Guide/Va Tech/456-018/ENTO-523, Tables 2.3 and 2.4 (pages 2-28 and 2-31). If you elect to treat with fungicide, be sure that it will control the disease your plants have, that it's not too late to be effective (some fungicides work only as preventatives), and that it is safe to use on tomatoes. Use the rate indicated on the label and follow the application instructions. Remember that the label is the law. The diseases and fungicide treatments listed in the VCE Pest Management Guide are set forth below:

Table 2.4 - Disease Management Tools for Specific Crops and Diseases (cont.)

Crop Disease	Treatment (PHI)*	Rate/Gal. (Unless otherwise Stated)	Remarks
Tomato Early blight, late blight, *Septoria* leaf spot, gray mold, Anthracnose and *Rhizoctonia* fruit rot	chlorothalonil 12.5% chlorothalonil 30% mancozeb (5) copper	3.0-4.0 tbsp 1.0 tbsp 3.0 tbsp 2.0 tbsp	Repeat at 7- to 10-day intervals throughout the season. Under severe conditions shorten spray intervals.
Bacterial spot and speck	copper	2.0 tbsp	Apply after observing disease and reapply every 7 days.
Fusarium wilt and *Verticillium* wilt			Use resistant varieties. Maintain soil pH from 6.5-7.0. Rotate out of area.
Southern Blight	PCNB	1.0 tbsp	Apply at transplanting. Apply 0.5 pt/plant

VCE Pest Management Guide 2023, Table 2.4, page 2-31. For a list of fungicides, consult Table 2.3

Happy gardening and thanks for joining us in *The Garden Shed*. We hope to see you again next month.

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Professor and Extension Specialist of Plant Pathology Virginia Tech – School of Plant and Environmental Sciences)

"Tomato Diseases and Disorders in the Home Garden," Penn State Extension

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"Late Blight of Tomato and Potato", Va Coop.Ext/ANR-6/ANR-6

Video: Late Blight on Tomato/VCE Master Gardeners

"Verticillium Wilt of Tomato and Eggplant," NC State/ncsu.edu

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"Tobacco Mosaic Virus of Tomato and Pepper", Missouri Botanical Garden/Pests & Problems

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Clemson Cooperative Extension, Publication HGIC 2217, “Tomato Diseases and Disorders”, http://www.clemson.edu/extension/hgic/pests/plant_pests/veg_fruit/hgic2217.html

Texas A&M Extension, Texas Plant Disease Hand Book, “Tomatoes”, http://plantdiseasehandbook.tamu.edu/food-crops/vegetable-crops/tomato/