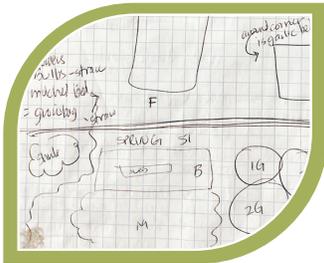


WELCOME TO

Community Gardening!



Creating Community
Gardens and Growing
Your Own Food in
Fairfax County



This community gardening guide is dedicated to anyone who loves fresh food and a healthy environment, who wants to help create a more stable local food system, and who wants to make it easier for all people to put nutritious fruits and vegetables on their tables.

Welcome to Community Gardening! is a product of *Nourish the Land, Cultivate Community*, a community garden project coordinated by the Northern Virginia Soil and Water Conservation District (NVSWCD). It was made possible by an Urban Agriculture Conservation Grant from the National Association of Conservation Districts (NACD) and the USDA Natural Resources Conservation Service (NRCS).

This guide is the property of the Northern Virginia Soil and Water Conservation District. It may be freely reproduced for non-commercial uses with credit to NVSWCD.

Cover art by Janelle Welch.



Table of Contents

Welcome to Community Gardening...3

Section 1:

Pre-planting

Getting started: Forming a team	7
Checklist for a community garden site...	8
County regulations.....	8
Agreeing on the rules.....	10
Basic equipment to get started.....	12
Picking the garden location.....	14
Preparing the soil.....	18
Composting.....	20
Growing for donation.....	24

Section 2:

Planning and designing your garden

When and how to plant what.....	27
How to read a seed packet	30
Easy crops to start with.....	30
Direct sow v. seed-starting.....	32
Making the most of your space.....	35
Flowers in the garden.....	39
Planning your garden.....	40

Section 3:

Taking care of your garden: Routine maintenance

Conservation best practices.....	45
Promoting healthy soil.....	45
Irrigation and watering.....	52
Weeding.....	56
Feeding your plants.....	61
Pest management.....	67
Diseases.....	76
Plant supports and protection.....	80

Section 4:

Fall in the garden

Deciding whether to fall garden.....	85
Bulb onions and garlic.....	86
Tips for fall gardening.....	87
Extending the season.....	88
Seed-saving.....	89
Putting the garden to bed.....	91

Looking ahead: Year 2 and beyond...93

Garden Journal..... 95

Glossary..... 102

Book and online resources..... 103

Recommended local resources..... 107

Tables

Garden plot types.....	16
Composting greens, browns and no-nos..	21
Composting systems.....	22
Lifecycles of common garden plants.....	28
Cool/warm season crops.....	29
Common crops information.....	31
Plant families.....	44
Mulches.....	47
Cover crops.....	49
Common weeds.....	58
Organic fertilizers.....	66
Garden pests.....	68
Beneficial insects.....	71
Common diseases.....	77
When to harvest.....	83
Common fall crops.....	86
Easy crops for seed-saving.....	90



Welcome to community gardening!

Whether you're new to gardening or know the difference between determinate and indeterminate tomatoes, we've created this workbook to support you. If you're a property manager who wants to create a growing space for others, we also salute you and will support your work too.

We want you all to be successful. Our #1 goal is to create more local community gardens so that everyone can have access to fresh and culturally appropriate vegetables, fruits and herbs that fit their diet and their budget.

A community garden has no set size or location. It can be in a neighborhood, a schoolyard, the grounds of a house of worship -- anywhere that people want to come together to grow food. Some community gardeners grow for themselves, but others grow for their school cafeteria, for their congregation or clients, or to distribute to people who don't otherwise have access to nutritious, affordable produce.

Regardless of your goals, we're here to help.

Who are we?

This workbook is a product of *Nourish the Land, Cultivate Community*, a community garden project coordinated by the Northern Virginia Soil and Water Conservation District (NVSWCD) in Fairfax County, Virginia. Under the program, NVSWCD and partners are

creating and expanding community gardens in the county and providing technical support, modest funding, education, and ongoing mentorship.

This project would not be possible without the National Association of Conservation Districts (NACD) and USDA Natural Resources Conservation Service (NRCS), which provided sole program funding under its Urban Agriculture Conservation Grant Initiative.

We're grateful to NACD and NRCS for supporting our efforts to provide more community gardening opportunities, to work toward a more stable local food system, to make it easier for all county residents to put fresh food on their tables, and to do all of this in the context of sound conservation practices.

NVSWCD also wants to thank our partners, without whom we could not carry out this project: the Arcadia Center for Sustainable Food and Agriculture, the Fairfax County Board of Supervisors, Fairfax County Master Gardeners, the Fairfax Food Council Urban Agriculture Work Group, Fairfax County Neighborhood and Community Services, Food for Others, Hands On Harvests and Virginia Cooperative Extension.

The purpose of this workbook

This guide aims to be a reader-friendly manual and interactive workbook that will empower gardeners and communities to establish and maintain their own community gardens. It's intended to speak to new gardeners looking for clear, simple guidance. It's also meant for experienced gardeners, who can dip into it as a useful reference guide at various stages of the growing season.

Three aspects make this workbook unique:

- 1) Overview of what to consider when starting a community garden before you even touch the soil.
- 2) County-specific information about regulations, plant life, soil, and resources.
- 3) Dedicated pages for gardeners to sketch their designs and record information that will be helpful both for the current growing season and the future. Some of these pages are in the main sections; others are in a Garden Journal near the end of the workbook.

We want you to successfully grow your own food. To that end, this workbook will:

- Teach community leaders and interested gardeners how to develop/start community garden programs,

- Address relevant county regulatory and environmental issues,
- Highlight key physical features for locating successful garden sites,
- Promote good garden management practices,
- Direct gardening communities to available technical experts and resources that can offer customized solutions to site-specific challenges,
- Provide guidance for tried-and-true produce distribution practices, and
- Educate how to maintain garden sites during outside the growing season.

Benefits of community gardening

Community gardens have been part of US history since the Panic of 1893, a four-year, nationwide depression. Facing massive unemployment, the city of Detroit created plots in vacant lots for out-of-work residents to grow their own food. Called “Pingree’s Potato Patches” for Mayor Hazen Pingree, the program gave the laborers growing space, seeds, tools and instructions in three languages (English, Polish and German).

Since then, community gardens have come and gone, always rising in popularity during hard times. Probably the best-known community gardens in the US are the Victory Gardens. During World War I and II, Americans converted all types of land -- even baseball fields! -- into spaces to grow food. Most recently, we saw a community gardening revival during the 2020 COVID-19 pandemic, when Americans experienced firsthand the fragility of the food supply chains and realized the importance of local food systems.

Community gardening is good for you in so many ways. For the price of a pack of seeds, you can grow fresh produce that you like to eat, know how to cook and that gives you comfort. You can reduce your food budget and increase the amount of fresh food you put on your table.

Other benefits of community gardening:

Physical and Mental Health. Vegetable gardeners tend to eat more fresh food and a bigger variety of it, improving their overall health. As a bonus, these health benefits extend to household members who don’t garden but eat the same meals. Gardeners increase their physical activity by working in the garden. Being in the sun boosts Vitamin D, while smelling the fresh air and fragrant plants, touching the soil, and observing nature makes people feel more connected to each other and to other living things.

Life skills. Working with your neighbors to create and abide by the rules and responsibilities of a community garden develops organization, planning and communication skills. It also requires collaborative problem-solving, compassion, listening skills -- and sometimes patience. In other words: teamwork.

Environmental protection. By growing food near you, you're cutting the distance that food travels -- and that you travel to get it. If you use sustainable gardening practices, as taught in this workbook, you'll also be creating healthy soil, preventing erosion, conserving water, supporting important insects that help our gardens, and establishing crop varieties that have adapted to the local climate.

Community. Community gardens lead to stronger and safer communities. Gardeners who might not otherwise interact get to know and learn from one another. They rely on each other, help each other solve problems, and swap seeds and seedlings. They share their stories and develop greater understanding of each other's cultures and backgrounds. During planting days, harvest parties and other special events, the gardeners celebrate their shared accomplishments. Through these strengthened ties, good will radiates beyond the garden and into the community.



Section 1. Before you break ground: Pre-planting

Getting started: Forming a team

The most critical part of your community garden isn't your garden. It's your community. Your starting point isn't on the land, but around a table or in an array of Zoom boxes with everyone who wants to be involved from the get-go. This is your Garden Team.

Ideally, who should be on the team?

- Devoted gardeners. At least one person should be experienced. If no one in your community has experience, contact your local Extension office to see if a Master Gardener can advise your garden planning team. Your community may also have a Garden Club with members who are expert food growers. (See “Recommended local resources” at the end of the workbook.)
- Organizers and planners. There's a lot to keep track of, like gardener contact information, garden materials to be ordered, and planning details for work days and special events.
- Individuals with knowledge of what to look for when setting up a garden, like underground pipes, land slope and soil health. This may be someone from your local government or Soil and Water Conservation District. This person could also act as an advisor instead of being on your team.
- People with connections to organizations and businesses that can support your garden. This might be someone who's constantly looking for goodies on Facebook's BuyNothing, someone whose profession requires them to interact with a lot of people, or someone with a community leadership position.
- If you're growing food to donate, someone who can recruit volunteers to help pack and deliver the harvest.
- A note-taker. Seriously! You'll want to remember what decisions the team made, so a good record-keeper is valuable.
- Translators. If people involved in the garden don't speak the same language, make sure there's at least one person who can write and speak in two languages.
- The property manager or owner of your site. If they don't have the time or interest to be part of the team, make sure it's someone's job to keep them informed about garden

plans, needs and successes.

- Someone good at building, especially fences and trellises.

You may need to persuade some additional people to join your effort so you can build a solid foundation. Tell your neighbors, friends, and local businesses and organizations about your plans and keep a list of those who express interest in being involved or at least in helping.

Don't be discouraged if your team doesn't look like this. It's most important to start with people who have time and passion. Bring in others with expertise as you need them.

Recipe for a promising community garden location

Use this checklist to identify a promising site for a community garden:

- Flat land. Steep slopes and hillsides are difficult to walk and garden on. A garden at the bottom of a slope could flood after rain.
- Lots of sun. Summer veggies want at least 7 hours of direct sun a day. Root and leafy vegetables like carrots and lettuce can get by with 5-6 hours of direct sun.
- Access to water. Preferably the tap isn't any farther than the end of your hose. Lugging watering cans is more exhausting than you think, especially at the height of summer's heat.
- Dry land. If water pools on the prospective site or if it's a marsh or wetland, don't garden there.
- Good soil. This isn't a deal-breaker but if the soil can't be worked, you'll need raised beds, raised bed soil, and compost. Also, if the site's former use may have been environmentally hazardous – such as a gas station or industrial facility – the soil may be contaminated. Before doing anything else, contact NVSWCD or Virginia Cooperative Extension (VCE) about how to get it tested.
- Accessibility for gardeners. Is the site you're looking at easy for gardeners to get to? If it's not in walking distance, is there adequate parking and a smooth path for hauling in supplies, like bags of mulch?
- Permitted by Fairfax County. The county defines a community garden like this:
Any land or rooftop area used for the cultivation of herbs, fruits, flowers, vegetables, or ornamental plants by more than one person, household, or a

nonprofit organization for personal or group use, consumption, or donation.

As of this writing (late 2022), Fairfax County allows community gardens **without restrictions** both on the ground and on rooftops provided that they are

- Producing food to be shared by the group or donated, but not sold.
- Less than two acres. Your community gardens may be more than two acres if you apply, pay for and receive a special permit from the county Board of Zoning Appeals. The BZA process also requires a public hearing. See the list of local resources at the end of the workbook for information about how to contact the Board.
- Not in environmentally sensitive areas such as a wetland, floodplain, steep slope or within a designated Resource Protection Area (RPA). RPAs include local bodies of water (such as streams) and the environmentally sensitive lands within 100 feet of these waters. One of the main goals of Resource Protection Areas is to protect water quality by decreasing the amount of pollutants that reach local waterways and drain to the Chesapeake Bay. The limits of Fairfax County's RPAs can be found as shaded areas in the county's "Watersheds and RPAs" online map. If you need help determining whether you're in a protected area, contact NVSWCD at Conservationdistrict@fairfaxcounty.gov.
- Not on the property of a single-family home.
- Not the primary use of the property. For example, the main use of a townhouse community's property is residential, so community gardens can be created on the community land. The only time your garden may be the principal, or main, use on the property is if the land measures **less than** two acres **and** you apply and receive a two-year, renewable administrative permit from the county Zoning Administration Division (For information about how to contact the Division, see the list of local resources at the end of the workbook).
- More than 15 feet from the front lot line and more than 25 feet from a side or rear lot line.

Even if your garden meets all the requirements listed above, you still may need a zoning permit and a Soil and Water Quality Conservation Plan, depending on the location and size of your garden. Additionally, gardens greater than 10,000 square feet may have to provide extra erosion and sediment protections as well. **The best thing to do when embarking on a new**

garden is to check in with the county Zoning Administration Division at 703-324-1314 or by email at ORDadmin@fairfaxcounty.gov. **This also will give you an opportunity to see if there have been more recent updates to the county's regulations.**

Fairfax County provides a Nonprofits and Places of Worship Coordinator to help guide organizations through zoning and permitting requirements. If you're with a non-profit organization or faith institution, contact this office any time in your garden planning and development process (see the list of local resources at the end of the workbook).

Once you've received the okay from the county, you still may have a few hoops to jump through to get all the approvals you need. Be sure to obtain permission from the landowner. If you're at a school, you'll need permission both from the principal and the part of the school system's facilities department that maintains school grounds. In a residential area, you'll need to check with the Homeowner's or Community Association, if there is one, to confirm that the bylaws allow a garden.

Agreeing on the rules

Good communication is key to a successful community garden. That starts with Garden Team discussions about why the garden exists and how it will be managed. At the beginning, the team should discuss and agree on these issues:

- What are you hoping to achieve by creating this garden? Do you have goals other than growing food? For instance, do you want to build a tighter-knit community? Make your neighborhood safer? Get kids outside?
- Who is the food being grown for? Will gardeners be growing for themselves or their family? Will any of the produce be grown for donation?
- Does everyone have their own plot or is the team working together to maintain the garden and share the harvest?
- Will gardeners pay for a plot to cover group expenses like water? If so, who do they pay it to? Will there be a sliding scale?

Once you've agreed on the big issues, it's time to get into the details. Use the following checklist of questions to guide your discussion:

Garden access. What are the hours of the garden, if any? (Fairfax County allows

community gardens to operate from 7 a.m. to dusk.) Are guests and children allowed? Will there be a lock on the garden fence or shed?

Garden maintenance. Will each gardener take care of their own weeding and watering, or will gardeners sign up for days to be in charge of these tasks for the whole garden? What's the notification process and back-up maintenance plan for a gardener who's temporarily unable to care for a plot? Under what circumstances, if any, can a gardener lose their plot?

Tools. Will everyone have their own set of tools or will community tools be available to everyone? Who will be responsible for making sure the tools are cleaned and sharpened?

Height restrictions. Do you want to set height limits on the plants to be grown to avoid one garden casting shade on an adjacent plot? Do you want to establish an area of the garden for community growing of tall plants like corn?

Using products. Will fertilizers, pesticides and herbicides be allowed? If so, will there be any restrictions on what types? Some approaches include using only products that are listed by the Organic Materials Review Institute (OMRI) and/or practicing Integrated Pest Management (IPM), which will be covered in a later section.

Communications. Who should be notified about vandalism and neglected garden plots and what's the process for notifying them? Who should gardeners contact if they have a question about garden operations or a problem in the garden? Conversely, how will gardeners be notified about things like workshops, events, water shut-offs, and changes to health and safety policies?

Who's in charge?

As you read this list, you may be realizing that your team will need volunteers to take on specific, necessary tasks. The most essential job is a garden coordinator (or two!) who's responsible for overseeing the garden management. Tasks generally include communicating with the gardeners, resolving complaints, answering questions, enforcing rules and policies, managing vandalism, handling maintenance issues with the property manager, and coordinating events.

To lighten the coordinator's load and to allow more people to be involved in the garden's care, identify volunteer opportunities that could easily be filled. Options include a workday coordinator, a special events planner, a newsletter writer, a social committee, a garden mentor and, if you're growing to donate the produce, a distribution coordinator.

Basic equipment for starting your garden



Cultivator. Also called a hand fork, this device is good for chopping up clumps of soil and smoothing out soil.

Fencing. You may not have seen the deer, squirrels and rabbits yet, but they're around and eager for you to start this garden. The cost of fencing varies wildly, from chicken wire off Freecycle to expensive chain-link fencing. Some community gardens ask gardeners to figure out the fencing for their individual plots, while others fence the entire garden. Regardless of what you choose, make sure that the spacing is too small for a rabbit to squeeze through (which is smaller than you think) and that you provide a gate or other easy access to the garden. You can fashion your own gate from chicken wire and stakes, cattle panel, or even a pallet. It should be at least 3 feet wide so that a wheelbarrow can roll through it. As for deer: They can jump over a 6-foot fence.

Garden gloves. Gloves that use a waterproof material on the palm will best protect your hands. Some are made entirely of waterproof material, like nitrile, but will make your hands sweaty in the heat. Leather gloves hold up the best, but can also make your hands hot; cotton gloves are cooler but don't always hold up well.

Hose and nozzle. Invest in a no-kink hose that will easily stretch from the tap to every corner of your garden. A hose nozzle isn't required, but makes watering easier. Look for nozzles with different settings, like mist and spray, so you can choose how strong the flow of water will be.



Pruners. These clippers will keep your plants trim during growing season, but are also useful when it's time to clean up the garden. Instead of pulling dead plants out of the garden, it's better for the soil to cut the stems at the soil level and leave the roots to rot underground.

Shovel. Shovels come in different shapes and sizes. When looking at shovels, consider your gardeners and choose one that isn't long or heavy. A good starter shovel is one called a round point shovel. It has a pointed tip that can easily break into the ground and nose its way into a pile of topsoil or mulch. One with a D-shaped handle will be easy to grip, making it easier to maneuver the tool. Keep the blade sharp and don't drag the tip along the ground.



Steel rake. Unlike a leaf rake, this rake is good for moving harder materials. It's especially useful when trying to even out the soil after filling a raised bed, adding compost or other materials, or leveling your in-ground garden. The long handle extends your reach and the steel head won't bend.

Trowel. Probably the most important piece of equipment, the trowel is your best digging tool in the garden -- both when putting something in the ground and when removing it. The side edge is also useful for drawing shallow trenches in the soil to plant seeds in.



Watering can. Having several watering cans allows multiple gardeners to water at one time. Watering cans may have an open spout, which pours a strong stream of water, or a rose head with small holes that sprinkle water. On some watering cans, the head is detachable or can be turned between a sprinkler and a spout.

Wheelbarrow or yard cart. You only need wheelbarrows for specific tasks -- hauling mulch or compost, carting out debris -- so if you can't afford everything on the list, try to borrow these until you have more funding or someone donates one.

Where does your garden grow?

Before you start digging, take some time to look at your yard or the property where you plan to build a garden. To help figure out the best place for a vegetable garden, use the graph paper on the next page to draw an outline of your site and the following features:

- Mark North, South, East (sunrise) and West (sunset). Because the sun travels across the southern sky, you want your garden to face south. If you have to choose between morning and afternoon sun, choose the less harsh morning sun. Many crops, like tomatoes and basil, prefer a late-afternoon break from the scorching sun.
- Mark where the water taps or pumps are. The garden should be as close to water as possible.
- Draw any streams, slopes, or exposed tree roots. Stay away from those. If you have a stream on your property, contact the Northern Virginia Soil and Water Conservation District to see if part of your property is a protected area. NVSWCD can help you properly situate your garden to protect the stream.
- Draw any sidewalks, roads or parking lots that could lead people to your garden. Where are people most likely to enter the site?
- When it rains, walk the site. On your map, sketch how the water flows and where it pools. Keep your garden out of the way of the water.
- Think about structures besides garden beds that you might want in the community garden. Fairfax County allows structures but limits the combined square footage of all structures to 250 square feet. Building permits aren't required for sheds or greenhouses, but you may need one for a retaining wall. To learn more about county regulations, visit Fairfax County's online Community Gardening page (<https://www.fairfaxcounty.gov/topics/community-gardening>) or call the county Permit Application Center at 703-222-0801, TTY 711, with questions.
- Structures you might want in your community garden: a tool shed, greenhouse, compost bin or pile, a picnic or potting table, and benches. Keep these out of the prime gardening area – the sunny, flat parts of the site that are near water and away from sensitive areas. Also, composting areas may not be located in the front of the property and must be screened from adjoining residential properties.

Location: _____ **Date:** _____

A large grid of graph paper, consisting of 20 columns and 30 rows of small squares, intended for taking notes or drawing.

Notes:

Laying out the garden plots

You have several options for how to set up the garden plots. First, though, decide whether gardeners will grow for themselves or if they'll grow in a single communal space in which everyone shares in the work and harvests.

Garden plot type	Pros	Cons	Notes
Planting directly in the ground	Inexpensive.	Must be diligent about keeping out grass and weeds. Not a good choice if soil is compacted.	If you plan for growers to have individual plots, you may want fencing to clearly separate the growing spaces.
In a raised bed 	Great choice for an area with compacted or unhealthy soil. Gardeners can each be assigned their own bed.	Can be expensive, depending on what you buy and whether you build it yourself. Can be difficult to access all the crops. They shouldn't be more than 4 feet wide – and no more than 3 feet if they're against a fence or wall.	You can buy or repurpose wood to build beds. Make sure the wood hasn't been treated with harmful chemicals. The longest lasting wood is cedar, and you can extend its life by giving it a coat of exterior paint or stain. You can buy bottomless metal beds made for gardening. Beware that other metal containers, like farm troughs, can get too hot in the summer.
In a container or growbag 	Less expensive than wood or metal beds. Usually portable. Can add fun and creativity to your garden. You can grow in reusable tote bags, laundry baskets, toddler swimming pools, sleds – almost anything that doesn't contain harmful chemicals and that you can create drainage holes in.	Dries out quickly, so needs frequent watering. To avoid flooding your plants, drill small holes or cut quarter-sized slits in the bottom of your container to allow water to drain.	Look for baby varieties of your favorite vegetables. Pick bush beans/tomatoes over pole varieties, which need support from a pole or trellis. Good for growing potatoes (to harvest, you can dump the soil onto a tarp) and pollinator-attracting flowers (you can move the containers where you want the pollinators doing their job).

Fencing: Consider fencing either the entire garden or the individual plots, and not just to protect your harvests from theft. Even if you've never seen deer on the property, chances are good in Fairfax County that you will see them once the garden starts producing. Rabbits, chipmunks and squirrels also will be regular visitors. Six-foot fencing is ideal, but expensive. Aim for at least 4 feet tall and with very small openings in the material. You can find many DIY fencing options online, but your first stop should be with any regulatory group – an HOA, for instance – to make sure you're following the rules.

Paths: Plan for paths at least 3 feet wide between all beds. This allows room for gardeners to pass each other and to move wheelbarrows and is compliant with the American Disabilities Act (ADA). The paths can be covered with turf, mulch or pea gravel. If you cover your paths with turf, the 3-foot wide passages will also be wide enough for a lawn mower.

Establishing a strong foundation: Soil

Healthy soil is essential to a successful garden. Shards of rocks, living and dead plants and animals (also known as “organic material”), air, and water make up soil. These components provide the necessary vitamins and minerals that will feed your plants.

In addition to feeding your plants, soil:

- Gives plants a supportive foundation to grow in.
- Provides water and oxygen to plants.

How do you know if your soil is healthy?

- The texture is crumbly but moist.
- It's rich in organic matter. Some good signs of this are dark color, plant roots (especially if the root system is spread out), and active underground life, like earthworms and sowbugs.
- It registers a pH between 5.5 and 7.5, with the most ideal range being 5.8-6.5. pH is a measure of acidity or alkalinity. A few crops, like blueberries, prefer acidic soil. (An ideal pH for blueberries is around 4.5.) To reliably figure out your soil's pH, you can buy a home pH test kit or meter or conduct a soil test that you send to Virginia Tech's Soil Testing Lab. More on soil testing on the next page.

Often community gardens are started on land that has been heavily walked on or was part of a recent construction project, so the soil is hard. Just getting the nose of shovel into it is tough because it's so compacted. Air and water can't flow freely. Rototilling used to be recommended for compaction, but soil scientists have learned that this technique disrupts the underground living environment and, therefore, diminishes soil health. If your soil is compacted, start with a mix of topsoil and compost in a raised bed. The plant roots will penetrate the soil, breaking particles up to allow air and water flow, and eventually the raised bed can be removed.

Even if you don't have compacted soil, you might find that your soil is clumpy, sticky and hard to work with. Welcome to Virginia clay! It's great for making bricks, but can be a gardening challenge. To improve clay soil, mix 2-3 inches of organic material like **compost** (more on compost a little further down) and broken-up dried leaves into the top several inches of your plot.

If you're using raised beds or containers, compaction and clay shouldn't be an issue. Tips for healthy soil in a raised bed or container:

- Buy soil for vegetable gardening, not for landscaping. There are soil mixes for raised beds and containers.
- If you're new to gardening, contact the Master Gardeners or go to one of the nurseries (not a big box hardware store) and ask for advice on what to buy.
- Purchase the soil in bulk, using an online calculator to estimate how many cubic yards you'll need. This will save you money and eliminate plastic bags.
- If you don't have a pick-up truck, try to find someone in your community who will let you use theirs so you don't have to pay the steep delivery fee.

Take steps to maintain healthy soil

- Keep it covered. Don't expose bare soil to the scorching sun or risk erosion in heavy rains. Mulching – the practice of using materials to protect soil around plantings – can be done with organic materials like grass clippings, sawdust and straw or inorganically with newspaper or plastic. Mulching will be covered more thoroughly in Section 3.
- Grow cover crops in parts of the garden where you aren't growing food or flowers. Cover crops are as advertised – crops you grow to cover the soil. They hold the soil in place, absorb moisture and provide nutrients. More information will be provided on cover crops in Section 3.
- Test the soil. If this isn't the first year of your garden, check the soil by taking a sample and sending it to Virginia Tech's Soil Testing Lab. Kits for the \$10 test can be picked up from Virginia Cooperative Extension, Master Gardeners – who host monthly plant clinics at the county's farmer's markets and community gardens – and nonprofit Hands On Harvests. Although you can take a soil sample any time of year, Virginia Tech says that fall is “ideal.”



Follow the directions on the kit, check the box on the form indicating that you want a vegetable garden analysis, then send it to Virginia Tech. Within two weeks, you'll receive an email with recommendations of what nutrients may be missing and what amendments to use to boost the soil's health.

Section 3 discusses soil nutrients and how to interpret the soil test results.

Composting: Nature's recycling

Composting is collecting organic material like leaves and grass clippings so that it can break down until it looks and feels like soil. This decayed material contains the nutrients that were in the organic material, making it a valuable food source for your garden crops.

Making compost is a money-saving, resourceful way to both dispose of garden waste and turn it into fertilizer. When you compost on-site, you don't have to lug in plastic bags of compost or pay expensive delivery fees to have it dropped off in bulk. Many people compost their kitchen scraps, but you don't have to. You can just use what's in your garden.

Composting is math. Greens + Browns (+ Air + Water) = Nutrient-rich compost.

Greens: These are fresh plant parts like green leaves, pruned stems, clipped grass and fruits and veggies that for whatever reason you can't eat (as long as they aren't diseased or sprayed with chemicals). As greens decompose, they release nitrogen, the key nutrient that plants need to grow.

Browns: These are dead and dried plant parts like dried stalks and crispy autumn leaves. This dry material adds carbon, which provides energy to the microbes doing the actual work of decomposition. You can also find browns inside your house, like shredded office paper and coffee filters.

See the table on the next page for more ideas for greens and browns. To successfully compost, the greens and browns need to be balanced. Too many greens make the pile stinky, but too many browns mean a dry pile with no decomposition happening.

The solution for each problem is to add more of what there isn't enough of. Scientists say that a balanced compost pile has 30 times more browns than greens, but don't worry about trying to measure it. Just add more browns than green and your nose will tell you if you don't have enough browns.

To keep the pile from drying out, occasionally water it or remove the lid before a rain to allow the water in. Also, stir the pile a couple times a week with a pitchfork or shovel so air can flow freely.

GREENS	<p>Just-trimmed flowers, leaves and stems</p> <p>Fresh grass clippings</p> <p>Fruits, veggies and herbs (non-diseased, non-chemically treated)</p> <p>Coffee grounds</p> <p>Tea leaves</p> <p>Eggshells (rinsed)</p>
BROWNS	<p>Sticks</p> <p>Dried leaves, vines and seed pods</p> <p>Straw</p> <p>Pine needles</p> <p>Dryer lint</p> <p>Shredded paper or newspaper</p> <p>Egg cartons (not plastic or Styrofoam)</p> <p>Coffee filters and tea bags (even the string and tag! Just not the staple)</p> <p>Pencil shavings</p>
NO-NOs	<p>Weeds that have gone to seed or invasive plants</p> <p>Wood ashes or bbq charcoal</p> <p>Waste from plants that are sick or were treated with chemicals</p> <p>Feces</p> <p>Animal byproducts: No bones, dairy, or meat</p> <p>Plastics, metal or glass (even if they say biodegradable)</p> <p>Most compostable carry-out containers. They're made to compost in an industrial composting facility, but not in a home compost pile.</p>

Composting systems

	Type	Pros and cons
 <p><i>Image by Snowmanradio (license at https://creativecommons.org/licenses/by-sa/3.0/deed.en)</i></p>	<p>Plastic single bin</p>	<p>Sits on the ground and is easy for decomposers like worms and sowbugs to get to.</p> <p>Fairly easy get to finished compost through a door on the bottom.</p> <p>\$50-\$150</p> <p>Better to have two or three to hold compost in various stages of decay.</p>
	<p>Two- or three-bin system. As compost goes through stages of decay, it's moved from one bin to the next so that the last bin is finished compost ready for the garden.</p>	<p>Sits on the ground and is easy for decomposers like worms and sowbugs to get to.</p> <p>Can be purchased or built with chicken wire, lumber or pallets. Many design instructions are online and in gardening books.</p> <p>Easy to water or let rain fall on.</p> <p>Make sure there's a gate or other access to easily move compost from one bin to the next.</p>
 	<p>Tumbler</p>	<p>Sits above-ground, so difficult for decomposers to access.</p> <p>Needs more attention than on-ground composters because you have to turn it regularly to add oxygen and promote decomposition. However, if you frequently rotate the batch and keep it moist, you can get finished compost in a few weeks.</p> <p>Good option if you don't have a pitchfork or if there's a concern about wildlife getting into the pile.</p> <p>Cost can be expensive, but you can learn how to make one in a NVSWCD workshop (see list of local resources at the end of the workbook).</p>

Some questions to help you choose:

- Do you want a lid?
- Do you care if the debris is visible?
- Do you want to contain the materials that are composting or are you fine with them spilling in a small pile?

A word on wildlife: Many people say they don't want an open or on-the-ground bin because they worry about attracting rats or other wildlife. Animals are drawn to the odor of the pile (and are better at detecting smells than we are). When you add greens, heap several inches of browns on top of them to muffle the scent.

How to start a compost bin

Designate a specific place in your yard or garden as the composting area. Make sure there's room around it for air to circulate.

1. Once built, put sticks and dried leaves ("browns") at the bottom.
2. Add layers of greens and browns, making sure that you have more browns. In the fall, save several bags of leaves so that you can add them to your pile during the rest of the year.
3. Water the pile. It should always be moist, like a wrung-out sponge.
4. Every week or two, turn the pile with a pitchfork or, if you don't have one, a shovel. This not only mixes the materials, but moves oxygen to the decomposing microorganisms in the center of the pile. If you have a tumbler system, spin it for several minutes 3-4 times a week.

Growing for donation

Local food insecurity

Despite the wealth of many local residents, Fairfax County has the highest number of people in Virginia who regularly go hungry. The Capital Area Food Bank's Hunger Report 2022 estimated that 24% of county residents were dealing with "food insecurity," or not getting enough to eat.

Across America, food insecurity is a chronic problem for millions of people. The USDA estimates that 1 in 6 children may not have regular enough access to food to lead a healthy and active life. Not getting enough to eat, or even not getting enough nutritious food, can lead to long-term health issues like high blood pressure, Type 2 diabetes, heart disease, anxiety, trouble focusing in school, and physical development delays.

Lack of access to healthy food generally results from policies and systems that keep people in poverty. Because of the high cost of living in Fairfax County, a resident being paid Virginia's minimum wage will struggle to pay for basics like food and housing. In the US, more than half of the people who receive Supplemental Nutrition Assistance Program (SNAP) benefits have jobs.

If you want to help people by growing produce and giving it to them, you may already know the community you want to serve. But if you're unsure, there are a couple of ways you can find out where the need is:

1) Locate the county's "food deserts." These are areas where residents earn low incomes and have to travel more than a mile to get to a grocery store, supercenter or supermarket. You can find the food deserts in the county by searching the USDA's food desert map. However, the map isn't perfect; sometimes people live within a mile of a grocery store but the bus lines that would make it easier to get to the store don't go through their neighborhoods.

2) Ask school or county social workers or local food pantries about communities that need fresh vegetables and herbs. Local nonprofit Hands On Harvests keeps on its website a list of pantries that accept fresh produce.

Distributing produce

Garden teams that grow to donate have additional questions to answer:

- Will you donate some or all of the produce?
- Will you give it out yourself or take it to a food pantry to store and distribute?
- Where will you store produce that has to be harvested before it can be delivered or distributed?
- How frequently will you donate or distribute? This doesn't matter so much if you're delivering produce to a pantry that isn't depending just on your harvest. But if you're donating to a school, a community or to people who are picking up directly from you, they may be relying on you to provide a regular supply of fresh veggies and herbs.
- Can you recruit enough volunteers to help package the produce for donation and then to either give out or deliver to its next destination? Unless you already have a big team, consider who you could partner with to help with harvesting, packing, and delivering or distributing -- even if it's just for one time. Houses of worship, Girl and Boy Scout troops, local clubs, and public and private school students are often seeking service projects and volunteer opportunities.

The Arcadia Center for Sustainable Food and Agriculture and Hands On Harvests can advise you about recruiting and managing volunteers and establishing the steps for distribution. See the list of local resources at the end of the workbook for contact information.

Guidelines for packing produce to donate

- If you're not feeling well, stay home.
- Before harvesting and handling the produce, wash your hands with soap and warm water.
- Only harvest high-quality produce. Compost or trash the overripe, bruised, insect-bitten and/or molding pieces. If you wouldn't eat it, don't donate it.
- Don't rinse the produce. The water can remove a protective coating and accelerate spoilage. If there's mud or dirt, just gently wipe it off. The pantries rinse donated produce.
- Clip greens and leafy herbs as close to donation time as you can.
- Refrigerate the produce in baggies with dry paper towels, in paper bags or in cardboard boxes. The paper products will absorb moisture.

- Label produce that might be unfamiliar to the community you're growing for. Be sure to label it in a language they can understand. If you are donating a vegetable or herb that you think the community won't know, include a recipe or two.
- Weigh the produce on a food scale and keep a running record of how much you give away. You'll want these numbers to inspire your team and volunteers. Nothing motivates a team like trying to beat last year's total! The data also is useful for when you need to ask partners or potential partners for funding and in-kind donations like shelving or a refrigerator.



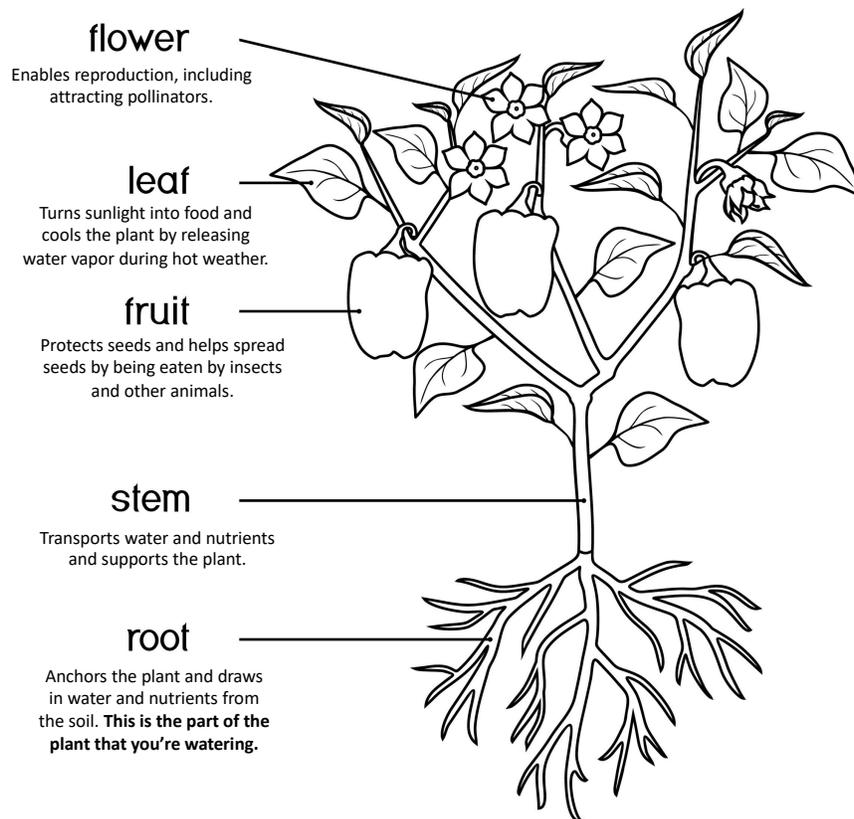
Section 2. Planning and designing your garden

When and how to plant what

Good planning will help you get the most out of your garden. Knowing how much space mature plants will need, which plants can grow vertically on stakes or trellises, and which plants grow well together will help you create a garden where plants have the room and nutrients to thrive.

This section will give you information for thinking ahead and maximizing your growing space. First, three basic facts about plants:

1. **Each part of a plant has a different job.** If you understand what each part does, you'll be better able to take care of your plants and get the most out of them.



2. **The life cycle of plants varies:**

- *Annuals* go from seed to compost pile in a year. They're re-planted every year.
- *Biennials* have a two-year life cycle, meaning they grow roots, stems and leaves in the first year, then flower and produce seeds in the second. The parts of biennial plants that we tend to eat are roots, stems and leaves. Most gardeners don't know that these plants are biennial because we harvest them in their first year, before they have a chance to flower. That means that even though they're biennials, we usually grow them like annuals and re-plant them every year.
- *Perennials* grow year-round or die back at the first frost, then re-emerge in spring. However, frost will kill eggplant, okra, peppers and tomatoes. If you want them year-round, you'll need to move the plants inside or to a heated greenhouse. Otherwise, plan to grow them like annuals.

Common vegetable garden plants and their lifecycles		
Annual	Biennial	Perennial
Beans (most varieties)	Beets	Asparagus
Corn	Brussels sprouts	Daisies
Cucumbers	Cabbage	Eggplant
Marigold (most types)	Carrots	Okra
Nasturtium	Celery	Peppers
Peas	Chard	Purple coneflowers
Squash	Collard	Strawberries
Watermelon	Kale	Tomatoes
Zinnias	Leeks and onions	
Zucchini	Parsley	
	Turnips	

3. Plants don't like the same temperatures. We don't grow oranges and mangoes in Fairfax County because the annual climate is too cold. To help gardeners know whether a plant will thrive in their location, the US Department of Agriculture (USDA) has divided the US into plant hardiness zones with 1a being the coldest and 13b being the warmest (and in only a small section of Puerto Rico).

You can find the zone of any location on the USDA Plant Hardiness Zone [Map](#), but – spoiler alert! – most of Fairfax County is in **Zone 7a**. The exception is the southeastern part of the county – areas like Belle Haven, Mount Vernon, Gum Springs and around Fort Belvoir – which are warmer because of the proximity to the Potomac. Those communities are in **Zone 7b**.

Even within those zones, plants are choosy. Just as they need different amounts of sunshine and water, they thrive in different temperatures. Cool season crops tolerate colder weather and soil, but bolt – or start producing flowers and seeds – once the warm weather moves in. Plan to plant them in early spring and expect them to be done producing mid-to-late July. Cool crop seeds will germinate when the soil and air are at least 45F but won't do much once the air temperature reaches 70F.

Important dates for Zone 7a/b gardeners:
 Last frost date: April 15
 First frost date: Nov. 15

Warm season crops, not surprisingly, require the heat and will perish at the first frost. Summer crops should be planted after the last frost date and with enough time to grow so that you can finish harvesting by the first frost date the following fall. Read the seed packet for the number of days to harvest to help you plan how much time the different summer crops will need. These crops thrive in daytime temperatures between 70F and 90F; night temperatures need to be above 50F. If you use a soil thermometer wait to plant until soil temperatures are at least 65F.

Cool season crops: hardy	Cool season crops: semi-hardy	Warm season crops
Can survive a heavy frost.	Can survive a light frost.	No frost, thanks.
Broccoli	Arugula	Basil
Brussels sprouts	Beets	Beans
Cabbage	Carrots	Corn
Cilantro	Cauliflower	Cucumbers
Collards	Celery	Eggplant
Kale	Lettuce	Okra
Leeks and onions	Potatoes	Peppers
Parsley	Swiss chard	Squash
Peas		Sweet potatoes
Radishes		Tomatoes
Spinach		Watermelon
Strawberries		Zucchini

How to read a seed packet

Take the time to read the seed packets. Both sides of the envelope provide important information: where and when to plant, how to space the seeds, how much time is needed to get to harvest, descriptions of what the plant looks like, and how to harvest, store and cook it.

The diagram illustrates the front and back of a seed packet for 'Long Standing Bloomsdale' spinach. The front of the packet (left) features the 'Southern Exposure Seed Exchange' logo, a 'USDA ORGANIC' seal, and the variety name 'SPINACH Long Standing Bloomsdale'. It includes a description: '45 days, Heirloom. Fully-crenked dark green leaves. Most heat-tolerant variety we offer. Dependable and full-flavored. Can withstand winter lows up to 0°F. 3g (240 seeds)'. It also states 'Packed for 2021. Sell by 12/21. #67102. Lot #BC288'. The back of the packet (right) contains detailed instructions: 'Soil Temp. 45-75°F', 'Sowing Depth 1/2"', 'Final Plant Spacing 4-6"', 'Final Row Spacing 8-12"', 'Light Full Sun', and 'Days to Emerge 7-12'. It also provides 'Culture' and 'Harvest' instructions, a 'Seed Savers' note, and contact information for Southern Exposure Seed Exchange.

Name of variety of spinach.

45 days means about how many days from planting to harvesting.

The description gives important information about what the variety needs to thrive.

Package and sell-by dates tell you how fresh the seeds are. Some seeds will sprout a few years after this date, especially if they were stored properly.

Soil temperature tells you whether this is a warm or cool season crop.

Planting information says how deep to put the seeds, and how far plants and rows should be.

Sun information tells you where to plant the seeds.

Days to emerge explains how soon you should expect to see sprouts.

Easy crops to start with

The best plants to grow are the ones you're going to use. If you're managing a community garden but aren't a grower, keep in mind that gardeners are more likely to enthusiastically tend to their plots if they're growing what they want to use, are able to eat, and know how to prepare. (We say "use" because some crops are grown to make teas, balms, bath salts, cleaning products, dyes or other non-food items.)

Like children, some crops are easier to raise than others. Some do better when you plant their seeds directly in the garden; this is called direct sowing. Other crops will be more successful if you buy young plants (seedlings) at a nursery or start by planting the seeds indoors or in a greenhouse. These transplants are kept inside until the weather is suitable for them to grow outdoors.

Similarly, certain varieties are more challenging because they sprawl across the ground or need to be supported with stakes or trellises. The table on the next page, which provides information about common crops, will help when you're planning your garden.

Common crops

Except for dill and parsley (biennials), these crops will be harvested after one growing season.

Crop type	Cool or warm	Easy or more challenging	Size or growth habit	Start by seed or transplant
Basil	Warm	Easy	Medium	Seed
Beans, bush	Warm	Easy	Medium	Seed
Beans, pole	Warm	Easy	Very tall, grow as a climbing vine on a trellis, tomato cage or sunflower/corn stalk	Seed
Beets	Cool	Easy	Small	Seed
Broccoli	Cool	Easy	Large	Transplant
Cabbage	Cool	Easy	Large	Either
Carrots	Cool	Easy	Small	Seed
Cauliflower	Cool	Challenging	Large	Transplant
Celery	Cool	Challenging	Medium	Transplant
Cilantro	Cool	Easy	Medium	Seed
Collards	Cool	Easy	Large	Seed
Cucumbers	Warm	Easy	Can spread; best to grow vertically	Seed
Dill	Cool	Easy	Small/Medium	Seed
Eggplant	Warm	Challenging	Small/Medium (depends on variety)	Transplant
Kale	Cool	Easy	Large	Either
Lettuce	Cool	Easy	Depends on variety	Either in spring/transplant in fall
Melons	Warm	Easy	Long vines spread everywhere; can be grown vertically	Either
Okra	Warm	Easy	Large, tall	Seed
Pak choi (aka bok choy)	Cool	Easy	Small/Medium (depends on variety)	Either
Parsley	Cool	Easy	Medium	Either
Peas	Cool	Easy	Vines need to be supported	Seed
Peppers	Warm	Can be easy or challenging	Medium to large	Either
Radishes	Cool	Easy	Small unless daikon	Seed
Spinach	Cool	Easy	Small/medium	Seed
Squash (includes zucchini and pumpkins)	Warm	Easy	Long vines spread everywhere; can be grown vertically	Seed
Tomatillos	Warm	Easy	Large. You must plant at least 2 because they can't self-pollinate.	Either but you might have better luck with transplants
Tomatoes	Warm	Can be easy or infuriating	Large, will need stakes or cages for support	Transplant

Direct sow vs. indoor seed-starting

Gardeners rely on transplants to get a head start on their food-growing. For instance, tomatoes don't tolerate frosts. If you direct sow – plant seeds directly into the soil -- tomato seeds in your garden, you should wait until after the last frost date in April. But if you plant tomato seeds inside in March, you can put tomato *plants* in the ground after the last frost instead of seeds. The same is true of starting lettuce inside in August, then transplanting into the garden in September when temperatures have cooled.

Not all plants transplant well, though. Often these plants are delicate and/or have shallow roots. Their seeds need to be planted directly into the garden soil. The table on the previous page provides guidelines for whether to plant a crop as seeds or transplants in your garden.

How to direct sow

The information you need for planting seeds in your garden is usually on the seed packet. If you can't find it there, often the seed company has planting information on its website. To plant most seeds, you can use a garden tool, stick or even a pencil to draw a straight line in the soil. This will be the trench that you'll line with seeds. How deep the trench is depends on the size of the seed. Check the seed packet to be accurate, but a general rule of thumb is that the row should be as deep as the seed is big.

If the soil is very dry, lightly water it before planting. Drop the seeds in the trench, spacing them at the distance recommended on the seed packet. The bigger the seeds, the farther apart you need to space them. If you plant seeds too closely, the sprouts will be crowded and you'll eventually need to thin them. Thinning is pulling out some sprouts to create more growing space for those that stay in the soil. All living things need nutrients, water, air and space to grow – and the soil only has so much to offer.

Also look at the seed packet for how far apart to plant the next row of seeds. New gardeners often don't believe how far apart the rows should be and space their seeds (and transplants) much too closely. Planting too closely can lead to disease, insect infestation, a lack of nutrients and water; in short, none of the plants thrive.

How to transplant a seedling

This workbook doesn't cover how to start seeds inside, but two excellent online guides

are listed under “Book and online resources” at the end of the workbook. We want to emphasize this: **Don’t start your seeds too soon.** Don’t plant tomato and pepper seeds inside in January. Just be patient. Virginia has a long growing season and you might still be picking tomatoes and peppers after Halloween – if you don’t kill all your plants first by starting them inside too soon, then struggling to keep them healthy and thriving for the next four or five months.

Most seedlings that are started too early end up being long and spindly. They run out of space and nutrients in their small pots and crane to reach the light. A basic rule of thumb is to sow seeds indoors 4-6 weeks before you’re going to transplant outside. Onions, hot peppers and celery need to be started at least 8 weeks before they’ll be ready for garden living.

Whether you buy seedlings or direct sow seeds inside, when you’re about two weeks from transplanting, set the seedlings outside in their pots for a few hours a day. Increase the amount of time outside as you get closer to planting. This process, called hardening off, gives the plants a chance to get used to outdoor temperatures and wind.

Here’s how to plant the seedlings in the garden:

1. If possible, pick a day that’s overcast or misty to reduce the stress on the plants.
2. Make sure the soil is moist and dig a hole at least as deep and wide as the pot that each plant is in.
3. Tilt the bottom of the pot upward and pat it while using your other hand to keep the plant from falling out.
4. If a plant has been in a pot too long and the roots have started to bind, “tickle” the roots to loosen them and deepen the hole so the roots can spread downward.
5. After settling the plant into the hole, refill the hole with the soil.
6. Tamp the soil down around the base of the plant, but don’t mound it against the stem or press too hard. The soil should be firm enough that the plant can stand, but not so firm that oxygen can’t circulate.
7. Water the transplants and keep them hydrated until you can see that they’re thriving.
8. Mulch the seedlings to hold in moisture and suppress weeds; mulches will be covered more in Section 3.

The special case of tomato seedlings

Tomatoes are a special transplanting case. They can grow roots all along their stems, so

you can help them develop a large root system by burying most of the seedling stem when you transplant. Remember, though, this applies only to tomatoes.

There are two ways to plant tomatoes. One is to dig a hole as deep as the part of the stem that will be buried; the other is to dig a trench as long as the stem to be buried. Either way, the first step is to decide how much of the stem to bury. A good rule of thumb is to keep at least 4 inches of the stem above ground.

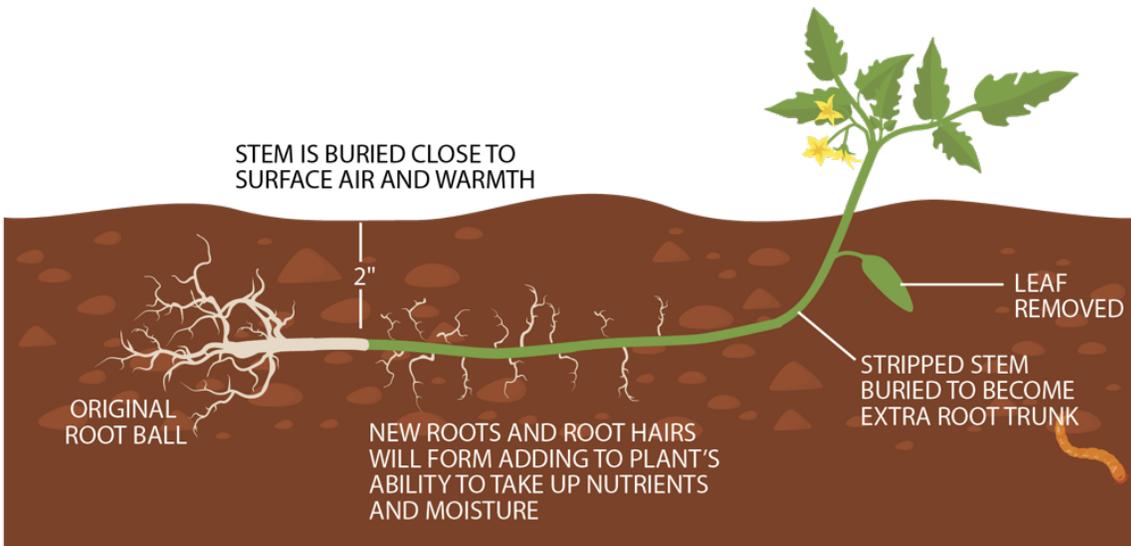


Illustration by Janelle Welch

Trench planting:

1. Dig a shallow trench that's a few inches shorter than the seedling.
2. Remove the leaves from the part of the stem that will be underground.
3. After you take the seedling out of the pot and loosen its root ball, lay it sideways in the trench.
4. Fill the trench, lay the seedling in it, and carefully bend the stem so the part out of the ground is vertical. The plant will adapt to grow upright.
5. Water right away and keep the soil moist.

Making the most of your garden space

High and lower-value crops

Just because a plant is easy to grow doesn't mean that you should grow it. When designing your garden, keep in mind how much space each plant needs to be productive and healthy. You probably won't be able to fit in everything that you want, so choose wisely.

Some crops are considered high-value, meaning they produce a lot for the amount of time and space they require. Others are lower-value because they need room to spread out, take a long time to grow, and/or don't produce much. Unless these crops are part of your regular diet, it's probably cheaper to buy them than to grow them. Another option is to set aside a large communal space for these crops where everyone in the garden can help take care of and then harvest them.

Lower-value crops include:

- **Broccoli, cauliflower and cabbage**, which produce only one head for every plant – and the plant can take up as much as 2 square feet of your garden. To minimize the space they take up, you can plant baby varieties –but the harvested vegetable will also be smaller. You also can choose sprouting varieties of broccoli, like broccoli raab, that need less room and form many small heads or florets.
- **Potatoes and sweet potatoes**. Both of these crops can produce A LOT. But their growth takes a long time and, at least in the case of sweet potatoes, the vine (which is edible – cook it like spinach!) takes over. Because the part we eat grows underground, planting other crops with them can be tricky. When it's time to harvest, you have to dig up the soil



An oversized reusable shopping bag in this garden plot at Lynbrook Elementary School is growing potatoes.

to get to the potatoes. Many local community gardens have solved this by being creative about where they plant potatoes, using laundry baskets, children's plastic swimming pools, and oversized reusable tote bags. (Cut multiple slits or drill small holes in the container so water can drain.)

A benefit of this approach is that when it's harvest time, gardeners just dump the soil on a tarp, dig around for the potatoes, then put the soil back in the container or in the compost pile.

- **Corn.** Each stalk of corn produces one to four ears total, depending on the variety and growing conditions. Corn requires a heavy load of nutrients and needs several stalks for pollination -- Virginia Cooperative Extension recommends three to four rows of corn. Because corn is pollinated by wind, it's better for the stalks to be planted in a square rather than a couple of long rows. That said, some gardeners grow corn for the leaves because they use them as wraps for meat and vegetables. One solution is to dedicate a single plot to corn, which can be planted with other crops. Keep reading to learn more about that.
- **Melons, pumpkins and other winter squash (like acorn and butternut).** The long vines of these plants sprawl across the ground and take over the garden if not given ample space or if they're not trained to grow vertically up a trellis, fence or pole. Melons in particular need a great deal of water and all of these crops are heavy feeders, so plan to give them extra attention so you can have a plentiful harvest.

Interplanting

Growing more than one variety of plant in the same plot is called interplanting. Mixing non-competing varieties maximizes space and brings biodiversity to your garden that can lead to fewer pest insects and diseases. Many insects prefer vegetables of one type or in one family; interplanting eliminates large single-crop plots, limiting how much damage a pest can do and giving the gardener a smaller area to remedy.

Interplanting can be used a number of ways:

- To mix slow-growing plants with faster ones. For instance, carrot seedlings are slow to emerge and are tiny once they do. When planting a row of carrots, put in a radish seed after every six carrot seeds. Radishes grow quickly and will show you where your carrots are. When the radishes are ready to harvest 3 or so weeks later, just put another radish seed in the hole where you pulled out the radish.
- To keep the garden growing through the change of seasons. Planting seeds/seedlings immediately after removing a plant is **successive gardening**. Using the example of

carrots and radishes above, you can replace the radish seeds with bean seeds as temperatures start to warm. Then, in the fall, you can plant garlic after beans as garlic needs to grow during the winter, or **overwinter**. Don't use plants from the same families (such as replacing peas with beans) because they'll attract the same insects and diseases, which could lead to a build-up of problems in your plot. *For more information, see the plant families table near the end of this section.*

- To protect plants that don't thrive in all-day sun. Plant tomatoes and other tall crops where they'll shade heat-tolerant lettuces. In fall or spring, sow spring peas or snow peas on the west or south side of the row with lettuce.
- To provide nutrients. Put heavy feeders – plants like corn that need a lot of nutrients – near legumes like peas, beans, and clover. Legumes can give nitrogen, the nutrient that all plants need to grow, to the soil. Even though we don't eat clover, we plant it as what's called a **cover crop**, which protects the soil during the non-growing season. Another example is planting radish, crimson clover and triticale in a bed being prepared for deep-rooted vegetables that need high nutrients. The radishes will break through compacted soil, well below the normal root zone. Cover crops will be covered in more detail in Section 3.

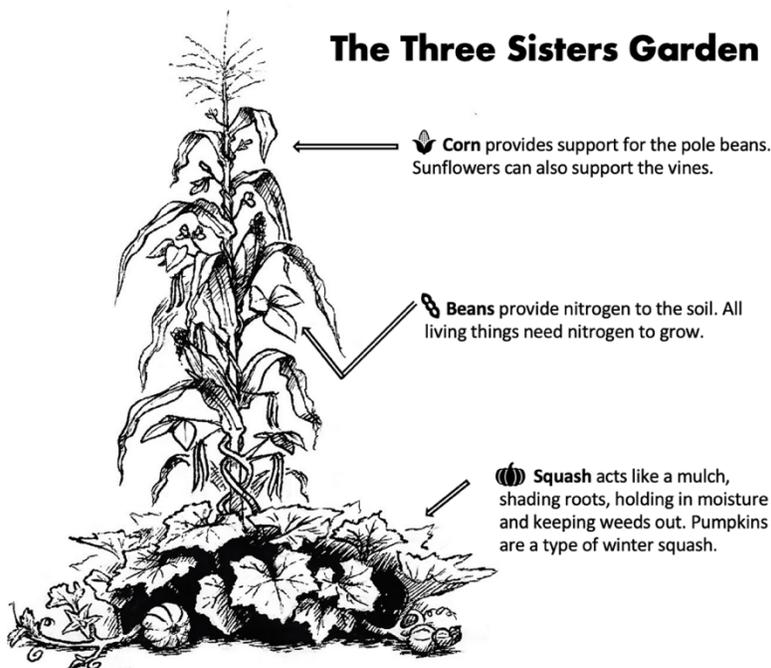


Illustration by Garlan Miles.
https://commons.wikimedia.org/wiki/File:Three_Sisters_planting_visual_graphic.png

Interplanting has been practiced for thousands of years. According to the USDA National Agricultural Library, at least 15 indigenous American nations excelled in this technique, growing what is called a Three Sisters Garden.

A few pages ago, squash and corn were listed as low-value crops because of the amount of space and resources they require for what they produce. By interplanting pole beans

(like black beans), squash and corn, however, you more effectively use the space. The plants also use resources more efficiently than if the crops were planted separately: the shading squash prevents water evaporation, the beans increase nitrogen in the soil, and corn provides a vertical structure for beans to climb.

You can grow other plants together like this. Examples include summer squash or zucchini, tomatoes or sunflowers, and cucumbers or pole beans. In this case, the tomatoes or sunflowers provide support for the cucumber or bean vines.

As mentioned in the earlier section on planting, be careful about packing in the plants too tightly. Unless you're familiar with the size of mature crops, sow fewer seeds than you think you need to. If you're completely new to interplanting, it will be easier to start by planting alternating rows of crops, such as side-by-side rows of tomatoes and basil. Save the Three Sisters for when you have more experience.

Vertical gardening

To get the most out of your growing space, grow up when possible by using trellises, stakes, cages and other support structures. Section 3 will share information about how to build and use these devices, but now's the time to consider whether to include vertical growing. While planning your garden, you must know whether the squash will be sprawling along the ground or growing upward. Remember, too, that vertical plants are tall and will cast shade, so they need to be placed where they can't take the sunshine from plants that need it.

Vertical growing is especially useful for plants on vines: pole beans, tomatoes, melons, squash and cucumbers. Being off the ground protects them from fungal diseases because air moves freely across the plants -- although this can also dry them out faster. Plan to water more frequently.

Flowers in the garden

Flowers aren't in the garden just for their good looks. They do important work:

- Attract pollinators like bees, wasps, butterflies and birds that are necessary for reproduction -- and for growing fruits like tomatoes, peppers, melons and squash.
- Control pests by attracting the beneficial insects and birds that eat them. (Section 3 will explain more about pest vs. beneficial insects.)
- Serve as “trap crops,” luring pests that otherwise would be damaging food crops.
- If they have dense leaves, flowers act as mulch, shading soil and keeping in moisture.

Plant them on the edges of the garden or in the outside corners and ends of raised beds.

5 flowering plants for Northern Virginia vegetable gardens		
	Name	Benefits
	Bee balm (<i>Monarda didyma</i>)	Boldly colorful perennial flower pollinated by the ruby-throated hummingbird, butterflies and bees. Large plant.
	Cosmos	Beautiful, easy-to-grow tall flower is a pollinator favorite. Attracts lacewings, a beneficial insect. Let the flowers drop their seeds in the garden for more flowers the next year. Large plant.
	Lavender	A fragrant, edible herb that bees will flock to, but will repel other living creatures – deer, ticks and cabbage moths. May overwinter. Large or medium-sized.
	Marigold	Bright-colored flower long paired with tomatoes, they lure pollinators and beneficial insects and release a chemical in the soil that controls harmful nematodes. Small or medium-sized, they can be planted in the plot with the tomatoes.
	Nasturtium	Colorful and edible flower whose thick leaves act as a mulch. Also a trap crop that attracts aphids, keeping them off your food crops. Attracts beneficial insects. Vining and mounding varieties.

What to plant where: Designing your planting plan

Now that you have more information about how and when plants grow, how much room they take up, and what they need to be happy, you can plan your garden. Many gardeners like to visualize their future garden, so they sketch it out. Doing this also allows them to consider the location of sun, shade, and water and to consider different crop placements.

You don't need special skills to plan your garden on paper -- and you can be creative with it. These fun designs are by US Botanic Gardens advanced gardener Thomas Crawley, who

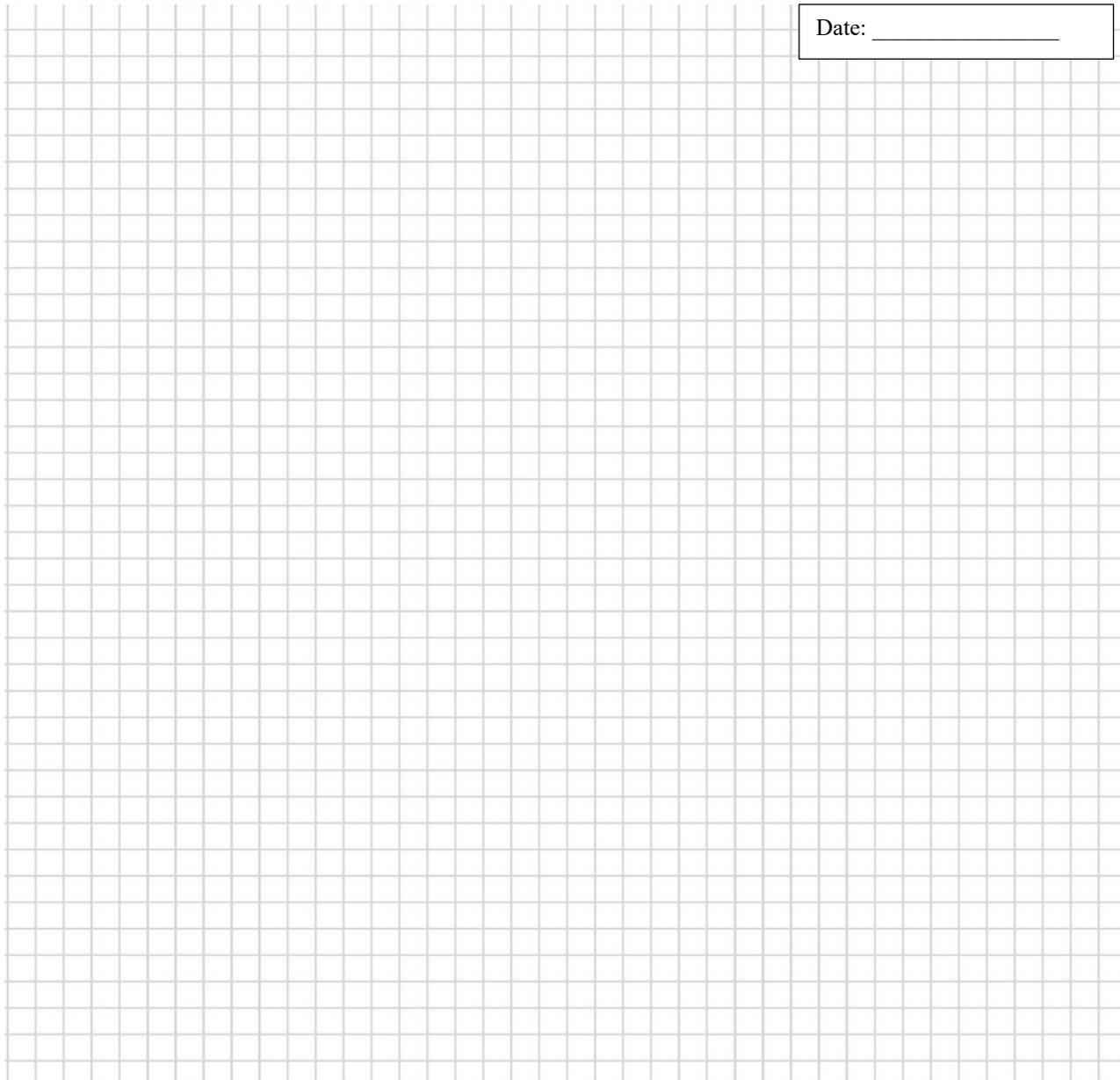


helped establish the USBG Kitchen Garden in 2016 and whose duties include designing and maintaining it. Thomas hasn't individually plotted where each plant will go, but if you're a beginning gardener, you might find it helpful to do so. Thomas has included several varieties of flowers – and planned to repeat the Spring 2021 garden again in the fall. The Summer 2022 plan shows how Thomas changed his plantings for warm-weather crops. He also included an arrow, designating North.

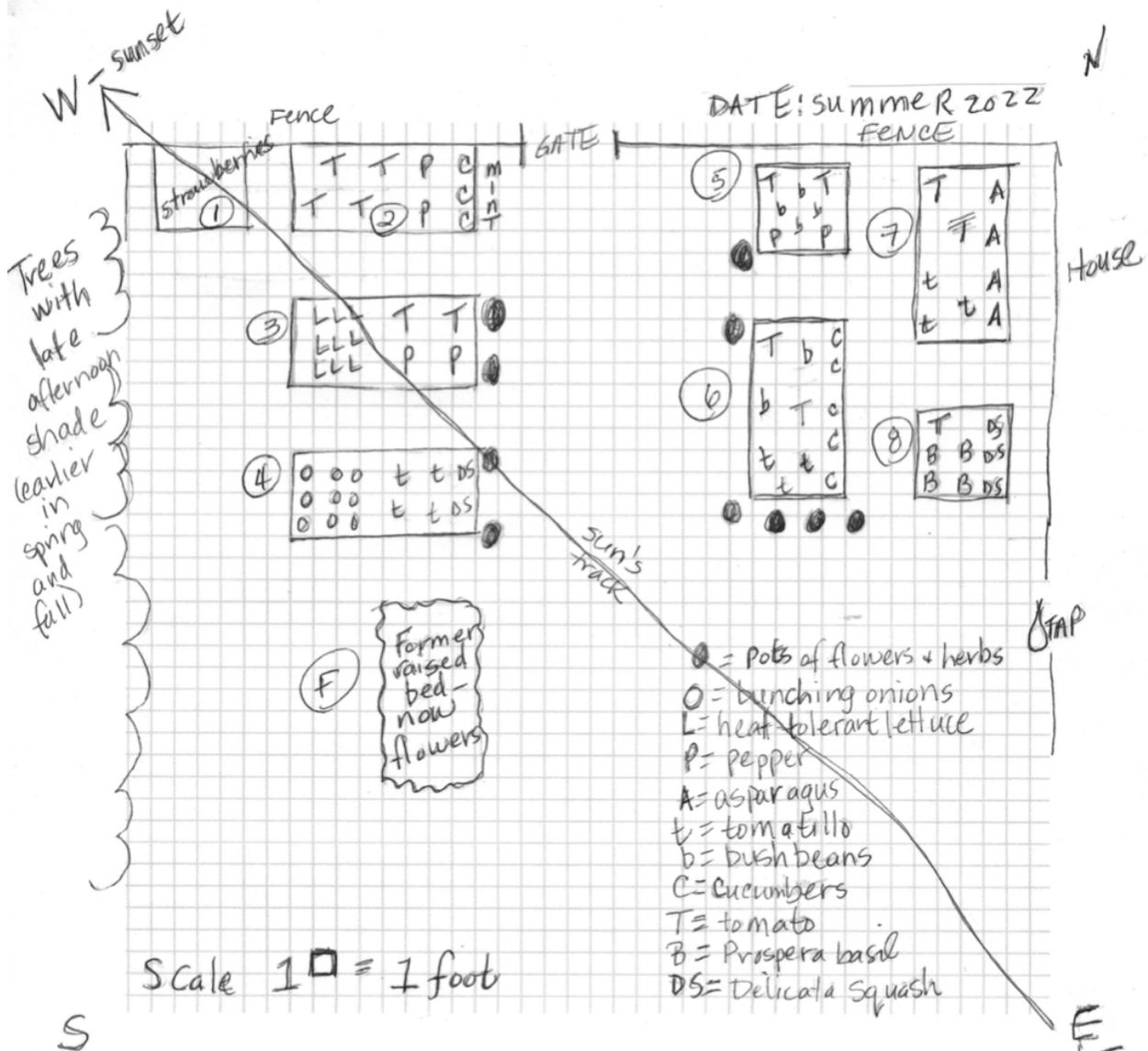
This page is for thinking through what you'll plant in your raised beds or in-ground rows. (See the next page for an example.) Refer to your drawing in Section 1 of your overall garden area. If you want, add your planting areas to that drawing. A copy is in the Garden Journal. On this page:

- Pick a measurement for the squares to stand for. If the squares are equal to 1 square foot, a bed 4 feet by 8 feet would be 4 squares by 8 squares. Draw your beds or rows to scale. (If you need more paper, another page like this is at the end of the section.)
- Mark North, South, East and West. The tallest plants should be on the north or east, unless you want them to shade their neighbors. In that case, plant them in the south and west.
- Using the previous page's list of what you want to grow, sketch here what you'll plant where. Use a pencil so you can erase. Number the beds to track what's planted in each.

Date: _____



Garden design example



- Each bed has a number except the flower bed, which is marked "F."
- Note the spacing of the plants. For instance, in bed 3, there are only two tomato and two pepper plants.
- Each square is equal to one square foot, meaning that it stands for 1 foot tall and 1 foot wide. Beds 1, 5 and 8 are 4 feet by 4 feet. Beds 2, 3, 4, 6, 7 are 4 feet by 8 feet.
- North, South, East and West are marked and the sun's movement from east to west is drawn across the plan.
- The cucumbers and delicata squash – plants that grow on vines and will be supported on tall trellises – are planted on the northeast ends of the beds so they won't shade the other plants. Onions and lettuces are planted where the trees on the southwestern edge will shade them later in the day.
- The plan is dated so that, in the future, the gardeners can look back and see what and how they planted in the past.
- The water tap, fence, gate and house are also marked.

Table of plant families

Use this table when you're planning to start a new crop where you've just removed a plant. Gardeners mostly do this when they're switching from a spring to summer or summer to fall garden. As mentioned in the Interplanting section, avoid planting crops from the same families in the same places to avoid the build-up of diseases and pests.

Family name/Latin name	Crops in this family	
Allium (Liliaceae)	Asparagus Garlic Onions	Chives Leeks Shallots
Aster (Asteraceae)	Artichoke Sunflower	Lettuce Tarragon
Brassicas (Brassicaceae)	Broccoli Cabbage Collards Kohlrabi Pak choi	Brussels sprouts Cauliflower Kale Mustard Radish
Carrot (Apiaceae)	Carrots Cilantro Fennel	Celery Dill Parsley
Cucurbits (Cucurbitaceae)	Cucumber Squash, which includes pumpkins and zucchini	Melons
Goosefoot (Chenopodiaceae)	Beets Swiss chard	Spinach
Grass (Poaceae)	Corn Rye	Millet Wheat
Legumes (Fabaceae)	Beans Edamame (soybeans) Peanuts	Clover Lentils Peas
Mint (Lamiaceae)	Basil Marjoram Oregano Sage	Lavender Mints Rosemary Thyme
Nightshade (Solanaceae)	Eggplant Potatoes Tomatoes	Peppers Tomatillo
Rose (Rosaceae)	Blackberries	Strawberries



Section 3. Taking care of your garden: Routine maintenance

Conservation best practices

This section focuses on the in-the-dirt work of gardening: promoting healthy soil, conserving water, and preventing and treating disease and damage. The techniques described here are best practices for conserving resources and protecting the environment and living things.

One way to keep up with best practices and to grow as a gardener is to take good notes. Given how much we all have going on in our lives, record-keeping matters. You've already taken planning and planting notes and made drawings of your garden area. The Garden Journal near the end of this workbook can be filled out to create a set of records for next year or copied to create an annual set of records. By writing down this information, you're creating a full year of lessons learned to guide you in the next growing season.

Promoting healthy soil

The soil arguably is the most important part of the garden. As Jim Hankins, executive director of the Fauquier Education Farm in Warrenton, says, "Successful farmers are truly dirt farmers, raising healthy soil first in order to raise a crop in that living system."

Here's the recipe for creating and maintaining healthy soil:

- 1) Feed it
- 2) Keep it covered
- 3) Leave it alone as much as possible.

It sounds simple, but achieving healthy soil is a balancing act. The soil needs to absorb and hold water, but not too much. It needs to provide nutrients, but not too many. It needs to hold enough oxygen, but – you got it – not too much. If you learn how to do this balancing act, if you pay attention to your soil and nurture it, you'll get your rewards at harvest time.

"Your job description should not include telling your soil that it will be stripped naked, beaten regularly and starved to death."

-- Jim Hankins,
executive director,
Fauquier Education Farm

Feed it

- **Add organic matter.** Organic matter is health food for your garden. This material, once living or from a living creature, includes shredded leaves, grass clippings, straw, compost and manure from horses, rabbits and chickens (but not dogs or cats!). They'll add nutrients, absorb and hold water, and improve soil structure.
 - Fall is a good time to add organic matter because the soil's nutrients are depleted. It's also the best time to add animal manure because fresh manure is high in nitrogen and can burn plants; by mixing them into soil in the fall, they have time to break down and won't affect your plants.
 - Feeding soil in the spring when you plant gives a nutrient boost to the soil. Add 2-3 inches of compost to the top of the soil. You don't need to mix the compost into the soil unless your soil is compacted.
 - Conduct a soil test before adding soil amendments such as lime, phosphorous, sulfur, potassium and gypsum. The soil test results will tell you what your soil is missing and how much to add.
- **Water deeply.** Non-compacted soil watered deeply allows plants to develop deep root systems, which in turn helps the soil: the roots create pathways that allow oxygen, water and nutrients to flow. As roots decay, they will provide important organic matter at lower levels of the soil. Additionally, denser root systems can create more partnerships with fungi and bacteria that allow the plant to absorb nutrients like nitrogen. (See more on how to water below.)
- **Mulch** – This is a variation of adding organic matter, but mulch is spread on top of the soil after planting or to protect the soil if you don't have a crop in the ground. Depending on the type of mulch, it may hold in water, suppress weeds, provide nutrients and/or lower soil temperature (because the soil isn't exposed and baking in the sun).

The following two pages provide more detailed information about different types of mulches, what type of uses they're suited for, and how to apply them.

MULCHES				
Type	How to use	How soon it breaks down	What it's good for	Potential problems
Wood chips Shredded bark	2-3-inch layer	Slowly (wood chips are slower than bark)	Suppressing weeds, preventing soil compaction (apply before soil is compacted) and reducing soil temperature.	Chips are too large for garden plots; use them for pathways and rows between plantings instead.
Shredded leaves	2-3-inch layer	Rapidly	Controlling weeds and improving the soil.	Can blow around; to get around this, allow the leaves to start decomposing before putting them in the garden.
Cardboard Newspaper	Single layer 4-6 layers	Slowly Moderately	Suppressing weeds between beds and to create paths. Water it before putting other organic mulches on top to hold it in place.	Remove stickers and staples. Use newsprint pages only (no slick or glossy pages). Now that printers use soy- and water-based inks, black-and-white and color pages are safe.
Straw	1.5-inch layer 6-8-inch layer	Moderately fast	Capturing rainfall and irrigation water, slowly releasing it. Reduces soil erosion. Controlling weeds.	Buy from a reputable source to avoid buying straw with seeds or brambles in it.
Grass clippings	2-inch layer	Rapidly	Controlling weeds and providing nitrogen.	Use dry grass to avoid the odor of freshly cut grass decomposing. Also, don't use grass that's gone to seed or has been treated with pesticides/herbicides or crabgrass.
Compost	2-3-inch layer	Quickly	Most effective as a mulch when layered in the fall to protect and provide nutrients to overwintering crops like asparagus and berries.	Can be used to suppress weeds, but isn't always effective because weeds like growing in most types of compost.
Sawdust	2-inch layer ¼-inch layer	Slowly	Controlling weeds Garden paths.	Don't use close to plants because it crusts and soil can't absorb it. Also, its decomposition takes nitrogen from the soil.

Type	How to use	How soon it breaks down	What it's good for	Potential problems
Plastic sheeting (clear or black)	Single layer	Slowly (needs to be replaced about every two years)	<p>Controls weeds very effectively.</p> <p>For a short period, will help keep moisture in the soil.</p> <p>A sheet of clear plastic can warm the soil in early spring before planting.</p>	<p>Can prevent water movement and, over the long run can lead to unnaturally dry soil. Cut holes in plastic to prevent this.</p> <p>Clear plastic can promote weed growth.</p> <p>Black plastic mulch can increase soil temperature too much in the summer and damage roots unless it's porous or has a white reflective side or if organic mulch or thick plant leaves provide protection from the sun.</p>

Keep it covered

Bare soil is never good in the garden! Exposed to the sun, the soil will dry out, preventing nutrients from flowing. Lacking moisture and plant roots to hold it together, soil also is more likely to wash away in rainstorms. During the growing season, it's easy to keep the soil covered with plants and mulches. But what about when you're not growing anything, like winter?

A specific group of crops addresses this situation. Called cover crops, they're grown for the benefit of the soil and are usually sown outside the regular growing season. You can also grow them to fill unplanted gaps in a garden plot or in areas where you want to improve the soil. Here are some of the many ways cover crops can help gardens:

- provide nutrients to soil
- break up compacted soil so oxygen and water can flow
- suppress weeds
- absorb moisture
- prevent soil erosion
- host beneficial insects
- store carbon

COVER CROPS 101

A NOTE ON THESE CROPS

The crops featured here are suited for Fairfax County gardens .

WHAT ARE COVER CROPS?

"Green manures" that

Nourish and improve the soil

Suppress weeds

Host beneficial insects

Store carbon

Can be tilled back into the soil for further nourishment

Are low-maintenance

buckwheat



Summer

Fast-growing

Chokes weeds

Feeds bees

Deep root system

Can be tilled into soil as soon as a month after being planted

red crimson



With buckwheat

Fast-growing

Suppresses weeds

Fixes nitrogen

Attracts pollinators

Buckwheat helps red clover seeds germinate in summer heat

Harvest flowers for tea

crimson clover



Winter

Sow mid-July through September

Fixes nitrogen

Suppresses weeds

Attracts pollinators

Grows well with Austrian winter peas

austrian winter peas



Winter

Sow mid-August to mid-November

Fixes nitrogen

Greens are edible

Hardy to 0 degrees F without cover. Plants that overwinter will produce peas in spring.

more on cover crops

OTHER COVER CROPS

Summer

- Birdsfoot trefoil improves poor soil
- Red cowpea is ideal for well-drained soil and fixes nitrogen

Winter

- Dutch white clover
- Hairy vetch
- Deep till radish
- Winter wheat
- Hullless oats

Seed blends of cover crops are also available.

A WORD ABOUT SESAME



Although sesame isn't a cover crop, it is a vigorous, heat-loving crop that grows fast and crowds out weeds.

Thomas Jefferson loved to grow sesame in his garden. According to Monticello historians, he received a sample of sesame oil in 1807 and considered it an ideal substitute for olive oil. After three years of growing it, though, he only had a gallon of oil to show for his efforts.

Benne and Monticello white sesame can be bought from Southern Exposure Seed Exchange.

WHERE TO BUY COVER CROPS

- Southern Exposure Seed Exchange, www.SouthernExposure.com. This seed company is based in Virginia.
- FEDCO Seeds and Supplies, fedcoseeds.com
- Johnny's Selected Seeds, <https://www.johnnyseeds.com/>

WHAT DOES "FIXES NITROGEN" MEAN?

Plants need nitrogen to grow, but they can't access what's in the air. Bacteria that live in the roots of legumes (e.g., peas and clover), however, convert atmospheric nitrogen into a form that plants can absorb from the soil.

When it's time to replace legume plants in the garden, they should be turned into the soil to retain the nitrogen.

Leave it alone

The top couple inches of your soil is mostly organic matter. The 10 or so inches below that is topsoil, made up mostly of organic and mineral matter combined with air and water.

Stay off the soil. Create paths outside the planting area to walk and kneel on. Staying off the soil where your plants are growing prevents compaction, allowing air and water to move smoothly through the soil and to your plants' roots.

Don't till or double-dig. When you dig into and mix up the soil, you're bringing a lot of air into the soil. This causes the organic matter to break down more quickly and the nutrients are released as carbon dioxide. When that happens, the nutrients aren't available to your plants.

Tilling into the soil also destroys the structure of the soil. This leads to compaction, which makes air and water flow difficult or impossible. However, if you are planting directly into the soil, you likely will need to till or use a shovel to loosen the soil for the first planting of the garden.

Leave plant roots in the ground. Instead of pulling a plant out of your garden by its roots, cut it where the stem meets the soil. Leave the roots to decay underground. As the roots decompose, they'll pass on their nutrients to the root zone of your crops.

If you're growing cover crops and want to remove them so you can plant, use a hoe, shovel or other sharp tool to chop at the cover crop. The goal is to separate the stems/leaves from the underground roots. Leave the green vegetation on top of the soil to decompose; in about two weeks, you can plant. If you've planted clover, peas or other legumes, try to time this with when they're blooming and before they've started producing seeds.

Irrigation and watering

How much to water is the one of the most perplexing things about gardening. New gardeners usually water too much or not nearly enough, but with climate change, even experienced gardeners are feeling challenged.

Water is critical for plants to photosynthesize, support themselves, shuttle nutrients around, and develop their root systems. This is especially important during the first couple of weeks after planting seeds, when roots systems are establishing. The soil should be kept moist, but not soggy, for the plants to successfully grow.

Food crops need around an inch of water a week, but several factors affect that measurement:

- Your microclimate, or the specific climate of your garden area. Brick walls, paved paths and nearby parking lots can add heat, which increases the rate of evaporation. Some gardens in windy spaces, which also means the soil dries out faster.
- Soil drainage. Garden soils drain at different rates.
- Crop type. Some crops are thirstier than others, while others are more resourceful. Both pole and snap beans can get by on little water. Melons, squash and tomatoes have deep root systems that can pull moisture from well below the dried-out surface.

Rules of thumb for watering

- The part of the plant you're watering are the roots – no other plant part takes up water. If you can, water close to the soil, not on the top of the plant.
- The most critical times to water are in the first few weeks of growth, right after being transplanted, and when flowers and fruits are developing. Examples of this last case include when beans and peas are filling their pods, cauliflower and broccoli are developing heads, and asparagus is producing spears.
- April through September, veggies need enough water that it soaks several inches into the soil, down to your plants' root zones. Shallow waterings, even if done frequently, will

How much should you water?

Fairfax County vegetable gardens need about 1" of water a week. It can come from any combination of water sources, such as rain and the hose.

In weeks without rain, give your garden 1-2" of water a week. If you put a finger in the soil, it should be moist beyond your fingertip – 6" down. You also can buy a moisture meter.

signal to the plant that water is abundant near the top of the soil and it will respond by producing a shallow root system. In times of drought, this shallow system won't be able to reach water stored more deeply in the soil. The Fairfax County Master Gardener's saying is to "water deeply and infrequently."

- Buy or make a rain gauge (see "Book and online resources" at the end of the workbook for making your own) and keep it in or near the garden.
- Don't water again until the top few inches of soil is dry

How to save water

Look for drought-tolerant plant varieties. Seed catalogs, seed packets, and seed seller websites will tell you if the variety you're considering has low water needs or can tolerate drought. Some varieties, such as Jericho lettuce, are bred specifically for hot and dry environments.

Use mulch. Adding organic matter like compost improves soil structure by creating larger air spaces in clay; this lets water drain more deeply in the soil. Applying organic mulch like straw or shredded leaves prevents moisture from evaporating and keeps it in the soil. Organic mulch is so effective at preventing evaporation that 2-3 inches of it can halve water needs. (Start with 6-8 inches of straw or shredded leaves; it will pack down.)

Plastic mulches can also conserve water, but at the same time they increase soil temperatures, especially during the hot summer months. They also tend to be more expensive than straw or shredded leaves. Leaves may cost nothing. If you save autumn leaves in paper yard bags, they'll stay dry and you can use them the following summer in your garden.

Save seeds from plants that thrived in your garden. Saving seeds from successful plants develops stock that's adapted to your garden's specific microclimate.

Plant in square-foot blocks instead of long rows. Planting in blocks is denser than row planting, so less water evaporates. Be careful, though, not to plant too closely together. Make sure air can flow and check regularly for pest insects and disease.

Plan well when planting your garden. Many summer vegetable crops, like basil and tomatoes, like a break from the hot sun later in the day. Plant them where taller crops, shrubs or trees will shade them in the late afternoon and they will need less water.

Create windbreaks. When air blows across a plant, it carries away the moisture on leaves and causes the plant to need more water. If it's very windy, the roots can't keep up with the leaves' needs and the plants will wilt. Windbreaks can be created from plants – summer corn, sunflowers and annual rye grass are frequently used -- or manmade materials, like fencing. You can also situate your garden so that a building or fence will break the wind, as long as these structures don't block the sun.

Water in the morning. If you use a sprinkler, hose or watering can, morning is the best time best for watering because the plant dries quickly. This rapid drying protects the plant from developing diseases caused by fungi. Also, the wind is usually calmer early in the day, so there's less water lost to evaporation and more absorbed by the soil.

If you water at midday, you're likely to lose more water to evaporation or wind. Watering in the evening with a sprinkler or hose can lead to disease because the plants' leaves will probably remain wet all night.

If you use a drip irrigation system or soaker hose, morning or evening are excellent times to water. There's no concern about wet leaves because the water is directed into the soil.

Irrigation systems

There are many ways to get water to your garden: a hose with a nozzle sprayer (if there are settings, use "shower"), a watering can, drip irrigation systems, soaker hoses, and sprinklers. Overhead sprayers are also available, but they waste a lot of water.



Image: "[Drip Irrigation Inside Raised Bed Cloche](#)" by [OSU Master Gardener](#) is licensed under [CC BY-NC-ND 2.0](#).

Drip systems, also called trickle systems, significantly reduce water usage. The systems are made of plastic hoses and water emitters that send water to the roots of individual plants. Because the water is directed, weeds are bypassed and less likely to survive. However, these systems can be pricey.

A soaker hose works similarly by dripping water into the soil. However, there are no emitters to deliver water to the roots; the soil must absorb it. Like the drip system, it requires more frequent application of

water because of the small amounts distributed. If you use a soaker hose, point the holes so they are facing the soil and place the hose under mulch.

If you see puddling in your garden, water spilling from raised beds, or water running off the garden soil, you are either watering at too high a volume or too frequently. Lower the rate of flow and see if that makes a difference.

Waterborne diseases

Water, especially water droplets on leaves and stems, plays a major part in plant diseases. Most plant diseases spread by water are caused by fungi, but some are caused by bacteria in the soil. In these cases, fungal spores and bacteria cells rely on water to spread and to infect plants. Once released, the spores or cells may be carried on the wind, in raindrops, or in the water from our hose and watering cans.

If your water flow is too strong, the force of the water can propel water droplets from the soil to lower plants leaves, from lower plant leaves to upper leaves, and from one plant to another. These splashing water droplets could be carrying diseased cells. Any droplets picked up by the wind can be blown greater distances.

To prevent your garden from being diseased by these fungus and bacteria that need water:

- Water only when needed, and then water deeply.
- Reduce the amount of time leaves are wet. (Reminder: don't water at night!)
- Keep fruit off the soil, which hosts waterborne bacteria and fungi. Use cages or stakes to support plants, and buy devices to keep undersides of squash and melon dry. Or be creative and use cardboard, upturned frisbees, colanders and other households items to create a barrier between the fruit and the ground – just make sure whatever you use doesn't hold water itself!

At the end of this section, there's a table of diseases common to local vegetable gardens. In the Garden Journal, there's a chart you can fill out to keep track of any diseases that afflicted your plants and how you treated them.

Weeding

A weed is a plant growing where you don't want it. It may be useful somewhere else, but not in your garden. Whether a plant is a weed has nothing to do with whether it's a native (originating in Virginia) or non-native (originating outside Virginia). A common characteristic of plants that we call weeds is that they're quick to adapt to environmental changes.

Weeds take advantage of newly tilled garden, sprouting quickly in the loosened soil. Their seeds – which can lie dormant in the garden for years – may also have already been present in the soil and were brought to the surface when you were establishing the garden.

Why should you pull weeds? They compete for nutrients, water and space with the plants you're trying to grow. They may shade your plants and host pest insects and diseases. To boot, they're often ugly.

Some plants that have long been referred to as weeds are now being recognized as beneficial. They may provide food or shelter to beneficial insects, have medicinal or other practical uses, be indicators of soil deficiencies, or be cover crops that can add nutrients to and protect the soil. Among these so-called weeds are milkweed, clovers and thistles. Learn to identify weeds so you know which you want to keep and which you want to kick out.

Some tips on managing weeds:

- Pull weeds when they're small and the roots are shallow. If they aren't growing on rhizomes – underground stems – they take seconds to pinch out of the soil. You can also use a hoe to scrape them up. To pull by hand, trace the stem to where the plant emerges from the ground and pull it at soil level to get the entire root. If there are rhizomes, which can be several feet long, you will need to do some digging.
- You can turn the weeds into the soil to add organic material, but don't do this if they have heavy roots or rhizomes (underground stems). The unwanted plant could survive. Don't turn under any grasses.
- Similarly, you can lay some pulled weeds on top of the soil to dry and decompose, adding organic matter to the soil. Don't do this with grasses, vining plants, or plants that have flowered or produced seeds. Those go in the trash (not even the compost). Also don't do this if there's rain in the forecast.
- Pull weeds before they go to seed or they'll take over. As mentioned above, seeds can survive in the soil for years.

- If the weeds are overwhelming your garden, smother them with 6-8 layers of newspaper pages or black plastic for a few months.
- When you pull out a weed, shake the soil back into the garden.
- Be diligent about weeding outside the garden, too. Weed whack or mow between raised beds or around the perimeter of an in-ground garden to get rid of developing seeds.

You can prevent or suppress weeds by mulching, closely spacing your plants and using small cover crops like clovers in between your vegetables. As the vegetables grow, you can cut or remove the cover crops. Also, as discussed earlier, use cover crops in any plots where you aren't actively growing other plants.

Herbicides

Use herbicides cautiously, if at all. Gardens thrive without them; it's easy to manage weeds if you check on your garden every day for weeds and insects. When you regularly monitor, you can pull the weeds as they're emerging and easy to pull.

If weeds overwhelm your garden, you can smother them with cardboard, newspaper or plastic for several weeks to months. If you prefer to use an herbicide, read the label and follow the directions. **More is not better; more can make your food crops toxic and be destructive to the environment.**

Don't apply an herbicide when rain is forecast or on windy days; the herbicide will wash away or drift to where you don't want it. (Which brings up another point: herbicides sprayed on your lawn or other plants, like roses, can end up damaging your vegetables.) Make sure the herbicide is specifically for the weeds you're targeting or, in the words of Virginia Cooperative Extension, you can "destroy a garden's productivity for years."

Also, keep in mind that when you use herbicides, you may inadvertently be creating a safe haven for weeds that aren't affected by the herbicide. Use different containers to spray pesticides, herbicides and to address diseases. Given all of these potentially negative impacts, you may decide that it's just easier to spend 15 minutes or so each day on weed watch. At the same time, you can look for insects and disease and enjoy watching your garden grow.

Identifying and managing common garden weeds in Northern Virginia

Weed	How to identify	Tips on managing, if more than hand-picking. Be sure to get the roots.
------	-----------------	---

Emerges in January-February

<p>English ivy</p> 	<p>Glossy leaves are green all year. Can grow horizontally across the ground or vertically on a tree, fence or other support.</p> <p><i>Image: "Hedera helix (English ivy) 3" by James St. John is licensed under CC BY 2.0.</i></p>	<p>Aggressive and can create a thick mat. Pull out every bit of this plant. Do not compost; put in the trash.</p>
--	--	---

<p>Henbit</p> 	<p>Square stems, pink-purple flowers.</p> <p><i>Image: "File:Lamium amplexicaule Kaldari 01.jpg" by Kaldari is marked with CC0 1.0.</i></p>	
--	---	--

<p>Speedwell</p> 	<p>Small blue and white flowers, round hairy leaves with rounded and toothed edges.</p> <p><i>Image: "Veronica persica" by crawfordaj is marked with CC0 1.0.</i></p>	
--	---	--

Emerges in March

<p>Hairy bittercress</p> 	<p>Leaves radiate from the base of the stem and are low to the ground. Long flower stalk with white flowers. Seedpods may explode, shooting seeds far from the plant.</p> <p><i>Image: "Cardamine hirsuta, 2 2013-02-14-15.21.27 ZS PMax" by Sam Droege is marked with Public Domain Mark 1.0.</i></p>	<p>It's edible. Pick it and add it to salads, salsas and pestos!</p>
--	--	--

<p>Plantain</p> 	<p>Long, narrow leaves with a small, cone-like flower.</p> <p><i>Image: "Plantago lanceolata" by andy71 is marked with CC0 1.0.</i></p>	
<p>Emerges in April-May</p>		
<p>Bermuda grass, also called wiregrass</p> 	<p>Coarse grass with stems that run horizontally across the ground.</p> <p><i>Image: "Cynodon dactylon" by aspidoscelis is marked with CC0 1.0.</i></p>	<p>Very aggressive. Remove all parts of the plant, including underground rhizomes that can extend for several feet. Do not compost; put in trash. If you have an overwhelming amount, cover in cardboard or a plastic barrier for a few months, although you may need to do this several times. Pull as soon as you see it.</p>
<p>Chickweed</p> 	<p>Small, pale green, oval leaves that grow in a clump. The flowers are white stars, like little daisies.</p> <p><i>Image: "Stellaria media" by loarie is marked with CC0 1.0.</i></p>	<p>It's edible. Pick it and add it to a salad!</p>
<p>Crabgrass</p> 	<p>Light green leaves with stiff hairs. Flowers and seedheads wire-like spikes on a stem. Grows in a clump.</p> <p><i>Image: "File:20170802Digitaria sanguinalis.jpg" by AnRo0002 is marked with CC0 1.0.</i></p>	<p>Remove entire clump.</p>
<p>Lambsquarters</p> 	<p>Long, thin stem and arrow-shaped leaves with toothed edges.</p> <p><i>Image: "Chenopodium album" by danielatha is marked with CC0 1.0.</i></p>	<p>It's edible, packed with vitamins and tastes a little like spinach. Enjoy!</p>

<p>Yellow woodsorrel</p> 	<p>Clover-like leaves with yellow flowers.</p> <p><i>Image: "<u>Oxalis stricta</u>" by <u>dagendresen</u> is marked with <u>CC0 1.0</u>.</i></p>	<p>Spreads by long, pink underground rhizomes. You must dig out all of these underground stems.</p>
<p>Emerges in summer</p>		
<p>Purslane</p> 	<p>Thick, reddish stems and plump green leaves that store water. Grows low to the ground. Yellow flowers.</p> <p><i>Image: "<u>Portulaca oleracea</u>" by <u>rich fuller</u> is marked with <u>CC0 1.0</u>.</i></p>	<p>It's edible, loaded with vitamins and tastes faintly of lemon. Try it in salads and stir-fries.</p>
<p>Spurge</p> 	<p>Easily confused with purslane, but spurge is smaller and the stems and leaves are much thinner. Stem contains a toxic white latex sap.</p> <p><i>Image: "<u>Powdery mildew and aphids on Graceful spurge</u>" by <u>Plant pests and diseases</u> is marked with <u>CC0 1.0</u>.</i></p>	<p>Not edible! If you see the toxic milky sap, you know it's spurge, not purslane.</p>

During the growing season, record in the Garden Journal what weeds emerged, when they emerged and how you managed them. This will help you anticipate weeds in future seasons and take steps to prevent them from getting out of hand.

Nutrient management: Feeding your plants

Like you, your plants need vitamins and minerals for good health. The four most important are carbon, hydrogen, oxygen and nitrogen. Plants access the first three from air and water. Nitrogen also is in the air, but in a form that plants can't use.

However, specialized bacteria that grow on the roots of legumes like beans and peas can convert atmospheric nitrogen into a form that can be readily taken up by plants. As the legumes grow, and especially as they produce flowers and fruits, they'll replenish nitrogen to the soil.

For normal growth, plants rely on 16-18 nutrients (scientists disagree on the number of nutrients that the plants need in small amounts). Nitrogen, phosphorus and potassium are absorbed in the greatest quantities; calcium, magnesium and sulfur are secondary nutrients. The others are also important but required in much smaller quantities.

CARBON (C)	NITROGEN (N)
<ul style="list-style-type: none">• Helps build new leaves, stems, and roots.• Every living thing has carbon.• Carbon sources are called "browns" in composting because they're usually brown and are already dead.	<ul style="list-style-type: none">• Gives plants the energy to grow.• Found in all plant cells, plant proteins and hormones, and chlorophyll.• Nitrogen sources are called "greens" in composting because they often have some color (not always green).• High amounts can lead to too much vegetative growth (leaves and vines) and fewer fruits/vegetables.• Too much can burn plant roots.• Excess nitrogen pollutes ground and surface water bodies.

PHOSPHORUS (P)	POTASSIUM (K)
<ul style="list-style-type: none"> • Helps make and store energy from the sun. • Supports development of strong, healthy root systems and seeds. • Promotes flowering and fruiting. • Too much can interfere with a plant's ability to take up micronutrients, resulting in leaves turning yellow. • Excess phosphorus pollutes surface water bodies like streams. 	<ul style="list-style-type: none"> • Helps form strong stems and stalks. • Improves fruiting. • Promotes resistance to disease and stress like drought and extreme temperatures. • Too much can lead to deficiencies in other nutrients.

Most of the required nutrients are already in the soil in sufficient amounts. Before you add anything to the soil, find out which soil nutrients are deficient – if any – by sending a soil sample to Virginia Tech’s Soil Testing Lab (see “Book and online resources” at the end of the workbook). The lab report will tell you the soil pH and recommend amendments, if needed. Depending on the soil type, and choice of vegetable and the vegetable rotation being followed, you may need to do a soil test as often as once a year, or once every 3-4 years. The quantity of

Why should you test your soil?

We recommend a soil test not just to save you money and time.

Overapplying nutrients isn’t healthy for your plants and can affect normal growth.

It also isn’t healthy for our environment: Excess nutrients will leach through or run off your soil, contaminating groundwater and waterways locally and downstream.

commercial fertilizer recommended should be applied annually if you are growing the same crop.

The degree of soil acidity or alkalinity is referred to as the soil’s pH. pH is measured on a scale of 0 – 14, with 7 being neutral. Any number below 7 is acidic and above 7 is alkaline. The lab results from your soil test will state its pH and recommend amendments to make the necessary soil pH adjustment. With the correct soil pH, your plants of choice will have maximum access to the available plant nutrients.

A lime application is generally advised to reduce acidity (raise pH). To acidify alkaline soil (lower the pH), the lab may recommend adding sulfur in the form of aluminum sulfate, elemental sulfur or ammonium nitrate. This is less common, as Virginia soils tend to be acidic.

The term “soil amendment” refers to any addition to the soil that improves it physically or chemically. Fertilizers make chemical changes to the soil. A complete fertilizer contains nitrogen (N), phosphate (P) and potassium (K), as indicated on the product by a row of three numbers. This so-called N-P-K ratio reveals in that order the percentage by weight of nitrogen, phosphate and potassium. A fertilizer labeled 10-0-0 contains 10% nitrogen and no phosphorus or potassium; a product labeled 20-20-20 has twice as much of the nutrients by weight as one containing 10-10-10.

Lime

Given that Virginia soils tend to be acidic, the lab may recommend application of agricultural lime to adjust the soil pH. There are two main types of lime that could be considered. They are “calcitic,” containing mainly calcium (Ca) carbonate (CO₃) constituents, or “dolomitic” containing mainly a mix of calcium and magnesium (Mg) with CO₃. Normally, a gardener would go with calcitic lime, which is less expensive. However, if the lab analysis suggests there is insufficient magnesium, an easy way to boost that level is to use dolomitic lime.

Unlike recommended commercial fertilizer that should be applied once a year, the quantity of lime recommended should be applied only once every three years. Also, unlike commercial fertilizer, agricultural lime is what’s called “sparingly soluble,” meaning it doesn’t dissolve easily. Because of this, no more than 50 lbs./1000 square feet of lime should be applied at any one time. If “no-till” gardening is being practiced and the recommendation for lime is above 50 lbs./1,000 square feet, the amount should be divided into two or three parts and applied monthly. If the same recommendation is made for a new garden or one that could be tilled, the entire recommended amount can be tilled into the top 6 inches of the soil.

It's important to keep in mind that over-liming dramatically reduces the availability of micronutrients, which can be very difficult to correct.

Nutrient management takeaways

If some of that was too technical, these are the basic guidelines:

- Always start with a soil test.
- Ask for advice from experts (see “Local resources”) and follow directions carefully.
- Remember the functions of nitrogen, phosphorus and potassium by thinking “Up, Down

and All Around.” Nitrogen spurs the growth of stems and leaves (up), phosphorus is critical to root development (down) and potassium promotes overall health and protection (all around).

Adding nutrients to your soil

The most important rule to adding nutrients to your soil is this: Use the right amount of the right fertilizer at the right place and at the right time. The first step to achieving this is conducting a soil test. If adequate amounts are in your soil, the right amount is none.

Once you’ve received your soil test results, you have a baseline for your garden soil. Be aware that the soil testing lab recommendation for quantity of fertilizer is given in lbs./acre or lbs./1,000 ft². That amount must be converted to the equivalent amount, based on your garden size, relative to an acre or 1,000 ft².

Here are some important stages during the growing season when food crops typically need a nutrient boost:

- After being transplanted.
- When they’re flowering or fruiting.
- To address symptoms of nutritional deficiency.
- To build resistance against certain pests or diseases.

The last two can be difficult to assess, however. You may want to do an additional soil test or consult with Fairfax County Master Gardeners. They host in-person and virtual help clinics and take calls at a Help Desk that’s staffed Monday-Friday 9 am until noon. You can also email them at HelpDesk@FairfaxGardening.org. (See “Recommended local resources” at the end of the workbook.)

Don’t fertilize during a drought as increased plant growth requires more water. Instead of adding to plant stress, spread mulch to the top of soil to help your garden retain water.

Types of fertilizer

There are two basic types of fertilizers: Organic and synthetic. Organic fertilizers are made from mined rock minerals and plant and animal materials. They release nutrients slowly and steadily over a long period, but the food doesn’t become available to plants for several weeks. You’ll need to apply these 3-4 weeks ahead of when the plant will need the boost. In

addition to applying organic fertilizers, ensure high organic nutrient levels by using compost and following the other tips in Section 1's "Establishing a strong foundation: Soil."

Synthetic fertilizers are manufactured and have chemical-rich names like "ammonium nitrate" and "potassium sulfate." Unless labeled "slow-release," these nutrients are available to plants within a few days; they dissolve easily and they readily become part of the soil's chemical constituent. If plants don't absorb the nutrients quickly, the nitrogen will leach through the soil column and contaminate groundwater; while the phosphorus will get washed off into nearby streams and lakes, polluting those water bodies.

For a list of organic fertilizers, see the table on the next page.

Organic fertilizers

Start with a soil test. Follow directions carefully. More is not better.

Name	Description	Nutrient(s) provided
Blood meal	Long-lasting. Made from dried slaughterhouse waste.	High amounts of nitrogen.
Bone meal	<i>Dried animal bones ground to a powder.</i> Too much can interfere with a plant's ability to take up micronutrients and interfere important connections to soil fungi.	Phosphorus, calcium.
Cottonseed meal	Slow-release, for acid-loving plants like blueberries. May contain pesticide residues from cotton farming, so look for pesticide-free products.	Nitrogen, phosphorus, potassium.
Epsom salt	This is advertised as a fertilizer, but scientific studies haven't shown effective uses in home gardens. Epsom salt can create imbalances in soil minerals that harm plants.	Magnesium, but only a soil test can tell if the soil has a deficiency.
Fish emulsion	Leftover liquid from the fish meal and fish oil industry. May offer protein to soil microorganisms. Has a strong odor. Many claims of what it will do have not been verified in scientific studies.	Nitrogen, phosphorus, potassium at varying N-P-K rates. Read labels closely.
Kelp meal	Processed seaweeds, especially kelp. Harvested from biodiverse and sensitive ecosystems. Other products are better choices from a sustainability standpoint.	Nitrogen, phosphorus, potassium.
Manure	Use fully composted manure only, and never from your pets. Fresh manure is high in salts that will burn your plants.	A range of nutrients, including nitrogen, phosphorus, potassium.

When you amend the soil in any way, including adding compost and mulch, record the details of when, where and what you applied in the Garden Journal.

Pest management

Pests in the garden can have two, four, six or eight legs. Birds, squirrels, chipmunks, deer, all kinds of insects, and mites see your garden and are thrilled about the new café opening near them. But not every creature is there to devour what you're trying to grow.

Beneficial creatures are those that prey on pests, and they can do tremendous work for you. These include birds, spiders and toads, who will eat many of the insects that come to feast on your garden plants. Other natural predators of garden pests include ground beetles, green lacewings, ladybugs and praying mantises. More information is provided below about garden pests and helpers.

Some creatures, like ants, are both pest and beneficial insects. Ants tunnel in the soil, helping the free flow of oxygen and water. They prey on slugs and caterpillars. But they also nurture aphids, which are harmful to your plants. Finding ants may be an indication that you have an aphid problem.

Learn how to identify the little living things so you'll know whether to take action or to



You can send an insect image to Virginia Tech's Insect ID Lab at insectidlab@vt.edu and **they'll identify it for you.**

sit back when they show up. The resources listed at the end of the workbook will point you to many excellent places to educate yourself – in books, online, with videos, and by contacting an expert. You also can check out field guides to insects, spiders, caterpillars and butterflies at the Fairfax County Public Library.

Following this page are two tables featuring some of the most common local pests and beneficial insects. Even though only about 1% of all insects are pests, these tables barely scratch the surface on what you might find in your garden.

Fortunately, many of the species that damage our food crops specialize in plant families, meaning they might eat squash but will have no interest in peppers. For this reason, one strategy for teaching yourself about garden foes is to focus on those that will be attracted to what you're growing.

Finally, a word on spiders: They aren't insects, but they sure like to eat them. Welcome them to your garden.

Garden pests

Name	Damage	Prevention/Treatment
<p>Aphids</p> 	<p>Aphids suck sap from plants, causing leaves to pucker and turn yellow. They also may leave a clear, sticky “honeydew” on plants that fosters the growth of black sooty mold.</p>	<p>They can be scraped off or sprayed off with water from a hose.</p> <p>Natural predators include ladybugs and green lacewings.</p> <p>Neem oil and insecticidal soap can be applied as late as the day of harvest, but must be allowed to dry.</p>
<p>Beetles, including Mexican bean, flea, cucumber and squash beetles. <i>Some are described separately below.</i></p> 	<p>Look for small, irregular holes in leaves, stalks and flowers. Some beetle damage will cause plants to wilt.</p> <p>Mexican bean beetles (a variety of ladybug) eat bean pods and the underside of leaves until they are skeletonized.</p> <p><i>Image "File:Mexican Bean Beetle - Epilachna varivestis, Elkhorn Garden Plots, Columbia, Maryland.jpg" by Judy Gallagher is licensed under CC BY 2.0.</i></p>	<p>Plant transplants early or sow seeds late to avoid pest population.</p> <p>Remove plant debris.</p> <p>Use row covers as a physical barrier from the time of planting until flowering. Remove the barrier once flowers have formed so that plants can be pollinated.</p> <p>Pluck pest beetles off plants and destroy or drown in a bowl of soapy water.</p>
<p>Cabbageworm</p> 	<p>Velvety green caterpillar’s color exactly matches the green of its target plants, but the ragged holes in leaves are easy to detect. It also bores into heads. Despite its name, it also feeds on Brussels sprouts, cauliflower, collards, kale, mustard and turnips.</p> <p><i>Image: "Cabbageworm" by machaq is licensed under CC BY 2.0.</i></p>	<p>Check the underside of leaves and look down the stems of leaves for cabbageworms, some which may be as small as your pinkie fingernail. Handpick and destroy or drown in soapy water.</p> <p>After harvest, thoroughly clean out plots where cabbage worm was. They overwinter in debris.</p> <p>The cabbageworm is also susceptible to parasitic wasps and other insects, such as the stink bug.</p>

Continued on next page

<p>Slugs</p> 	<p>They chew holes in leaves, stems, flowers, tubers and bulbs. They can also eat entire seedlings.</p> <p><i>"Mantled Slug, G. R. Thompson Wildlife Management Area, Linden, Virginia" by Judy Gallagher is licensed under CC BY 2.0.</i></p>	<p>Use sheets of newspaper or overturned pots to attract slugs. Check underneath in the morning and dump the slugs into soapy water.</p> <p>Attract with a shallow dish of stale beer at ground level, then drop into soapy water.</p> <p>Band copper foil around plant stems.</p> <p>Avoid destroying with salt because it takes a lot of salt, which is bad for the soil.</p>
<p>Spider mites</p> 	<p>Tiny, pale mite found mostly on beans and tomatoes. Look for tiny yellow spots that eventually turn leaves bronze. Silk webbing may also be present.</p> <p><i>"Plumeria: Bronzing of leaf due to spider mites feeding" by Plant pests and diseases is marked with CC0 1.0.</i></p>	<p>Insecticidal soap as soon as you see the mites. Forceful sprays of water may reduce their numbers.</p> <p>Insecticides generally aren't effective, and some will kill the mites' natural enemies instead.</p> <p>At the end of the growing season, get rid of weeds, including grasses.</p>
<p>Squash vine borer</p> 	<p>Larvae bore into stems, killing the stem and sometimes the entire plant. Favored plants include cantaloupe, winter squash, pumpkin, gourds, summer squash, and some melons.</p> <p>The plant may wilt and die before you notice the damage.</p>	<p>Watch for entrance holes on the vine and pulpy frass (bug poop) near them. If there's no frass, the plant may be suffering from bacterial or Fusarium wilt diseases.</p> <p>Transplant in early spring and then again in late June or early July to avoid the borer.</p> <p>Row covers can create a physical barrier, but will need to be removed when the plants have flowered and need to be pollinated.</p> <p>If you find an infested stem, slit it open and remove and destroy all caterpillars.</p> <p>Create a collar of aluminum foil or netting around the vine base to prevent larvae from boring.</p>
<p><i>Continued on next page</i></p>		

<p>Stink bugs, including Harlequin bug and brown marmorated stink bug.</p> 	<p>They suck sap, weakening plants and deforming buds and seedpods. Damage to okra and bean pods resembles warts. White marks like halos show up on damaged tomatoes and peppers. Feeding on crops in the cabbage family will lead to wilt and may kill the plant.</p> <p><i>"File:Brown marmorated stink bug adult.jpg" by David R. Lance, USDA APHIS PPQ is licensed under CC BY 3.0.</i></p>	<p>Control nearby weeds.</p> <p>Encourage natural predators, especially parasitic wasps.</p> <p>Pick off bugs and drown them in bowls of soapy water.</p>
<p>Thrips The name applies to more than 5,000 species, some beneficial.</p> 	<p>Tiny, bright yellow insects that damage the flowers and leaves of beans, beets, cabbages, carrots, cauliflower, celery, cucumber, melons, onions, peas, squash, tomatoes and turnips.</p> <p>Other possible indicators are white spots on leaves and leaf tips that have withered and turned brown.</p> <p>Some thrip species also transmit plant viruses.</p> <p><i>Image: "Citrus Thrips" by treegrow is licensed under CC BY 2.0.</i></p>	<p>Clear nearby plant debris, which attract thrips and are where they overwinter.</p> <p>Plant flowers that attract predators like green lacewings, pirate bugs mites, and parasitic wasps.</p> <p>Avoid high nitrogen fertilizers.</p> <p>Plant thrip-resistant plants, like certain varieties of sweet onion.</p> <p>Use fine mesh row covers to protect just-planted crops.</p> <p>Insecticides generally aren't effective.</p>
<p>Tomato hornworm caterpillar</p>  	<p>Bright green with diagonal stripes and a horn on its rear end, the hornworm feeds on leaves and unripe tomatoes.</p> <p><i>"Parasitized Tomato Hornworm" by ilovebutter is licensed under CC BY 2.0.</i></p>	<p>Can be hand-picked and destroyed or drowned in soapy water, but nature is likely to beat you to the necessary control. The Braconid wasp (see below) uses the caterpillar as a home for its eggs and as a nursery for the larvae, which eventually will kill it. First, though, they'll spin their cocoons on its back; you'll know it by the little white spears sticking out all over the caterpillar. When the adult wasps emerge, they will go on to prey on other pest insects.</p>
<p>When the pest population is beyond what you can manage easily, contact the Fairfax County Extension office or the Northern Virginia Soil and Water Conservation District (see "Recommended local resources" at the end of the workbook). They may advise you to hire a certified pesticide applicator.</p>		

Beneficial insects

How to attract beneficial insects: Most feed on nectar or pollen at some point in their lifecycle, so your garden plan should include herbs and flowers with different heights and bloom times. You can plant them in containers and move them as needed. There are many fantastic flower varieties for our area. Some suggestions: Alyssum, bee balm, coneflowers, marigolds, sunflowers, tickseed and zinnias.

Herbs do extremely well in our area and can provide both for the beneficial bugs and for you! Cilantro and parsley are two good choices because they bloom in early spring when there aren't many other flowers.

Name	Well-known types	How they help you
<p>Assassin bug</p> 	<p>Species include the wheel bug and milkweed bug.</p> <p><i>Image of wheel bug: "Ariulus cristatus, Wheel bug #1" by David Illig is licensed under CC BY-NC-SA 2.0.</i></p>	<p>They impale, liquify and suck up the insides of pest insects, including aphids, leafhoppers, caterpillars and Japanese beetles.</p>
<p>Beetles</p>  	<p>Most beneficial beetles are nocturnal, so you won't see them. One well-known type is the ladybird beetle, or ladybug.</p> <p><i>Image: "Soldier Beetle - Podabrus sp., probably brunicollis, Felsenthal National Wildlife Refuge, Crossett, Arkansas" by Judy Gallagher is licensed under CC BY 2.0.</i></p> <p><i>Image of native ladybug: "Coleomegilla maculata, U. Maryland, back 2015-07-10-16.38" by Sam Droege is marked with Public Domain Mark 1.0.</i></p>	<p>While some beetle species are pests, most prey on soft-bodied pests like cutworms and slugs. Soldier beetles, which feed on nectar and pollen, are also pollinators.</p> <p>Ladybugs prey on aphids, spider mites, scale insects, whiteflies, leaf beetle larvae, some insect eggs and small caterpillars. They also feed on nectar and pollen.</p> <p>Two ladybug species are exceptions: The Mexican bean beetle and the squash beetle are terrible pests.</p>
<p>Flies</p> 		<p>Syrphid flies (top image) prey on aphids.</p> <p>Tachinid flies lay eggs in gypsy moth caterpillars, Colorado potato beetle larvae, Japanese beetles, squash bugs and stink bugs. The hatched larvae then use the host insect for food, killing it.</p>

Continued on next page

<p>Green lacewings</p> 	<p><i>"Close-up macro shot of a Common Green Lacewing/ Chrysoperla carnea" by Ivan Radic is licensed under CC BY 2.0.</i></p>	<p>Larvae prey on many garden pests, including aphids, mites, mealybugs and scales. Some adult species also prey on insects; others feed on pollen and nectar.</p>
<p>Wasps</p> 	<p>Paper wasps, hornets and yellowjackets. Later in the growing season, yellowjackets may become too aggressive to tolerate.</p> <p><i>"Braconid Wasp Ovipositing" by treegrow is licensed under CC BY 2.0.</i></p>	<p>They prey on many pests, including beetles and stink bugs. The Braconid wasp injects its eggs in living caterpillars. The larvae feed on the caterpillar, then spin their cocoons – which look like rice grains – on the back of the dying caterpillar. (See image of tomato hornworm caterpillar in “Garden pests” above.)</p>

Keep track all year of your garden’s visitors – both friend and foe. There are pages in the Garden Journal to note your observations and any preventative or management steps you took.

Integrated pest management

Integrated pest management (IPM) is a common-sense, science-based approach to managing pests, diseases and weeds in your garden. When you use IPM, you take a holistic look at your garden within the broader environment. This perspective will guide you as you need to make decisions to keep your garden healthy and thriving.

At the heart of integrated pest management is the understanding that **pests are not completely eliminated**. Gardeners following IPM accept a certain number of pests and a certain level of damage to their plants. By doing this, they don’t need to take drastic action that could be harmful to the larger environment. They also use techniques (described below) to keep threats in check and to avoid infestations.

The steps of IPM are as follows:

1. **Knowledge.** Vigorous plants are more resistant to pests and disease, so educate yourself about the plants you want to grow, including their soil, light, space and other growing requirements. Know what insects may be attracted to these plants through the plants’ full lifecycles. Find out if insect- and disease-resistant varieties are available. Learn what your garden can offer in terms of light and soil conditions and be realistic about space.

Know how to prepare your soil and keep it healthy. Plant crops with similar water and nutrient needs together, and rotate appropriately.

2. **Monitor.** The single most effective thing you can do to ensure a successful garden is to check your plants regularly, daily if possible. This practice will help you notice changes in your plants early and stay ahead of pests and diseases. It also will make it easy to remove weeds when they are small and easy to pull out.
3. **Decision-making.** When pests arrive, use the knowledge you've acquired from education and observation to decide what action to take. "None" is sometimes the right answer.
4. **Action.** Multiple tools fill your pest-response toolbox and are discussed below.
5. **Records.** Keep track of what you observe, what you did in response, and when. This will help you anticipate problems in future growing seasons, as well as remind you what worked, what didn't, and what plant varieties were especially resistant or vulnerable. Good records also will alert you to the dates of greatest infestation or disease so you can adjust your planting calendar.

IPM uses natural controls and common-sense practices to minimize pest damage. These include:

Physical barriers. Cardboard tubes around seedling stems and foil collars around vine bases will deter some pests. Netting, mesh screens and mesh fabric can protect plants from insects, birds and other wildlife; however, remember to remove them when plants are flowering and need to be pollinated.

Biological control. Rely on natural predators and parasites to manage the pest population. Lure them by planting a variety of flowers and herbs. Don't buy beneficial insects unless you're using them in an interior space like a greenhouse or growbox. If you put them in your garden, they won't stay once they've eaten up your infestation. Also, purchased insects can introduce parasites or diseases from the locations where they were collected.

Traps. Items like overturned pots, newspaper and cardboard, and boards will attract earwigs, slugs, snails and sowbugs overnight. Collect them in the morning to feed to pet frogs, toads, turtles, and fish, or destroy them with boiling water.

Hand-picking. During your daily monitoring, check plants – including the underside of leaves – for insects, eggs and caterpillars. Pick off the pests and crush them or use a stick to knock them into a bowl of soapy water and drown them. If the bowl has a lid, you can leave it in the garden.

Crop rotation. Don't plant the same crop in the same place every year. Rotate to deprive specialized pests of their food sources.

Proper landscape maintenance: Promote air circulation by spacing your plants sufficiently, thinning seedlings, and pruning as needed. Remove infected plant parts. Water deeply and as close to the roots as possible. If you must water overhead, water in the morning so leaves have time to dry.

Build and maintain healthy soil. Healthy soil leads to healthy plants, which are less vulnerable to pests and disease. Regularly add organic matter and grow winter annual cover crops to provide additional organic matter and to keep the soil covered. Use mulch to cover soil, reduce splashing when watering, and to suppress weeds.

Use chemicals as a last resort. Chemicals can negatively affect you if you breathe them in or absorb them through your skin. They may leach out of the soil into groundwater, and excess will run off your soil into local waterways. They also take a long time to break down, so can remain in your environment for years.

Insecticides don't single out specific species or just kill pests. They'll kill any insect, including beneficials like butterflies and ladybugs. Additionally, insecticide use leads to a build-up of resistance among pest species.

We're not saying to never use pesticides. There are situations when nothing else will work, such as when the population grows beyond what you can manage. But there are ways to minimize their impact:

- Use the least toxic option available, and the more targeted application, the better (versus broadcast applications). Remember that even organic pesticides are toxic chemicals, although their toxicity is usually lower than that of synthetic chemicals.
- Don't apply if rain is in the forecast.
- Read the label and follow the directions. **More is not better.** More can mean toxicity in your harvested crops and leave residues on your hands.
- Hire a certified pesticide applicator.

Preventing and managing diseases

When you see damage on your plants, you have to determine whether it was caused by a pest, an insect or by something else. Virginia Cooperative Extension has excellent resources to help you do this, including a website for diagnosing plant problems (see “Book and online resources”). Some simple reminders for thinking through what the cause could be:

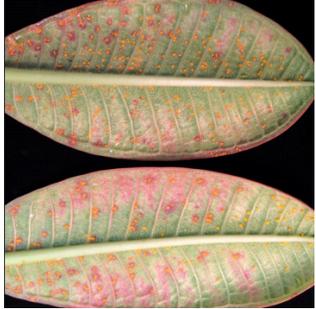
- Diseases caused by fungus generally produce round spots on leaves, often with concentric rings around them; discolor or wilt leaves, and give stems with a papery texture.
- Diseases caused by bacteria can create swollen bumps called galls or weirdly shaped leaf spots and can lead to wilting or rot.
- Diseases caused by viruses can cause yellowing or mottled coloring, or can stunt or otherwise distort part of the plant. Because viruses live off plants, they don’t usually kill them – they just weaken them.
- Insects and their eggs are often easy to spot. You can also look for their waste (called “frass”), holes in and on the edges of leaves, and curled or puckered leaves.
- Damage can also be caused by string trimmers, deer browse, extreme weather, excessive or inappropriate use of pesticides and nutrient deficiencies. For that last one, send in a soil sample to Virginia Tech’s Soil Testing Lab; you can get kits from the local Extension office, the Fairfax County Master Gardeners or Hands On Harvests.

Remember to note in the Garden Journal any diseases that afflicted your plants and how you treated them.

Common diseases in Fairfax County edible gardens

Disease	How to identify it	What causes it	How to prevent and treat it
<p>Alternaria leaf blight</p> 	<p>On leaves: Small dark, ringed circles that often have yellow haloes. Also may appear on heads of brassicas, such as broccoli.</p>	<p>Fungus in the soil. Can be water- or airborne. Occurs in periods of high humidity and warm temperatures.</p>	<p>Space plants so air can freely flow.</p> <p>Remove affected plants and, if you touch infected leaves, wash your hands before touching healthy plants.</p> <p>If it affects a crop, don't plant that crop in the same soil for 3 years.</p> <p>Fungicides are preventative, so can't undo damage.</p>
<p>Blossom end rot</p> 	<p>Black patches on the blossom end (bottom) of the fruit. Common in tomato, pepper, eggplant, pumpkin, squash and watermelon. Can be confused with Alternaria, whose black spots have haloes and can appear anywhere on the fruit.</p>	<p>A shortage of calcium in developing fruits. It can be encouraged by low soil pH and a calcium deficiency, inconsistent or shallow watering, drought and/or excessive use of nitrogen fertilizers.</p>	<p>In a drought or if you aren't consistently watering, the plants may not be able to transport calcium in the soil to the enlarging fruit. Regular and deep watering will resolve blossom end rot if calcium levels are adequate.</p> <p>If you suspect pH or calcium issues, get a soil test kit.</p> <p><i>Note: Claims that Epsom salt can treat blossom end rot are false.</i></p>
<p>Botrytis blight (aka gray mold)</p>	<p>Tiny spots on fruits, leaves and petals turn brown and look water-</p>	<p>Fungus overwinters on dead plant debris.</p>	<p>Remove old blossoms, dying plant parts and fallen leaves.</p>

	<p>soaked. Infected plant parts look fuzzy.</p>	<p>Occurs in humid or moist conditions.</p>	<p>Adequately space plants for good air circulation.</p> <p>Water in the morning, not at night.</p>
<p>Downy mildew</p> 	<p>Leaves may become yellowish or speckled or edges may curl. Light green to yellow angular spots on the tops of leaves. Faint gray fuzz on undersides of leaves.</p> <p>You are most likely to see this on basil.</p>	<p>Fungus. Spreads by air, splashing water or on hands and tools. Thrives in wet weather or high humidity.</p>	<p>Plant resistant varieties.</p> <p>Plant in sunny locations and space the plants far enough to allow air to circulate.</p> <p>Water the roots in the morning; don't get foliage wet.</p> <p>Wash your hands after handling any infected plant parts.</p>
<p>Powdery mildew</p> 	<p>At first, it appears as white, powdery spots on leaves and shoots. The spots then spread across leaves and stems.</p> <p>One strain, which affects artichokes, onions, peppers and tomatoes, appears as yellow patches on leaves.</p> <p>Affected leaves may turn yellow and fall off or become distorted.</p>	<p>Different species of fungus; each targets specific plants. Unlike other fungi, these do not need moist conditions. They favor moderately warm temperatures and shady spots. They also do not require water to spread and infect. They are windborne.</p>	<p>Plant resistant varieties or avoid the most vulnerable types.</p> <p>Plant in full sun and with plenty of room for air circulation.</p> <p>If fertilizing, use a slow-release type.</p> <p>Overhead sprinklers may wash spores off plants, but can cause other problems.</p> <p>Fungicides must be applied at first indication of disease.</p>
<p>Rust disease</p>	<p>Yellow, orange or red spots. Small, swollen blisters, like pimples, on leaves, stems or flower bases. Red, orange or brown</p>	<p>Fungus. Spores are spread by the wind or splashing water. To start a new infection, they need a thin layer of water on leaves.</p>	<p>Buy resistant varieties and don't buy plants with spots on the leaves.</p>

	<p>powdery spores on the underside of leaves.</p> <p>Usually doesn't significantly damage plant, but severely infected leaves may discolor or fall off.</p>		<p>Pinch off infected leaves, but not more than 1/3 of the plant. Trash removed leaves; do not compost.</p> <p>Because rust can overwinter, at the end of the growing season, cut the infected plants at the base and throw away the debris.</p>
---	---	--	--

Plant supports and protection

With a little bit of creativity and not much money, you can build your own devices to protect plants from pests. Many simple designs are available in garden books and online, including YouTube. Lean toward those that use these materials:

- Heavy duty materials that can tolerate heat, wind, rain
- Heavy gauge wire
- Untreated wood
- Rustproof metal

Trellises, stakes and cages

Trellises, stakes and cages support tall plants like tomatoes and vining plants like cucumbers and squash. They keep plants and their fruit off the ground, where they can spoil from contact with the wet soil, and make the free flow of air easier. Many options are for sale at hardware stores and nurseries, but it can be simple and often more effective to build your own.

A **garden trellis** is a vertical support for plants to climb. It has openings no more than 4” across for vining plants to cling to and needs to be grounded by being driven deep into the soil.

You can often find trellises in thrift stores, in swapping sites like Facebook’s Buy Nothing groups, or on community sites like NextDoor. They’re easy to make with thick sticks, bamboo, PVC pipe, rebar or other similar materials. The one in the photo is built as a lattice. Variations include building a frame and covering the opening with netting or building tripods with the vertical posts lashed together at the top. This type of support is good for cucumbers, pole beans and peas.



The same types of materials can be used as **vertical stakes** in the garden. They need to be driven at least 6 inches into the ground. Pole beans will grow freely on them (although they may need to be trained at first), and tomatoes, peppers and tomatillos can be tied to the stakes with garden tape or another material that’s wide and won’t cut into the stem. You may be surprised at how tall the stakes need to be; 8-foot stakes driven 2 feet into the ground are about right for indeterminate tomatoes (tomatoes that produce fruit all season).



Image: University of New Hampshire Extension

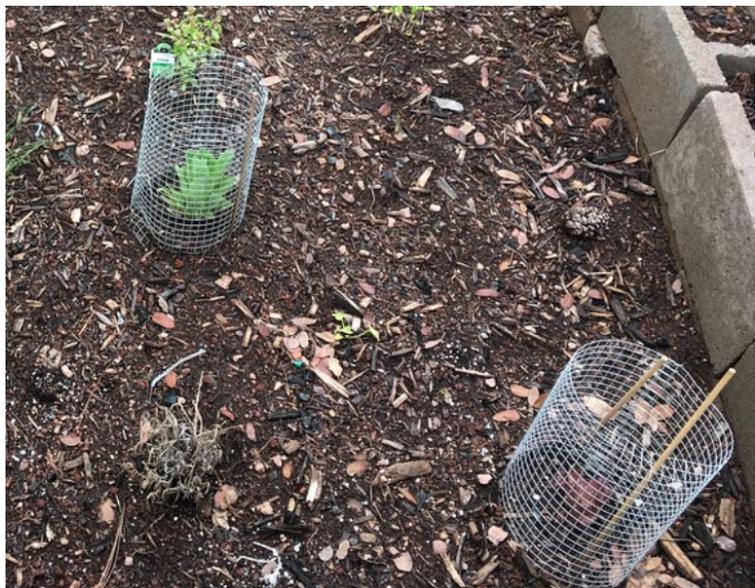
This drawing is of the **Florida weave**. Tall stakes are positioned between every 1-2 tomato seedlings. As the seedlings grow, twine is tied from one end to the other, alternating in front and behind stakes as it goes. To secure

the twine, loop it around each stakes once before going to the next stake.

At the other end, double-loop the twine, then head back to the first stake by continuing the weaving pattern. The result will be a line of supporting twine in front and behind each plant. Set up the first weave when the seedlings are about a foot tall, placing the twine about three-quarters of the way up the plants. If the plants don't flop over, you've done it right. Continue in this way as the plant grow, weaving new twine about every 10 inches.

Heavier produce, like squash and melons, need **cages** to provide stronger support. Use chicken wire or a similar material to create a cylinder around the plant. For more stability, drive stakes into the ground and bind them to the cage.

As the fruit grows, you can devise hammocks out of nylons, mesh bags and other materials to support them. Make sure that the sling will drain, not capture, water.



Row covers and tunnels

Row covers serve many purposes: They protect your plants from pests, including the four-legged kind, by creating a physical barrier. They shield against wind but allow sunlight and water to pass through. As temperatures drop, they can act like a blanket.

There are many variations, depending on your purpose. A fine mesh netting blocks insects. Frost cloth adds warmth while letting in light and water. Plastic protects against wind and can create a greenhouse of warmth.



The covers, which can be purchased in various degrees of thickness, may be draped over hoops that add height for the plants underneath. These structures are also called low tunnels. The hoops can be made with PVC pipe, flexible branches, or heavy-gauge wire. Long-time gardener and local high school teacher Jim Howland uses half of a megasize tomato cage to support coverings over his winter greens (*see Jim's photo to the left*).



"Row Cover Of Leafy Vegetables In The Subtropics = 被覆資材の種類" by JIRCAS is licensed under CC BY 2.0.

You also can place the material directly over the plants and hold it down with weights like bricks or stones. Leave some slack so the plants have room to grow. This option works well for low-growing, flexible crops but isn't a good choice for tall or sensitive plants like spinach. If your goal is to keep out insects, you'll need to bury the edges of the material.

When to harvest your vegetables
The best time is early morning after the dew dries.

Asparagus	Snap spears at ground level when they're about the width of your pinky finger. Harvest for 4-6 weeks, then stop so plants can replenish.
Beans (bush and pole)	Gently pick before pods are bulging, usually 1-2 weeks after flowering. Pick pole beans regularly to encourage continued production.
Broccoli	Using a sharp knife, cut the head from the stem when the individual florets are about the size of a match head. Harvest immediately if the flowers start opening or turn yellow.
Cabbage	Gently squeeze the head. If it feels solid, it's ready.
Carrots	You almost always have to pull one to know for sure. If you can, leave them until after a light frost. That sweetens their flavor.
Cauliflower	Cut from the stem when the head is full and smooth. If you wait too long, brown spots will appear on the head.
Corn	When the silks dry up and turn brown, test the ears by piercing a kernel with your fingernail. It'll exude a milky substance when the corn is ready.
Cucumbers	When you plant cucumbers, know what color the ripe fruit should be. While most varieties are dark green, some are pale yellow or almost white. A ripe cucumber will be firm and probably smaller than you think. Cucumbers that start turning orange are better left on the vine for seed-saving.
Eggplant	Cut from the vine when its slightly immature, firm and shiny.
Garlic	Clear dirt from the base of the leaves once they've flopped over and started turning brown. Dig them out – don't pull – and brush the dirt off instead of wash the head. Let the garlic dry out before storing.
Kale	To extend the harvest, pluck deep green, firm kale leaves but leave the whole plant in the ground. It will continue to produce leaves. Kale is a cool-season plant sweetened by frost; it's one of the easier crops to overwinter in Fairfax County.
Lettuce	Head lettuce should be pulled out once it feels firm. Harvest it before hot weather sets in; it will stop growing in the heat and go to seed (" bolt ") instead. For leaf lettuce, once the plant is about 4 inches tall, pluck the outer leaves. The inner leaves are younger and will continue to grow. Planting in partial shade, this lettuce may grow most of the summer, especially if you purchased a heat-tolerant variety.
Onions	Dig up onions when the tops fall over. Let them dry out before storing.
Peas	Unlike beans, pea pods should look full. However, they're sweeter when harvested before they've fully plumped up. You may need to taste them to determine readiness.
Potatoes	As soon as the plant flowers, you can dig up "new" potatoes. For fully grown spuds, wait until the flower has died and the stems turn brown. Start digging from the outside edge and move slowly to avoid slicing into the potatoes. Many gardeners prefer to plant potatoes in grow bags or other large containers so at harvest time they can empty the container onto a tarp and easily paw through the soil for the potatoes.

Pumpkin	You probably know a ripe pumpkin when you see one. Wait until the vine starts to die and you can't poke through the rind with your fingernail. Harvest before there's a hard frost.
Radishes	This is the best crop for anyone with a short attention span to grow. Most varieties are ready to harvest about three weeks after planting from seed. The ripe radish will begin to emerge from the ground. Harvest and plop another seed in the hole. You can also plant radish seeds once a week for continual harvest. Radishes become tough if left in the ground too long; if this happens, let them go to seed. The crisp, green seed pods are tasty and not as spicy as the radish. (You can also let some turn brown and crispy, then collect the seeds.)
Spinach	Start picking individual leaves once the plant is about 6 inches tall. Harvest the mature plant by cutting the stem at the soil line; be sure to do this before a flower stalk emerges.
Squash	Summer squash: This includes many types of squash, including patty pan, yellow and zucchini. Pick when you can still pierce the skin with your fingernail. Winter squash: Know the color of the ripened fruit, then cut from the vine when the squash is that color. Leave 2-3 inches of stem when you cut. Harvest before a hard frost. For better storage, let harvested winter squash – except for acorn squash – harden in a warm, dry spot for 2-3 weeks.
Tomatoes	Tomatoes come in many colors, so know what your ripe fruits should look like. Ideally, harvest tomatoes when they're this color, slightly soft, and almost jump into your hand when you gently twist them. Birds, squirrels and chipmunks also will be eyeing your tomatoes. You can pick the fruits when they start to blush, then place them in a sunny window safe inside to finish ripening. If you're growing indeterminate varieties (which produce fruit all summer and need staking), the plants may still be producing when nighttime temperatures dip into the low 30s. Temperatures below 32°F can kill unprotected tomatoes unless they're a cold-tolerant variety. As cold weather approaches, you can pick green tomatoes and put them in a paper bag or cardboard box. They'll ripen in the dry, contained space.
Watermelon	Cut from the vine when the underside color changes from greenish white to yellow or cream. The rind often changes from glossy to dull when the fruit is ripe.
Zucchini	See "Squash"



Section 4. Fall in the garden

We're lucky. Fairfax County has a long growing season – around seven months! If you're a new gardener, the growing season may last longer than you expect. Our first frost usually isn't until mid-November. Warm, sunny days will fuel the garden even as nighttime temperatures drop. Beans, tomatoes and tomatillos are some of the crops that can still be growing strong as Thanksgiving approaches.

Important dates for

Zone 7a/b gardeners:

Last frost date: April 15

First frost date: Nov. 15

To plant a fall garden of cool-season crops, you'll need to make decisions about how to create space for them. Many fall vegetables have to be planted while your summer crops are still producing. It can be hard to remove plants that are still healthy and growing.

To make it easier to decide whether to plant fall crops, how many and where, consider these questions:

- How much more yield are you likely to get out of each summer crop? Keep in mind that as the days shorten and temperatures decline, plants will grow more slowly. Growth can take two weeks longer in autumn. You may want to give the extra time to the fall crops.
- Do flowering plants have enough time to grow fruit to maturity? This is an especially important question to ask about slow-growing crops like winter squash and melons.
- Can you maximize space by planting low-growing cool-season crops under tall warm-season crops?
- By when do you need to start planting?

The last planting dates in the table on the next page will help you figure out when garden space needs to be freed up. You might be surprised at how early some crops should be started; this is especially true of the larger vegetables. Pay attention to these dates. If you cut your timing too close, you risk losing the crop to frost.

Garlic and onions are included in the table and will be discussed in more detail afterward. Plan carefully for where they'll go because they need a lot of time – they won't be ready for harvest until May or June.

Common crops planted in fall		
Crop	Last planting date	Cold-hardiness*
Beets	Sept 30	Light frost
Broccoli	July 31 (transplants by Aug 31	Light frost
Cabbage	Aug 31	Mid-20°F
Carrots	Early September	Light frost
Cauliflower	Mid-August	Light frost
Collards	Mid-September	Down to 20°F
Garlic	By Thanksgiving (don't plant before Oct 1)	Overwinters
Kale	Mid-September	Down to 20°F
Lettuce	Early October	Light frost
Onions (bulbing)	Oct 31 (don't plant before Labor Day)	Overwinters
Radishes	Oct 31	Light frost to 20°F
Spinach	Oct 25	Light frost to overwinters
Swiss chard	Aug 25	Light frost
Turnips	Oct 31	Light frost
*Cold-hardiness can vary by variety, so read the seed packet or look up your specific varieties to confirm what temperatures they'll tolerate. Also, many crops can extend their production time if protected by frost cloth or enclosures.		

Planting bulb onions and garlic

There are many types of onions, but the focus here is on the bulbing onion. In the fall, onion seeds can be sown or you can plant onion sets, which are small, dormant onions. There are three types: short-day, long-day and intermediate. Here in the Mid-Atlantic, gardeners can try all three, although if you select a long-day variety, pick one with fewer days to harvest.

A cold frame is generally recommended if starting from seed, or you can start the seeds inside in trays and under a grow light. Transplant in early spring when the seedlings are as big around as a skinny pencil. If you use onion sets, plant them in the fall about 2 inches in the ground, with the pointy end up.

Onions like moisture but do not like weeds. They'll indicate when they're ripe: the shoulders of the bulbs will emerge from the soil and their tops will turn brown. Gently dig them up and let them completely dry. After that, you can remove the outermost skins, brush off the dirt and cut all but 1-2 inches of the stem. Store in a cool, dry place or a mesh bag.

Garlic also is available in different types: soft-necked and hard-necked. The soft-necked can be braided, stores well, and thrives in temperate winters. Hard-necks produce fewer, larger

bulbs but don't store as well. Although they generally prefer colder winters than we have, local gardeners have had luck with varieties such as German Extra Hardy and Music.

Plant garlic by breaking up the head into individual cloves. They need to be planted more deeply than onions – about 3 inches underground, also with the pointed end up. A few inches of straw provides an easy mulch. Garlic must be planted in full sun, but you won't see anything until skinny shoots emerge in the spring. At that point, remove or reduce the mulch.

Hardneck varieties grow a flower, called a scape. Commonly this scape is cut while still curly to save nutrients for the bulb; they're edible and give a light, garlicky flavor to salads and stir fries. For both garlic types, when three leaves on a plant have dried up and turned brown, loosen the soil and gently lift the garlic head up. Dry out of the sun until the skin is papery, then brush off the dirt and clip the roots. Store in a cold place; they can sprout in 40°-50°F temperatures. Don't refrigerate.

Tips for fall gardening

- Download a weather app, bookmark the National Weather Service's website, subscribe to a nursery's email list or pay attention to the radio; these sources will announce frost alerts. When frost is forecast but temperatures will be above freezing, you can either cover your sensitive crops or harvest them. These include cucumber, eggplant, melons, peppers, squash and tomatoes.
- If the days are still warm and you just want to protect your sensitive plants from an occasional light frost before fully harvesting them, don't buy garden fabric. Use whatever you have at home: baskets, burlap, bedsheets or blankets, boxes, buckets. There probably are other items that don't start with the letter "b," too.
- Replenish your soil's nutrients by spreading 1-2 inches of compost or fully composted manure. After planting fall crops, lightly mulch the soil. The goal is to keep the soil cool and moist, but not inhibit the seeds from emerging. In extreme heat, you may want to use straw instead of shredded hardwood or leaves.
- Because fall crops are mostly planted when it's hot and dry, sow seeds after a rain or water the soil the day before.

Extending the season

Even though our growing season is long, sometimes we want it to be even longer – or year-round. Many materials and structures are available to make this happen. As mentioned in Section 3, row covers or low tunnels draped with frost cloth can boost the temperature.

Another good insulator is called a cloche (pronounced “klōsh”). The name of a bell-shaped hat, a cloche is a glass or plastic covering shaped like a dome that can protect an individual plant or a row-sized frame covered in clear material. Cloches are small, portable greenhouses that use the sun’s energy to create a warm climate. You can make your own out of well-rinsed, gallon-sized milk cartons or one-liter soda bottles. Make sure cloches are secured to the ground so they don’t blow away in a strong wind.



Here's an example of a cold frame at the US Botanic Garden's Bartholdi Park in D.C. Photo by USBG vegetable gardener Thomas Crawley.

A more permanent season-extending structure is a cold frame, which is usually built from four wooden sides with a glass or plastic cover. The frame should face southeast and be angled so that the cover slants. These two adjustments will maximize sunshine into the box.

Because they are so sturdy, cold frames provide much

greater protection from wind, frost and cold temperatures than other extenders.

Any structure used to protect plants from the cold needs to be monitored. Local temperatures can be unpredictable; warm, sunny days will cause heat to build up under the covers. Cloches and row covers may need to be removed or tilted to allow air flow.

This guide doesn’t cover greenhouse gardening. The range in greenhouse models is vast, and the expertise required to grow in the larger ones calls for a manual of its own. Fortunately, the U.S. Botanic Garden has one. You can find a link to it below under “Book and online resources,” along with other greenhouse resources.

Seed-saving

Gardeners love to share seeds and plants with each other, so seed-saving is a great way to get to know new people. But that's just one reason for saving seeds from your garden. Here are some more:

- You don't have to pay for seeds if you save and trade them.
- You can help save varieties not sold in grocery stores.
- The plants that grow from saved seeds learn how to adapt, or live successfully in your garden's microclimate. The type of soil, the amount of sun and rain, and the temperatures are different in every garden.
- You can affect a variety's adaptation by selecting seeds from plants with favorable traits. You may notice that one plant resists disease, tolerates drought or is especially productive. Tie a piece of yarn around that plant's stem so you'll remember to save its seeds.

The most reliable seeds for saving are from open-pollinated and heirloom plants. Look for seed packets or seedlings marked "OP" or "heirloom." These plants are just like their parent plants, and their children and grandchildren and so on will also be the same. Unless you like experiments in the garden, don't buy seed packets that say "hybrid" or "F1" if you plan to save seeds. In a couple of years, you could be growing a completely different variety!

Also, plant just one variety of each crop or plant them far apart so they don't cross-pollinate, which is when plants get mixed up with each other. You can look up online how far apart varieties should be planted from each other.

When to harvest seeds

With some plants, like tomatoes and winter squash, it's easy to tell when the seeds are ready for harvest. They're ready when the fruit is ripe. Other vegetables need more time. If you want to save these vegetables' seeds, you end up growing some plants just for the seeds and not to eat. Crops in this category include peppers, whose seeds are ready when peppers are shriveled on the stem, and cucumbers, whose bloating and unexpected coloring tell you the seeds are ripe.

See the table on the next page to learn what crops are easy to start with and a trick for successfully saving tomato seeds. "Book and online resources" at the end of the workbook also has more information about how to save seeds.

Easy crops for seed-saving			
Type	Grows in warm or cool weather?	How to know when the seeds are ready to be picked	How long the seeds should be good for, if saved in a cool, dark and dry place
DRY SEEDS			
Beans	Warm, except fava beans	Pods start to turn brown and feel like leather.	4 years
Lettuce	Cool	When you can see the hard, brown seeds in the white feathers of the flower.	2 years
Peas	Cool (except sweet peas, which are a different species)	Pods start to turn brown and feel like leather.	3 years
Peppers	Warm	After the fruits have stopped changing color and are wrinkled.	2 years
Sunflowers	Warm	When you can see the seeds set in the head and they are hard, but before the birds take them all!	2 years
WET SEEDS			
Cucumbers	Warm	Cucumbers grow very fat and turn yellow, orange or brown.	3 years
Squash/pumpkins	Warm	Squash (pumpkins are a squash) become very big and hard. The vine will be brown and crispy and maybe even breaking.	3 years
Tomatoes	Warm	The tomatoes are ripe and ready to be picked.	4 years

Preparing tomato seeds

After harvesting wet seeds, you need to thoroughly rinse them to remove all bits of the fruit. For tomatoes, this isn't good enough. Tomatoes need extra attention. A special gel coats tomato seeds to stop them from sprouting inside the fruit, where it's very warm. Before drying and storing the seeds, you have to conduct a simple science experiment to remove the gel:

1. Scoop the seeds into a glass jar.
2. Cover the jar with a paper towel or cloth and fasten it with a rubber band.

3. Let the mix sit for a few days, stirring it twice a day.
4. When it starts to smell OR when it stops bubbling, pour the mix into a strainer that the seeds can't get through. Rinse repeatedly in cold water until you can't feel the gel any more. Spread the seeds onto a flat surface, not touching, and let them dry for about two weeks.

Putting the garden to bed

Eventually, unless you're a diehard enthusiast, the garden season comes to an end. It's time to prepare the garden for its long winter nap. You may need the rest, too.

Cut at soil level any plants still rooted in the ground and either put them on top of the soil or in the compost pile. Exception: All pest-infected or diseased plants should be pulled out completely and thrown away. Remove any remaining weeds and pull up all stakes and trellises not still in use. Rinse them off, then put them away.

Give your garden a vitamin boost by spreading a layer of compost. The nutrients will have ample time to enrich the soil. Fall is also prime time for taking a soil test; any recommended amendments will have months to affect the soil's chemical composition.

Plant cover crops in any beds or plots you don't plan to use. If you don't remember cover crops, which are grown to benefit the soil, give yourself a refresher in Section 3. And if you don't want to plant cover crops, cover the soil with mulch, shredded fall leaves or straw for the winter.

Finally, clean, oil, sharpen and repair tools before putting them away until spring. Then go inside, start planning for the next year and wait for the seed catalogs to arrive.



Looking ahead: Year 2 and beyond

Congratulations!

Now you have a full season of gardening under your belt! We hope it's been a fulfilling, food-filled year. Don't be disappointed if crops failed or insects took over. Mother Nature is unpredictable and there's always more to learn. You'll use your new knowledge and Garden Journal notes to set yourself up for a more successful garden next year.

For a fun way to celebrate the start of the second year of your community garden, plan a seed swap in late January or transplant swap in early March. Invite all the gardeners to bring their extra seeds or seedlings. Put them all on a table and see who wants what. You can combine this with a potluck or invite a garden speaker.

Please let us at the Northern Virginia Soil and Water Conservation District know how your gardening is going: email us stories and photos, let us know what you learned or want to learn, invite us to your garden, and share with us on Facebook. And, of course, reach out any time with your questions and requests for support.

We want all Fairfax County residents to be able to eat fresh food and to have a space to grow it if they choose.

Thank you for helping to make these goals a reality.



Willie Woode, Executive Director

Stacey Evers, Urban Agriculture Specialist

12055 Government Center Parkway
Suite 905, Fairfax, VA 22035

ConservationDistrict@fairfaxcounty.gov
<https://www.facebook.com/nvswcd>

We promote soil and water conservation in Fairfax County and beyond. We are innovators. We promote hands-on conservation. We provide technical expertise. We develop young environmental leaders. We help you bring conservation home.



GARDEN JOURNAL

This is your place to keep notes about what you're doing and observing in your garden. You can fill out the pages right here in this workbook, or you can copy them to make a new journal every year.

Record-keeping matters! Your future self will be grateful to be have this log of what happened in previous growing seasons -- what you planted where, what unwanted visitors showed up and when, which of your responding actions worked and which didn't.

Some pages in the workbook that you might want to refer to while filling out these pages include:

- Map of your entire property, p. 15
- Parts of a plant and the function of each, p.27
- Cool and warm crops, p. 29
- Plant families, p. 44
- Common weeds, p.58
- Garden pests, p.68
- Beneficial insects, p. 71
- Diseases, p. 77
- When to harvest vegetables, p. 83
- Common fall crops, p. 86
- Easy crops for seed-saving, p. 90

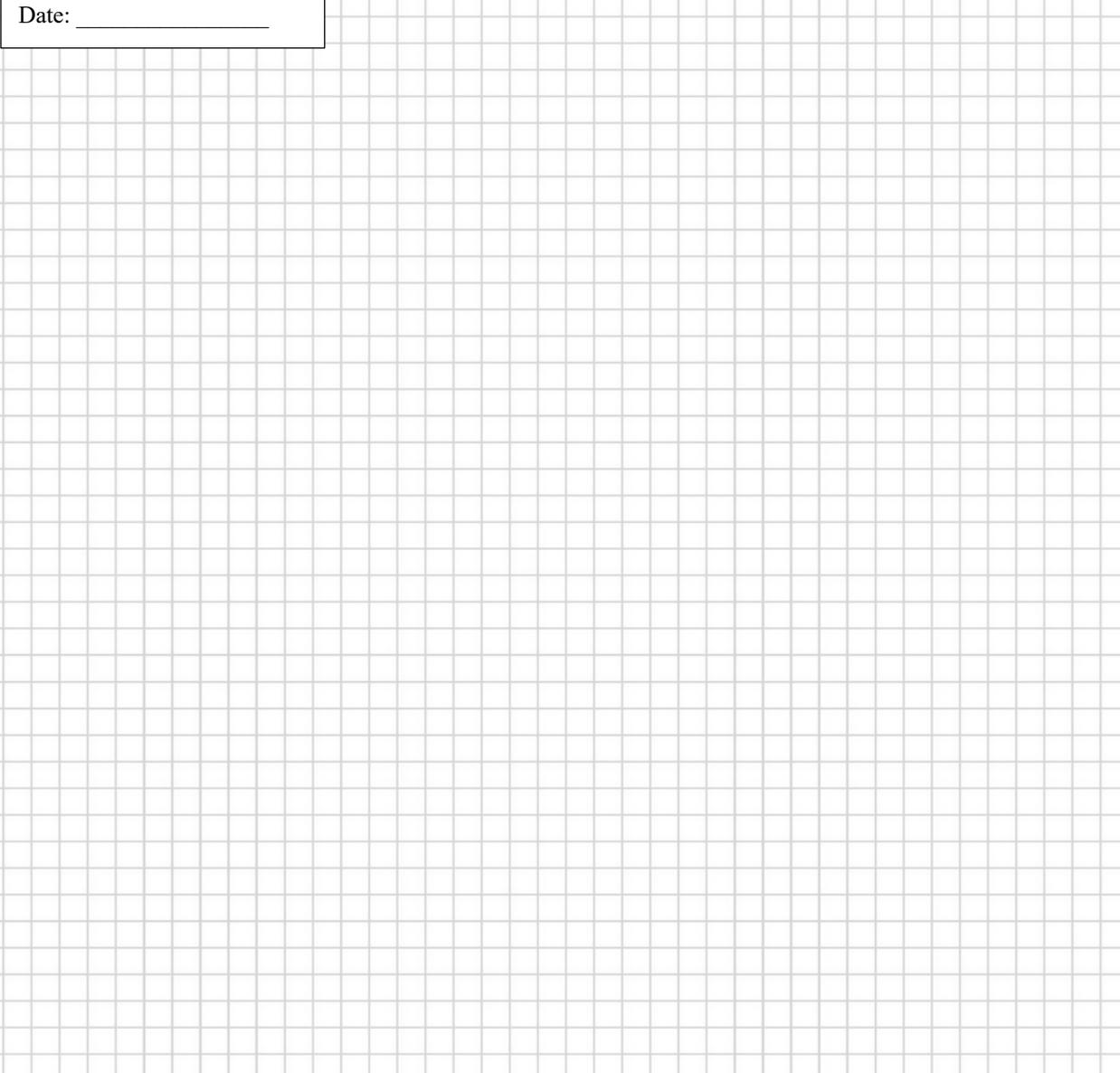
Two other helpful planning resources:

- Fairfax County Master Gardeners online garden calendar, outlining each month's gardening chores. <https://fairfaxgardening.org/november-garden-calendar/>
- "Vegetables Recommended for Virginia" from VCE. <https://jccwmg.org/wordpress/wp-content/uploads/2017/03/Vegetables-Recommended-for-Virginia.pdf>

This page is for thinking through what you'll plant in your raised beds or in-ground rows. (See the next page for an example.) Refer to your drawing in Section 1 of your overall garden area. If you want, add your planting areas to that drawing. An example plan is on p. 43. On this page:

- Pick a measurement for the squares to stand for. If the squares are equal to 1 square foot, a bed 4 feet by 8 feet would be 4 squares by 8 squares. Draw your beds or rows to scale. (If you need more paper, another page like this is at the end of the section.)
- Mark North, South, East and West. The tallest plants should be on the north or east, unless you want them to shade their neighbors. In that case, plant them in the south and west.
- Using the previous page's list of what you want to grow, sketch here what you'll plant where. Use a pencil so you can erase. Number the beds to track what's planted in each.

Date: _____



Glossary

Annual: A plant that goes through its full lifecycle in one year.

Biennial: A plant that goes through its full lifecycle in two years.

Bolt: A plant's sudden production of flowers, then seeds. Bolting often causes the plant to taste bitter. For cool season crops like cilantro, the onset of summer temperatures causes bolting.

Cover crop: A crop grown for the benefit of the soil and usually sown outside the regular growing season. You can also grow them to fill unplanted gaps in a garden plot or in areas where you want to improve the soil. Cover crops provide many services, including replenishing and protecting the soil.

Determinate: A variety that produces a single big crop and then is done. This term usually is used in reference to bush beans and tomatoes.

Direct sowing: Planting seeds directly in the garden soil outside. Some plants will grow beautifully from being directly sown, but others are better off starting outside and then transplanting into the garden.

Hardening off: The process of setting plants outside that have been growing inside. They are set out for gradually longer periods of time so they can get used to outdoor temperatures and wind.

Indeterminate: A plant variety that produces fruit all season. This term is usually used in reference to pole beans and tomatoes.

Interplanting: Growing more than one plant in the same place. This is done to maximize space and/or achieve some benefit, such as providing shade, support or weed suppression.

Overwinter: Grow over the winter. Some plants, like garlic, need a period of cold to grow. Other plants, like cold-hardy kales and spinaches, will continue growing from fall through the winter.

Perennial: A plant that lives for many years.

Rhizome: A horizontal underground stem.

Seedling: A young plant, often fragile.

Successive gardening: Planting new seeds or seedlings immediately after removing a plant.

Thinning: Pulling out some sprouts to create more growing space for those that stay in the soil.

Transplant: Planting outside a plant bought at a nursery or started by seed inside; to move a plant's location.

Zone, plant hardiness: Zones created by the USDA to help gardeners determine whether a plant will thrive in its area. Most of Fairfax County is in 7a; the southeastern part of the county is in 7b.

Book and online resources

Calendars

“Between the Rows,” Master Gardeners of Northern Virginia’s monthly online newsletter with timely To Do lists and articles relevant to vegetable gardening that month.

<https://mgnv.org/plants/veg-herbs/between-rows/>

Fairfax County Master Gardeners online garden calendar, outlining each month’s gardening chores. <https://fairfaxgardening.org/november-garden-calendar/>

Composting

“Making Compost from Yard Waste” by Ed Rishell, Extension Master Gardener.

https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/426/426-703/SPES-393.pdf

“Using Compost in Your Landscape” by Virginia Cooperative Extension.

https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/426/426-704/426-704%20Workv1.pdf

Cover crops

“Choosing Cover Crops,” Piedmont Master Gardeners.

<https://piedmontmastergardeners.org/choosing-cover-crops/>

“How to turn in your cover crops,” New York Botanic Gardens. 3:22-minute video on YouTube.

<https://www.youtube.com/watch?v=KUWsC1IgMMQ>

DIY (Do It Yourself)

“How to Florida Weave Tomatoes,” YouTube video with Louisiana State University Ag Center horticulture agent Joe Willis.

<https://www.youtube.com/watch?v=fayxT-telMA>

“How to Make a Rain Gauge,” South Carolina Botanical Garden at Clemson University.

https://www.clemson.edu/public/scbg/_files/pdfs/rain-gauge-tutorial.pdf

Food insecurity

The Route 1 Lived Experiences Report: Food Insecurity During the Covid-19 Pandemic by the Arcadia Center for Sustainable Food and Agriculture. April 2021.

<http://www.arcadiafood.org/sites/default/files/files/Route1%20Lived%20Experiences%20Report.pdf>

2019 Child Food Insecurity by Feeding America

https://www.feedingamerica.org/sites/default/files/2019-05/2017-map-the-meal-gap-child-food-insecurity_0.pdf

Hunger Report 2021 by the Capital Area Food Bank

<https://hunger-report.capitalareafoodbank.org/>

USDA Food Desert Map

<https://www.ers.usda.gov/data-products/food-access-research-atlas/go-to-the-atlas.aspx>

Maximizing garden space

“How to grow a Three Sisters Garden,” Native Seeds SEARCH,

<https://www.nativeseeds.org/blogs/blog-news/how-to-grow-a-three-sisters-garden>

Intensive Gardening Methods (Publication 426-335), Virginia Cooperative Extension

https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/426/426-335/426-335.pdf

Includes information about how far to space seeds for intensive growing and garden plans for maximum harvest.

Nutrients/fertilizers

“Fertilizing the Vegetable Garden,” Virginia Cooperative Extension.

https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/426/426-323/SPES-295.pdf

Fertilizing Vegetables,” University of Maryland Extension.

<https://extension.umd.edu/resource/fertilizing-vegetables>

Pest and disease management

“Alternaria leaf spot and head rot of Brassica crops,” University of Minnesota Extension.

<https://extension.umn.edu/disease-management/alternaria-leaf-blight>

“Blossom End Rot on Vegetables,” University of Maryland Extension.

<https://extension.umd.edu/resource/blossom-end-rot-vegetables>

“Diagnosing Plant Problems,” Virginia Cooperative Extension.

<https://www.pubs.ext.vt.edu/426/426-714/426-714.html>

“Fall Crop Pests and Tips and Tricks for Reducing Overwintering Pests,” by Kirsten Conrad, Agriculture Natural Resource Extension Agent, Virginia Cooperative Extension.

<https://mgnv.org/plants/veg-herbs/between-rows/beating-the-bugs/septober-fall-winter-pests/>

Home Vegetable Insects, “2022 Pest Management Guide,” Virginia Cooperative Extension.

https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/456/456-018/ENTO-462-B.pdf

“Organic and Biological Control of Plant Diseases,” PennState Extension provides information about specific organic methods for growing and maintaining healthy plants without using synthetic (man-made) fertilizers, pesticides, hormones, and other materials.

<https://extension.psu.edu/organic-and-biological-control-of-plant-diseases>

“Powdery Mildew on Vegetables,” University of California Agriculture and Natural Resources’ Statewide Integrated Pest Management Program.

<http://ipm.ucanr.edu/PMG/PESTNOTES/pn7406.html>

“Powdery Mildew vs. Downy Mildew,” University of Florida Institute of Food and Agricultural Sciences’ Extension Gardening Solutions. <https://gardeningsolutions.ifas.ufl.edu/care/pests-and-diseases/diseases/powdery-vs-downy.html>

Virginia Tech Insect ID Lab. For helping identifying an insect in your garden:

<https://www.ento.vt.edu/idlab.html>

“What’s Eating My [*Cucumbers, Tomatoes, Eggplant, Beans, Squash*]?” Video presentation by Kirsten Conrad, Agriculture Natural Resource Extension Agent, Virginia Cooperative Extension.

<https://mgncv.org/mg-virtual-classroom/ug-class-video/pest-management-veg-2020/>

Season-extending

“Extending Your Growing Season Into Winter,” by Jim Howland, Hands On Harvests.

<https://www.handsonharvests.org/post/extending-your-growing-season-into-winter>

“Tips for Selecting a Hobby Greenhouse,” Elizabeth Cornell Fake, Fairfax Master Gardener.

<https://fairfaxgardening.org/hobby-greenhouse/>

U.S. Botanic Garden Greenhouse Manual. <https://www.usbg.gov/greenhousemanual>

Seed-saving

National Seed Swap Day, seedswapday.blogspot.com, provides information about seed swaps across the country on January 30 of each year.

The Rocky Mountain Seed Alliance hosts a Seed School that teaches people how to save seeds. They also host monthly, online, free “seed socials” with speakers and Q&A.

<http://rockymountainseeds.org>

Seed Savers Exchange Heirloom Seeds is one of the oldest and most established seed-saving organizations in the United States.

<http://seedsavers.org>

Seed Libraries will teach you how to set up a Seed Library to store and share seeds with your fellow gardeners.

<http://seedlibraries.weebly.com>

Southern Exposure Seed Exchange shares seed-saving guides on its website.

<https://www.southernexposure.com/growing-guides/>

Soil

“Soil Health, Drainage and Improving Soil.” University of Maryland Extension.

<https://extension.umd.edu/resource/soil-health-drainage-and-improving-soil>

“Soil Sampling for the Home Gardener,” Virginia Tech

https://www.soiltest.vt.edu/content/dam/soiltest_vt_edu/PDF/urban-sampling.pdf

Virginia Tech Soil Testing Lab

<https://www.soiltest.vt.edu/>

Analyzes soil samples submitted by the public and university researchers. Tests evaluate the soil's nutrient potential and determine the most beneficial application rates of fertilizer and lime for optimum plant growth. The fee is \$10 and all results are sent by email. You can get soil test kits from the Fairfax office of Virginia Cooperative Extension, the Fairfax County Master Gardeners or Hands On Harvests.

- To see an example of the form that gardeners need to submit with their soil sample, go to https://www.soiltest.vt.edu/content/dam/soiltest_vt_edu/PDF/SSIS-452-125.pdf.
- For information on how to understand your test results, visit https://www.soiltest.vt.edu/content/dam/soiltest_vt_edu/PDF/soil-test-note-01.pdf

Starting a community garden

Fairfax County community garden guidelines and resources.

<https://www.fairfaxcounty.gov/topics/community-gardening>

Fairfax County Watersheds and Resource Protected Areas map

<https://fairfaxcountygis.maps.arcgis.com/apps/Viewer/index.html?appid=67ca30a491084ddf92db292337bd87e1>

Resource Protected Areas and the Chesapeake Bay Preservation Ordinance at

<https://www.fairfaxcounty.gov/landdevelopment/chesapeake-bay-preservation-ordinance>

Start a Community Food Garden: The Essential Handbook by LaManda Joy.

Can be checked out from the Fairfax County Public Library, call number 635 J 2014.

Starting plants from seed

“Plant Propagation from Seed,” Virginia Cooperative Extension

<https://www.pubs.ext.vt.edu/426/426-001/426-001.html>

“A Beginner’s Growing Guide,” Southern Exposure Seed Exchange

<https://www.southernexposure.com/a-beginner-s-growing-guide/>

Tomatoes

“Tips on Transplanting Tomatoes,” Piedmont master gardeners

<https://piedmontmastergardeners.org/tips-on-transplanting-tomatoes/>

“Pruning Tomato Plants,” University of New Hampshire Extension

https://extension.unh.edu/resource/pruning-tomato-plants-fact-sheet?fbclid=IwAR0AnSeARo4DuVLtJQS5YawWRHnRKxf2PXeMvNnWEFW4XkHSMccbp8U_lbl

Vegetable gardening (general resources)

“8 Easy Tips for Growing and Curing Garlic,” by Lori Krishnan, Hands On Harvests.

<https://www.handsonharvests.org/post/8-easy-tips-for-growing-and-curing-garlic>

Arlington Food Assistance Center. Multiple vegetable garden resources, including pest management and irrigation techniques for gardens without water access.

<https://www.dropbox.com/sh/l2jo742riocqmla/AAAFJrClba85TtxIu5BNzz49a?dl=0>

“Fall Garden Advice from an Expert,” featuring US Botanic Gardens’ Thomas Crawley, Hands On Harvests.

<https://www.handsonharvests.org/post/fall-garden-advice-from-an-expert>

Home Vegetable Gardening, Virginia Cooperative Extension

<https://ext.vt.edu/lawn-garden/home-vegetables.html>

The Timber Press Guide to Vegetable Gardening in the Southeast by Ira Wallace of Southern Exposure Seed Exchange. Can be checked out from the Fairfax County Public Library, call number 635.09 W 2013.

“Virginia’s Home Garden Vegetable Planting Guide: Recommended Planting Dates and Amounts to Plant,” Virginia Cooperative Extension.

https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/426/426-331/SPES-170.pdf

Windbreaks

“Windbreaks for Fruit and Vegetable Crops” by the University of Nebraska-Lincoln Extension.

<https://extensionpublications.unl.edu/assets/pdf/ec1779.pdf>

Recommended local resources

Arcadia Center for Sustainable Food and Agriculture

<http://arcadiafood.org/>

Provides ample volunteer opportunities to farm with the crew and hosts field trips and a summer Farm Camp for kids. The Veteran Farmer program trains military veterans for new careers in agriculture. The Live, Eat, Grow Route 1 program gives support to community and school gardens and offers a summer internship program to teens.

Fairfax County Board of Zoning Appeals

For more information about the special permit application process for proposed garden sites greater than 2 acres, contact the [Zoning Evaluations Division](#) at 703-324-1290.

Fairfax County Master Gardeners

<https://fairfaxgardening.org/>

Help Desk (9-noon during the growing season): 703-324-8556 or

HelpDesk@FairfaxGardening.org

Help Desk info: <https://fairfaxgardening.org/help-desk/>

Plant Clinic info: <https://fairfaxgardening.org/plant-clinics/>

Fairfax County Nonprofit and Places of Worship Coordinator

[Nonprofits/Places of Worship Coordinator | Department of Land Development Services](#)

<https://www.fairfaxcounty.gov/plan2build/assistance-places-worship-and-nonprofit-community-groups>

703-324-1780

Fairfax County Zoning Setbacks and Permits

[Zoning Administration | Department of Planning and Development](#)

703-324-1314

ORDadmin@fairfaxcounty.gov

Fairfax Food Council

<https://www.fairfaxcounty.gov/food-council/>

Provides workshops on vegetable and community gardening through its Urban Agriculture Work Group. All are welcome to attend the meetings of that work group and of the Food Access & Literacy Work Group.

Fauquier Education Farm in Warrenton.

The farm offers a variety of classes and programs. They also seek volunteers to come out and help during the growing season. <https://www.fauquiereducationfarm.org/programs>

Hands On Harvests

www.handsonharvests.org

Gives seeds, plants and mentorship to gardeners of all experience levels and manages and supports community gardens. The website includes an updated list of Northern Virginia pantries that accept fresh produce: <https://www.handsonharvests.org/food-banks-need-support>.

Northern Virginia Soil and Water Conservation District

<https://www.fairfaxcounty.gov/soil-water-conservation/>

[Build Your Own Composter Workshop: https://www.fairfaxcounty.gov/soil-water-conservation/build-your-own-tumbler-composter](https://www.fairfaxcounty.gov/soil-water-conservation/build-your-own-tumbler-composter)

[Rain Barrel Workshops: https://www.fairfaxcounty.gov/soil-water-conservation/rain-barrel](https://www.fairfaxcounty.gov/soil-water-conservation/rain-barrel)

This agency can prepare a Soil and Water Quality Conservation Plan for your garden. You also can sign up for a workshop on how to build your own tumbler composter or rain barrel. Contact the District at ConservationDistrict@fairfaxcounty.gov.

Virginia Cooperative Extension, Fairfax County office

<https://fairfax.ext.vt.edu/>

12011 Government Center Parkway, 10th floor, Fairfax, VA 22035-1111

Main Office: 703-324-5369, 8:00 a.m. to 4:30 p.m. Monday - Friday

Horticultural specialist and Extension agent: Adria Bordas