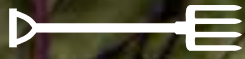
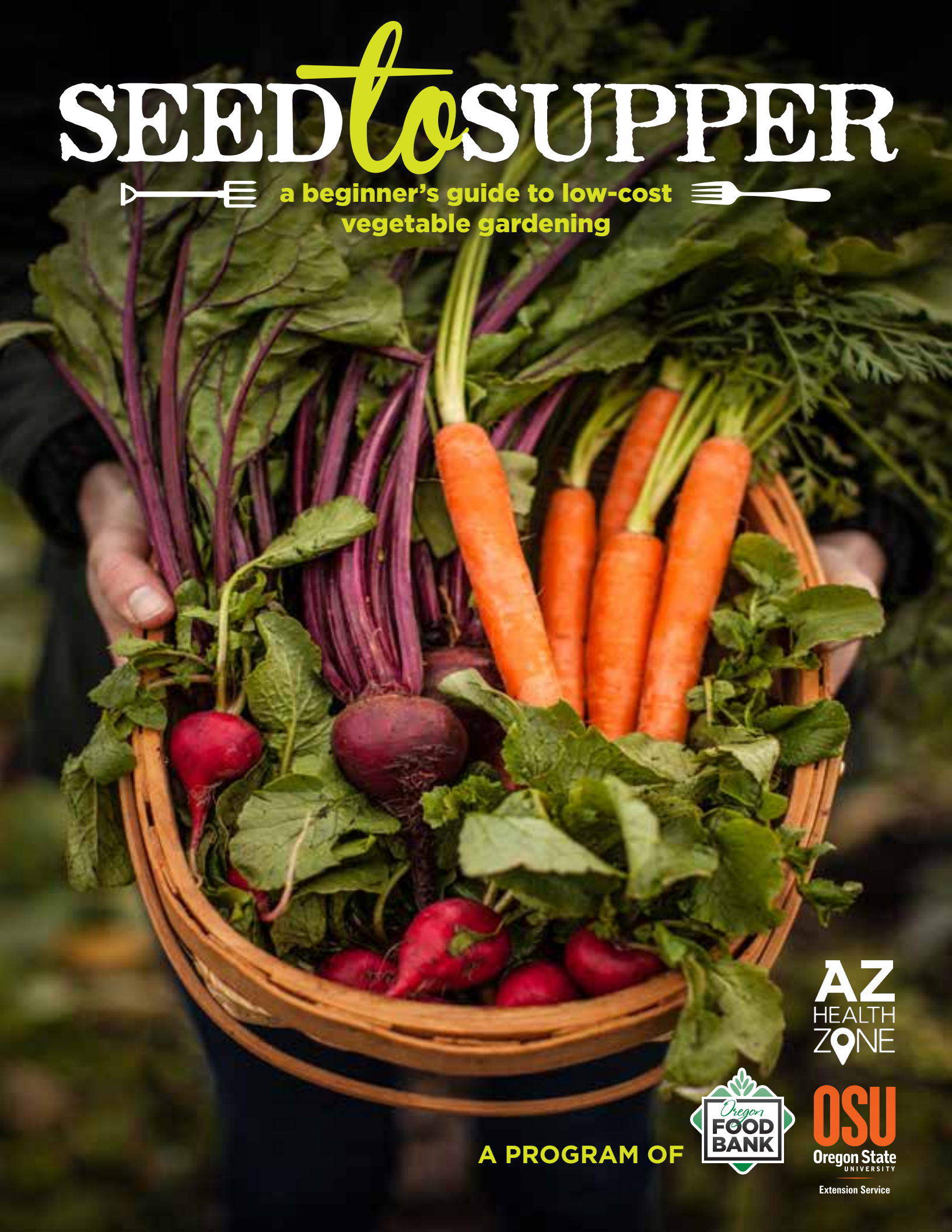


SEED *to* SUPPER



a beginner's guide to low-cost
vegetable gardening



AZ
HEALTH
ZONE



A PROGRAM OF

OSU
Oregon State
UNIVERSITY

Extension Service

Seed to Supper®

A beginner's guide to low-cost vegetable gardening



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For any other information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, persons should either contact the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or in Arizona 1-855-777-8590

This material was funded by USDA's Supplemental Nutrition Assistance Program - SNAP through the AZ Health Zone. This institution is an equal opportunity provider.



Welcome, gardeners!

We invite you to experience the deep satisfaction that comes from growing a portion of your own food.

This booklet was created for participants of the Seed to Supper course, a shared program of Oregon Food Bank's Learning Gardens and the Oregon State University Extension Service, and adopted by AZ Health Zone in October of 2018. Seed to Supper is a comprehensive beginning vegetable gardening curriculum designed for adults gardening on a budget. Taught at community sites throughout Arizona by staff educators and trained volunteers, Seed to Supper highlights practical, low-cost techniques for building, planning, planting, maintaining and harvesting a successful vegetable garden.

Seed to Supper is part of AZ Health Zone's work to build more food secure communities—places where all people at all times have access to enough food for a healthy life. The AZ Health Zone is an Arizona network with statewide partners that include health departments, the University of Arizona, Native American tribes, school districts, food banks, and non-profit agencies. We are SNAP-Ed (the Supplemental Nutrition Assistance Program – Education) in Arizona. SNAP-Ed is the nutrition promotion and obesity-prevention component of SNAP. Our goal is to improve the likelihood people eligible for SNAP will choose physically active lifestyles and make healthy food choices. We provide nutrition education and make policy, systems, and environment changes throughout Arizona communities.

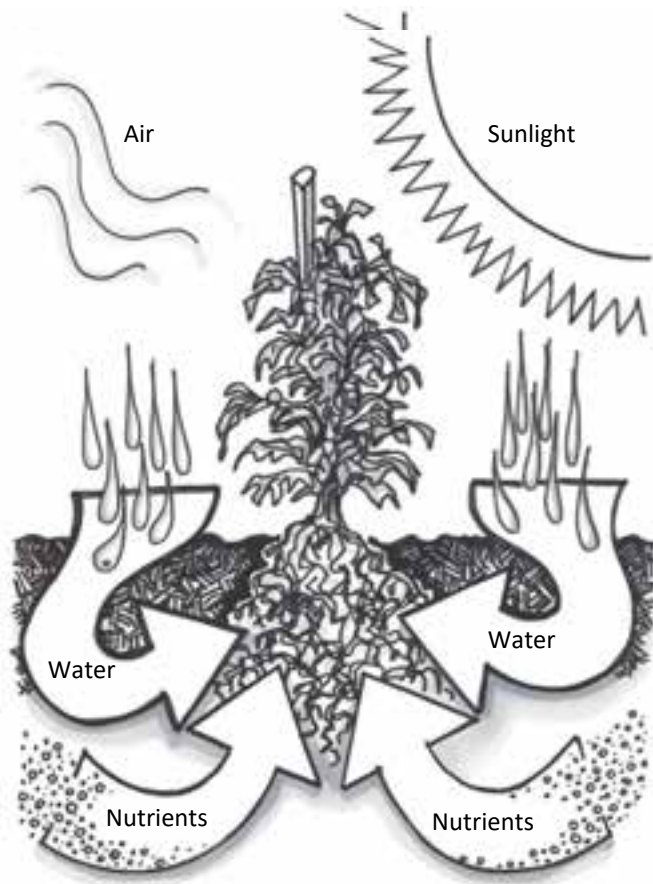
Whether you've taken a Seed to Supper class or come across this booklet in another way, we hope that the information in these pages will help you make budget-friendly decisions in your garden and, ultimately, share in the joy of eating your own home-grown vegetables!

Happy gardening,



A Gardener's Job

Your job as a gardener is simple: to understand what your plants need and to give it to them. So what do plants need? They need sunlight, water, air, and nutrients in the right amount and at the right time. This guide will help you make sure your plants get everything they need to grow well, so you get the best possible results from your garden.



Gardening in Arizona

Arizona has six plant climate zones. Each zone is determined by expected minimum temperatures and elevation. This course book groups Arizona's climate zones into two basic regions — *higher elevation* and *lower elevation*.

Use the map to the right to determine your climate zone. Then, use the chart below to see whether your zone is in relatively higher elevation or a lower elevation region of Arizona.



<i>Higher elevation regions</i>	Zone 1	Above 6,000 feet
	Zone 2	4,000 to 6,000 feet
	Zone 3	3,500 to 5,000 feet
<i>Lower elevation regions</i>	Zone 4	2,000 to 4,000 feet
	Zone 5	1,000 to 2,000 feet
	Zone 6	10 to 1,000 feet

In the higher elevations of Arizona, there is one main growing period which is planted during the spring and early summer. Additionally, in higher elevations of Central and Southern Arizona, an early fall planting of cool season vegetables is usually productive.

In Arizona's lower elevations, gardens produce year-round. Two main planting periods are generally followed, an early spring period for warm-season vegetables and a late summer to winter period for cool-season crops.

The climates of adjoining zones grade into one another near their boundaries. This sometimes makes it possible to grow plants that are too cold tender for a given zone, or it may exclude certain plants at the coldest extremes of that zone.

Microclimates also play a part in determining the kinds of plants that will grow in your landscape. A microclimate is simply the local climate on a small site. Microclimates are formed by hills and valleys, structures, paved areas, hedges or windbreaks. These features may change airflow patterns, alter day length or light intensities, trap heat during the day and slowly release it during the night, or in other ways modify local climate.

While zones and charts provide valuable baseline information, nothing is more valuable than the guidance of local gardeners. We strive to incorporate local gardening experience throughout both this course book and Seed to Supper classes. Future editions of Arizona's Seed to Supper will prioritize additional information and tips from gardeners and farmers in our state. Wherever you are growing food, gardening is an experiment. No two garden beds are the same. Be sure to share what you learn with friends, neighbors, and the next generation of gardeners.

Adapted from Arizona Plant Climate Zones (AZ1169) and Ten Steps to a Successful Vegetable Garden (AZ1435), found at extension.arizona.edu/pubs. Courtesy of the University of Arizona, College of Agriculture and Life Sciences, Cooperative Extension.



Chapter 1:

Planning your garden

Your first job is to choose a location for your garden and turn it into a space where your crops will thrive. In this chapter, you will learn about choosing a site, deciding which plants to grow, and where to put them. As you make your choices, use the planning map, chart and graph paper on pages 25-26 to map out your garden.

Choosing your site

Choosing the right place for your garden is just as important as choosing the vegetables you will grow. All vegetables need sunlight, fertilizer, and well-drained soil, but a garden must be convenient for the gardener too. When picking a site, think about these five things: the amount of sunlight, what the soil is like, where water comes from, how the air flows, whether the spot is convenient for you, and if there are any problem areas.

Select for sunlight. Choose an area with plenty of morning sunlight and some afternoon shade. Higher elevation gardens benefit from an open, south-facing, gradual slope. Lower elevation gardens benefit from morning sun exposure and protection from the afternoon heat. If you cannot find a spot like that, any shade-free location will do. Most vegetables, especially fruiting types, do best with six to eight hours of full sun exposure. Leafy and root vegetables will tolerate partial shade. Not enough sunlight will weaken your crops no matter how much care you give them. Try to locate your garden away from trees and large shrubs. They will take sunlight, water, and nutrients away from your vegetables.

Get to know your soil. Good gardening soil is loose enough so air can get to the roots of growing plants. It is fertile enough to grow a good

TOPICS IN THIS CHAPTER

Choosing your site
Making a planting plan & map
Crop rotation by plant family
Common crop chart
Worksheets





If your yard is already growing a healthy crop of weeds, your soil should also be able to support vegetables.

crop of weeds or grass. Arizona soils contain limited amounts of organic matter and are composed mostly of clay with some sand. They often have low levels of nitrogen, phosphorous, and iron. Garden soils in Arizona need regular amendments such as compost to increase organic matter.

Good soil dries out enough so that it warms early in spring, but it can still hold water in summer heat. Poorly drained soil stays wet and cold later into spring. If your soil is heavy and stays wet long after rains or waterings, you could grow your vegetables in raised beds instead. Beds that are raised off the ground drain faster and warm up earlier in spring.

Is there water nearby? Watering is necessary for all gardens in Arizona because rainfall throughout our state is limited and uncertain. Chapter 2 covers different methods for watering gardens. Whether you choose to hand-water with a hose or set up a drip or sprinkler system, make sure the *source* of this water is close enough to your garden.

Is there good air flow? Avoid a location where there is little air movement. A natural breeze helps keep plant leaves healthy. Diseases like tomato blight, mildew on squash, and mold on green beans thrive in warm, humid air that does not move.

Make it convenient. Put your garden where you can see it or easily visit it every day. “What is out of sight is out of mind,” so grow your garden where you can enjoy it and keep an eye on it!

Avoid problem spots. Some areas are just not good for vegetable gardening. Avoid low areas at the where cool air and frost can settle and injure your

plants. Avoid spots close to a creek because the soil may be too wet and the garden could get flooded in heavy rains. Avoid high wind areas. If that is not possible, build or grow a windbreak to protect your garden. Avoid locations near busy roads because automobile exhaust can pollute vegetables. Avoid sites where lead paint might be in the soil, such as along a building, under gutters, or where an old building once stood.

Making a planting plan

Deciding what to grow

What do you enjoy? First, make a list of the vegetables that your family likes to eat or would like to try. Many people keep gardening because what they grow tastes better than what they buy at the store. Grow what you enjoy eating and what tastes good!

What is realistic? Most people do not have the space or time to grow everything they want, so you may need to narrow down your choices. Start by thinking about what grows well in your climate. The Arizona Vegetable Planting Calendar on pages 14-16 list crops that grow well in different parts of the state. Use the dates in these calendars to start learning about what you can grow where you live. Planting calendars give you an idea of what is realistic, but you will learn just as much from the experiences of local gardeners. The Cooperative Extension office in your county can offer advice as well as local nurseries and garden centers.

Container gardening can be a great option for anyone who would like to grow their own food but has little or no yard space. With container gardening, you can grow almost anything, and anywhere. Use your imagination and make the most out of a little space!

What is cost-effective? Given the time and effort you will put into your garden, you may want to grow crops that give you the most value for your money.

For example, radishes and lettuce are easy to grow from seed, and seeds are less expensive than starts. Radishes and lettuce also grow quickly, so you can sow and harvest them several times in a season. And the plants do not take up much room



in the garden. This makes them a good value.

On the other hand, one pumpkin plant uses a lot of garden space, takes a long time to grow, and produces only a few pumpkins. Pumpkins can be inexpensive to buy at the store, so they are a less cost-effective choice in a small garden.

The “scale of relative value” chart to the right is a useful tool for making cost-effective choices. Crops in the left-hand column are generally a better value than crops in the right-hand column.

How much space will it take? Finally, think about the amount of space each vegetable will take up in the garden (also called a crop’s “footprint”). This is important because most gardeners have only a limited amount of space. To find the “footprint” sizes of many garden vegetables, see the Common Crop Chart on pages 17-19.

You can plant quick growing small herbs, leaf lettuces, and radishes around larger fruiting veggies. The small stuff will be ready for harvest by the time the big plant takes over the pot. Companion planting works well in container gardens too!

If you are planning to garden with containers, the following plants aren’t worth the trouble due to their root size, growing season, inefficient use of space, etc.:

- full-size fruit trees
- watermelon and cantaloupes
- pumpkins & winter squash
- corn
- cabbage
- mammoth sunflowers
- beefsteak-type tomatoes

If you have your heart set on one of these, choose a bush or dwarf variety if possible.

Choosing varieties

After you decide which vegetables to plant, you need to choose the varieties, or specific types of each plant. Some varieties do particularly well in our area. Getting your seeds or plant starts from a local company means you get plants that were bred for our region.

Scale of relative value of garden vegetables*	
Fresh herbs (<i>basil, oregano, thyme, sage, rosemary, etc.</i>)	Tomatoes (<i>indeterminate, staked</i>)
Parsley	Cucumbers
Carrots	Peppers
Beets	Cantaloupes and muskmelons
Parsnips	Snap (pole) beans
Loose-leaf lettuce	Broccoli
Most other leafy greens	Cauliflower
Scallions	Cabbage
Spinach (for salad)	Brussels sprouts
Kale	Bulb onions
Chard	Winter squash
Leeks	Sweet corn
Kohlrabi	Watermelon
Potatoes	Pumpkin
Rutabagas	* The value drops from the top left column down to the bottom right column and is based on the approximate value per square foot of garden per the amount of time that the area will be growing the crop.
Zucchini and other bush summer squash	

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Considering the time and effort you will put into your garden, you may choose to grow crops that give you more value for your money.



Ask Master Gardeners at the Cooperative Extension office in your county for recommendations on vegetable varieties suited to your region. See page 146 for contact information.

Native varieties: Indigenous peoples have been growing and harvesting crops in Arizona for thousands of years. These crop varieties are well-adapted to our local climates. Because they are better able to withstand conditions such as drought, they are often easier and less resource-intensive to grow. Check out Native Seeds/SEARCH. In Tucson, AZ to learn more.

Short-season varieties: Short-season crops have shorter maturity dates or less ‘days until harvest.’ These varieties are ready to harvest in a shorter amount of time. This means you can eat your garden vegetables sooner or plant a wider variety of crops each season.

Container varieties: Some varieties are even specifically bred for containers. In general, go for

quick maturing plant varieties, and also dwarf/miniature varieties. For example, consider baby carrots, scallions instead of onions, small or cherry tomatoes, and bush varieties of squash. Review the “vegetables & varieties ideal for container gardening” chart on pages 20-21 for more ideas on which varieties work well.

Planting dates

Planting your seeds or plant starts at the right time reduces the risk of damage from frost or hot weather. For ideal times to plant, look at the AZ Vegetable Planting Calendar on pages 14-16.

Seed packets and seed catalogs also have information about planting dates. They may mention the last and first frost dates. The chart below lists average frost dates for a few cities in Arizona. Plant on the last frost date to avoid late spring frosts. Make sure plants will mature before the first frost date in fall.

Seed packets, catalogs, and the Common Crop Chart (pages 17-19) also tell you the ‘days until harvest.’ This is the number of days from planting a seed or plant start until that crop is ready for harvest. This lets you work backward from the first frost date. For example, if your tomatoes need 80 days until harvest, and the first average frost date is only 50 days away, it is too late to plant tomatoes this season. The tomatoes will not have enough time to ripen before the frost hits. Many seed packets also give you information about length of harvest, or the number of days the crop continues to produce food.

Charts, seed packets, and seed catalogs may list a long planting window, but remember that plants do not “read” charts. Plants respond to soil temperature and weather conditions.



To learn more about frost dates in your area, contact your local Master Gardeners.

Average frost dates for Arizona		
City	Last frost	First frost
Yuma	January 24	December 20
Phoenix	January 30	December 16
Tucson	February 16	November 29
Douglas	April 11	November 4
Payson	May 13	October 20
Flagstaff	June 9	September 22

Dates provided by National Centers for Environmental Information



Seeds will germinate (start to grow) when the soil is moist and the temperature is warm enough. The seed packet tells you what the temperature should be. A soil thermometer will tell you if the soil really has reached that temperature. See page 60 for more information about soil temperatures and seed germination.

Succession planting

Two-week succession. Some plants grow quickly and have such a long planting window that you can plant them every two weeks during the growing season. This gives you a long harvest of fresh vegetables. Short-season crops like lettuce, beets, and carrots work well planted in two-week succession.

Two or more crops in succession. Some plants mature quickly and can be replaced by a different crop midseason. This method allows you to grow more than

Examples of succession planting		
Pull up		Replace with
Peas	➡	Carrots
Broccoli	➡	Salad greens
Spinach	➡	Collard greens
Lettuce	➡	Radishes
Tomatoes	➡	Garlic
Beets	➡	Kale
Salad greens	➡	Leeks

Varies depending on your region. For a list of crops to plant in two-week succession, see the common crop chart on pages 17-19.

one crop in the same space during different times of the year. For example, sow peas or cilantro in spring, then sow kale in summer when the peas or cilantro are finished. What you plant when depends on your region, so reference the AZ Vegetable Planting Calendar (pages 14-16) when planning different crops in succession.

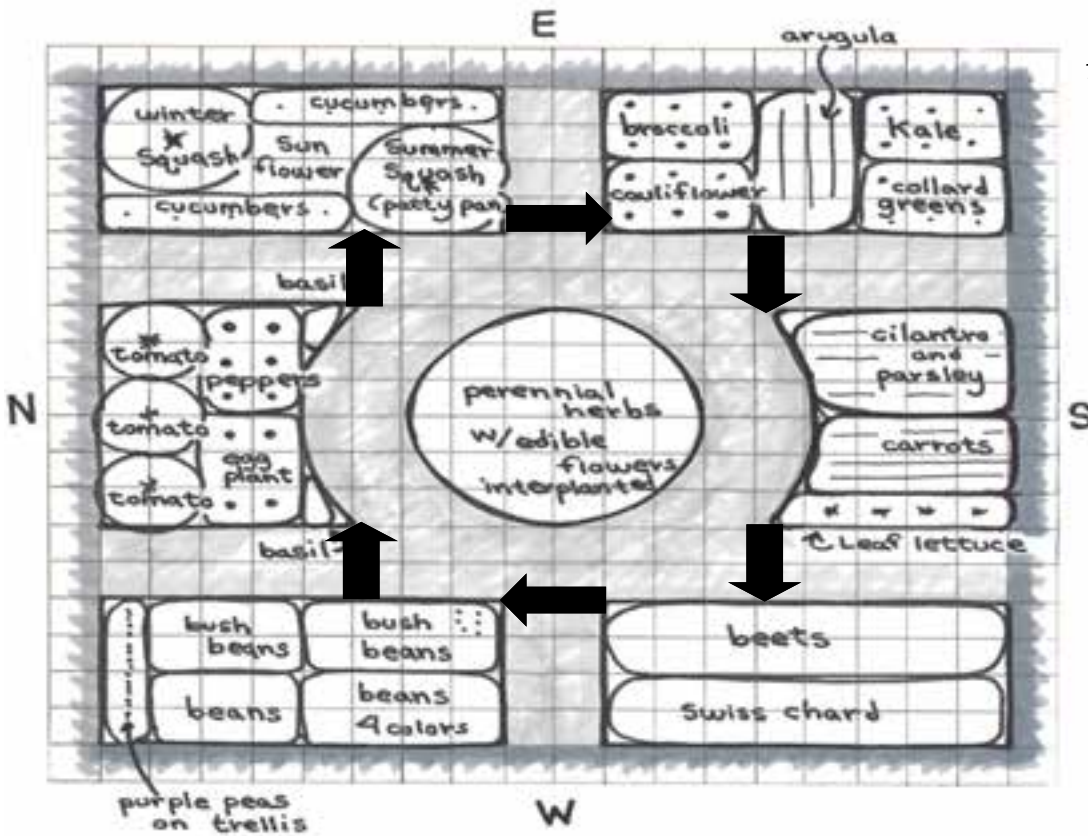
Crop rotation by plant family

A plant family is a grouping of plants that are similar. Most common vegetables can be grouped into just nine plant families (see the chart on the left). Crop rotation by plant family—or changing the location of plant families from season to season—can help prevent disease, pest problems, and loss of nutrients from the soil.

As you plan your garden, think about grouping your crops by family and rotating each family into a different space every year. Avoid planting crops from the same family in the same place two years in a row. When possible, wait four or more years before rotating a family back into the same spot. If your space does not allow for crop rotation, you can still keep your garden healthy. Do it by building up your soil with compost, growing cover crops, keeping the garden clean, and choosing disease-resistant plant varieties.

For an example of a garden grouped by plant family, see the “sample planting map” for a 20 x 20-foot garden space on the next page. The plant groups in the outer beds are designed to move clockwise to the next bed space every year. Each plant family on this map will return to its original space after seven years.

Plant families	
Plant family	Crops
Beet family (Amaranthaceae)	Beets Chard Spinach
Cabbage family (Brassicaceae)	Broccoli Cabbage Cauliflower Collard greens Kale Radishes Turnips
Carrot family (Apiaceae)	Carrots Cilantro Parsnips Parsley
Grass family (Poaceae)	Corn
Legume family (Fabaceae)	Beans Peas
Nightshade family (Solanaceae)	Eggplant Peppers Potatoes Tomatillos Tomatoes
Onion family (Liliaceae)	Garlic Leeks Onions
Squash family (Cucurbitaceae)	Cucumbers Summer squash Zucchini Winter squash Pumpkins Watermelon
Sunflower family (Asteraceae)	Lettuce Sunflowers Artichoke



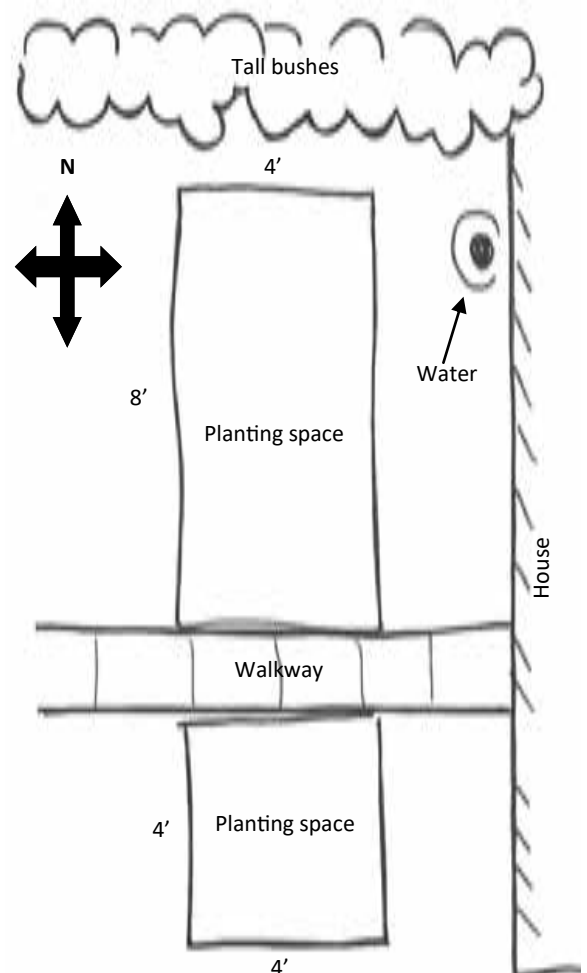
This map shows crops grouped by plant family. Each family rotates into a new space every year (larger map on page 22).

Making a planting map

Once you fill in your personal planting plan with the crops and varieties you want to grow, use it to map out your garden.

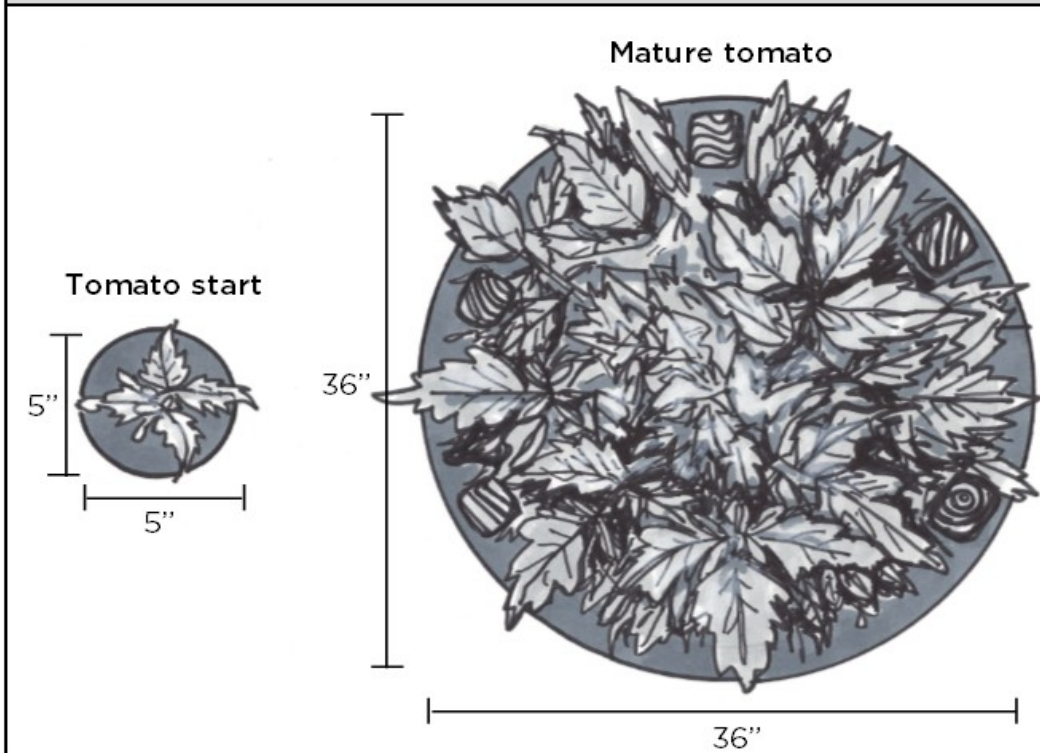
Sketch your space. Start by drawing a rough sketch of your garden area. Be sure to mark things like outdoor water faucets, fences, buildings and sheds, and any large trees or shrubs. Consider a protected place for storing tools as well as place to sit in or near your garden. Also, mark which directions are north, south, east, and west. Include the rough dimensions of your planting space or beds. Your sketch should be simple, like the example to the right.

Map out your planting area. Use a blank sheet of paper or the graph paper on pages 25-26 to draw just your planting space or beds and to mark the paths. Use one square on the graph paper to indicate one square foot of garden space. Indicate north, south, east, and west on your map. Now you are ready to choose the locations for your crops. You can use the rough sketch you made earlier to make sure you put your crops in the best locations. For example, be sure that sun-loving crops are out of the shadow of buildings or trees.



Footprints of plant start and mature plant

A well-designed garden plan will account for a crop's space needs at maturity, also called its "footprint."



Plant spacing

Plants need plenty of space above and below the ground. Plant leaves need enough room to reach sunlight and natural breezes which keep them dry and help prevent disease. Leaves use sunlight to create their own energy, so plants grown in full sun produce larger vegetables and sweeter fruit than plants grown in the shade.

Plant roots also need room to reach the water, air, and nutrients in the soil. Plants that are too close together will not thrive because they are competing with each other.

Your plants might look too far apart when they are small, but they will use up the space when they reach full size. As you arrange your garden, plan for the proper width and height of your plants at maturity.

Plan for the "footprint" of your plants at maturity. Plant starts and seedlings are tiny, but healthy, full-grown plants can be large. A well-designed garden plan will account for the width of a full-grown crop, also called its "footprint."

Imagine looking at a full-grown tomato plant from above. When a tomato plant is staked, it is about 36 inches wide by 36 inches deep (three feet by three feet)—this is its footprint. Drawing out the footprints of your crops on your map will give you a better idea of how many plant starts you need or how many seeds to use.

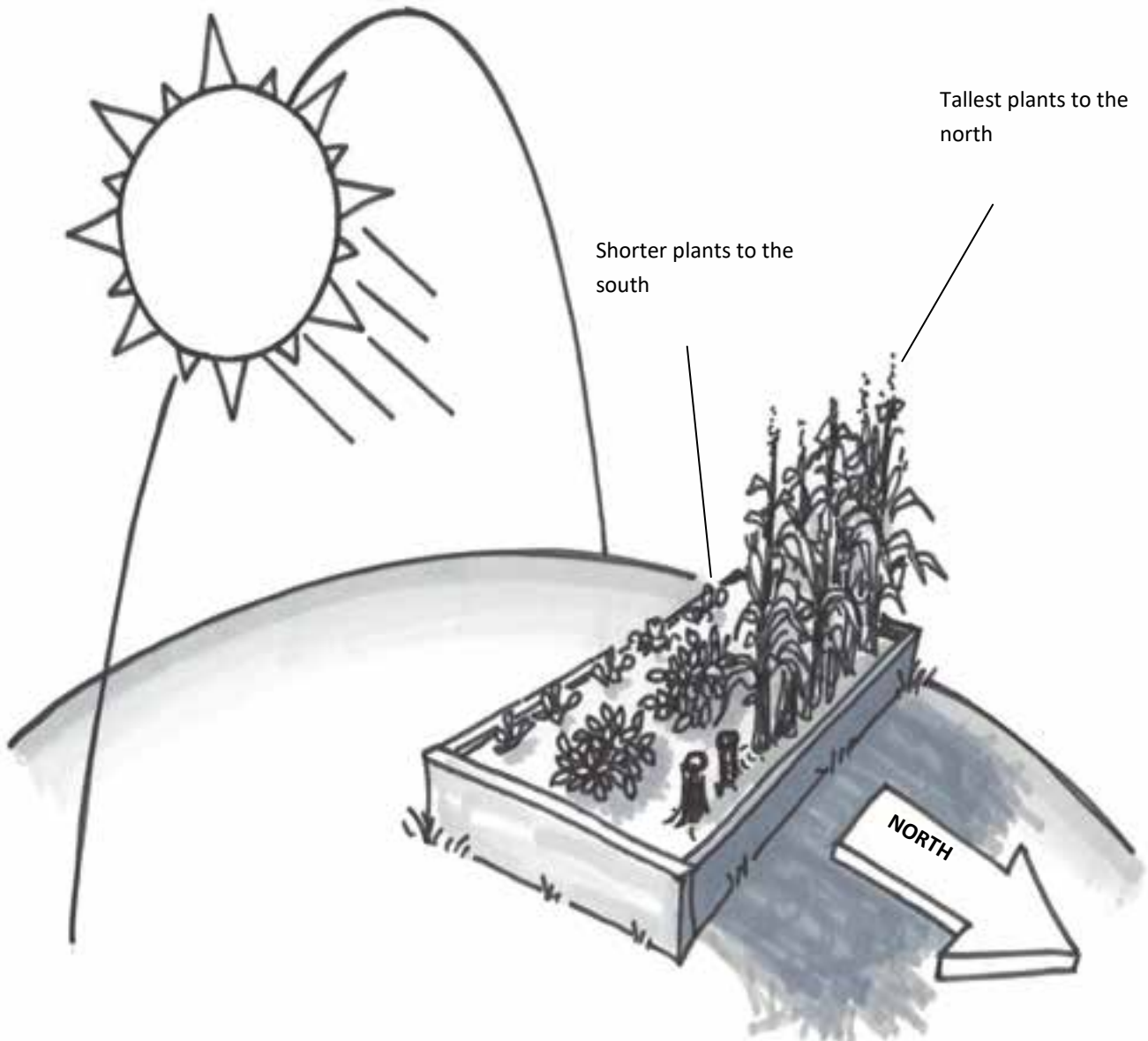
Seed packets and planting calendars may give instructions for "seed spacing" (the space between seeds), "row spacing" (the space between rows), and "thinning" (the space between full-grown plants in the rows). The footprint takes all of these into account and helps you picture the space a full-grown plant will need.

Plan for the height of your plants at maturity and for the shadows they will cast. The full height of a mature plant is important, because tall crops can shade out short crops. In North America, the sun always shines from the south, casting shadows to the north. Plant your tall or trellised crops like corn and tomatoes on the north side of the garden, so they do not shade shorter vegetables. Put shade-tolerant plants under or near tall plants. Gardens in Arizona often do well with western shade in the summertime. So, you could also put taller plants

on the west side of your garden. Shade cloth protects plants during the summer, too.

Make a map for every season. Because your plantings change from season to season, you may need more than one map. For example, you could have one map for spring plantings and another for summer plantings. Or you could have a map that shows succession planting. Your map could have an arrow showing the change from one crop to another, such as peas in spring and summer switching to garlic in fall.

Plant your tall or trellised crops like corn and tomatoes on the north or west side of the garden, so they do not shade shorter plants.



Arizona Vegetable Planting Calendar

In order to have a successful garden, you must know the right time of year to plant your vegetables. Use the internet to search for the elevation of your town or city. Then, use this calendar as a guide for when to plant in your area. The list below give suggested planting dates for different elevations.

Adapted from *Ten Steps to a Successful Vegetable Garden*, a publication of The University of Arizona, College of Agriculture and Life Sciences, Cooperative Extension. Search publication **AZ1435** at extension.arizona.edu/pubs.

Elevation:	<u>10 to 1,000'</u>	<u>1,000 to 2,000'</u>	<u>2,000 to 3,000'</u>	<u>3,000 to 4,500'</u>	<u>4,500 to 6,000'</u>	<u>Above 6,000'</u>
	Yuma, Parker, Lake Havasu City, & Gila Bend	Phoenix, Casa Grande, & Ajo	Tucson, Safford, & Wickenburg	Kingman, Globe, Clifton, Douglas, & Nogales	Payson, Prescott, St. Johns, Page, & Holbrook	Flagstaff, Show Low, Window Rock, & Williams
<u>CROP</u>						
Asparagus	Oct. 1-Feb. 1	Oct. 1-Mar. 1	Oct. 1-Mar. 1	Feb. 15-Apr. 1	April 1-30	Apr. 15-May 15
Bean, bush	Feb. 1-Mar. 1 1Aug. 1-Sept. 1	Feb 15-Mar 15 Jul. 15-Aug. 15	Mar. 1-Apr. 1 July 15-Aug. 15	Apr. 25-July 15	May 15-July 1	May 25-June 15
Bean, pole	Aug. 1-Sept. 1	July 15-Aug. 15	July 15-Aug. 10	Apr. 25-July 15	May 15-July 1	May 25-June 15
Bean, lima	Feb. 1-Mar. 1	Feb 15-Mar 15	Mar. 1-Apr. 1	Apr. 25-July 15	May 15-July 1	May 25-June 15
Beet	Sept. 15-Mar. 1	Sep. 1-Mar. 15	Aug. 25-Apr. 1	Mar. 1-May 15	May 1-July 15	May 15-June 15
Broccoli	Sept. 1-Jan. 1	Sept. 1-Dec. 1	July 25-Oct. 1	Feb. 15-Aug. 1 Sept. 1-Oct. 15	Apr. 1-July 15	<i>Not adapted</i>
Brussel Sprouts	Sept. 1-Jan. 1	Sept. 1-Dec. 1	Aug. 15-Oct. 1	July 1-Aug. 1	June 1-July 1	May 15-June 15
Cabbage (seed)	Sept. 1-Nov. 20	Aug. 15-Dec. 1	Aug. 1-Dec. 1	Feb. 15-Apr. 15	March 15-30	April 1-15
Cabbage (plants)	Oct. 1-Dec. 1	Sept. 15-Jan. 1	Sept. 1-Feb. 1	Mar. 15-May 1 Aug. 20-Oct. 1	May 1- June 1	May 15-June 15
Cantaloupe	Dec. 1-Apr. 10	Feb. 15-Apr. 1	Mar. 15-June 1	May 1-June 20	May 15-June 15	May 25-June 10
Carrot	July 15-Aug. 15 Sept. 1-Jan. 1	Sept. 1-Mar. 1	Aug. 25- Mar.15	Mar. 1-May 10 July 15-Sept. 15	May 1-July 15	May 15-July 1
Cauliflower	<i>Same as cabbage</i>	<i>Same as cabbage</i>	<i>Same as cabbage</i>	<i>Same as cabbage</i>	<i>Same as cabbage</i>	<i>Same as cabbage</i>
Celery	October 15	Aug 15-Oct 15	Aug. 1-Oct. 15	May 15-June 20	June 1-July 15	Not adapted
Chard	Sept. 1-Jan. 1	Sept. 1-Mar. 1	Aug. 15-Apr. 1	July 15-Sept. 15 Feb. 15-Apr. 30	July 1-Aug. 1 Mar. 1-Apr. 10	Apr. 1-June 10
Chinese Cabbage	Sept. 15-Dec. 1	Sept 1-Jan. 1	Aug.15-Jan.15	July 1-Sept.15	June 1-July 15	May 15-June 15
Collard	Sept. 15-Dec. 1	Sept. 1-Jan. 1	Sept.1 -Jan.15	June 15-Aug. 1	June 1-July 15	May 15-July 1
Corn, sweet	Feb. 15-Mar. 1 July 30-Aug. 30	Feb 15-Mar 15 July 15-Aug. 15	Mar. 15-Apr. 1 July 15-Aug. 15	May 10-July 15	May 25-July 1	June 1-10
Corn, Mexican june	June 20-July 20	June 20-July 20	July 1-July 5	May 10-July 15	May 25-June 15	<i>Not adapted</i>

Arizona Vegetable Planting Calendar

	<u>10 to 1,000'</u>	<u>1,000 to 2,000'</u>	<u>2,000 to 3,000'</u>	<u>3,000 to 4,500'</u>	<u>4,500 to 6,000'</u>	<u>Above 6,000'</u>
Cucumber	Dec. 1-Apr. 1	Mar. 1-Apr. 1 Aug 15-Sep 15	Mar. 20-May 15 Aug. 1-Sept. 1	May 10-June 15	May 15-June 15	June 1-25
Eggplant	Jan. 15-Apr. 1	Feb. 1-Apr. 1	Apr. 1-May 15	May 1-June 1 (plants)	May 15-June 15 (plants)	June 1-20 (plants)
Endive	Sept. 1-Dec. 1	Sept. 1-Jan. 1	Sept. 1-Feb. 1	Feb. 1-Apr. 1	Apr. 15-June 15	May 15-June 15
Garlic	Sept. 1-Dec. 1	Sept. 1-Dec. 1	Sept. 1-Jan. 1	Feb. 15-Apr. 10 Sept. 15-Nov. 15	April 1-30 (cloves)	<i>Not adapted</i>
Horseradish	<i>Not adapted</i>	<i>Not adapted</i>	Nov. 1-Feb. 1	Feb.-Apr.	Feb 15-Mar 15	April-May
Kale	Sept. 1-Dec. 1	Sept. 1-Dec. 1	Aug. 15-Feb. 15	Feb. 1-Mar. 20 Aug. 1-Sept. 15	Feb. 15-Apr 10	April-May
Kohlrabi	Sept. 1-Dec. 1	Sept. 1-Dec. 1	Sept. 1-Feb. 1	Feb. 15-Apr. 1	Apr.15-May15	May 15-June 1
Leek	Sept. 15-Dec. 15	Sept. 1-Jan. 1	Sept. 1-Jan. 15	Feb. 15-Apr. 10	April 1-30	Not adapted
Lettuce, head	Sept. 20-Nov. 20	Sept. 1-Jan. 1	Sept. 1-Feb. 15	Feb 15-Mar 15 July 15-Aug. 15	July 1-Aug. 1 June 1-30	June 1-30
Lettuce, leaf	Sept. 20-Jan. 1	Sept. 1-Mar. 1	Aug. 20-Apr. 1	Mar. 1-Apr. 15 July 15-Sept. 15	Mar. 15-Apr.15 Aug. 1-Sept.15	May 1- July 1
Muskmelon	Dec. 1-Apr. 10	Feb. 15-Apr. 1 July 1-Aug. 1	Apr. 1-July 15	May 10-June 15	May 15-June 15	Not adapted
Mustard	Sept. 15-Dec. 15	Sept. 1-Jan. 1	Sept. 1-Feb. 1	Feb. 15-July 15	Apr. 1-July 1	April-May
Okra	Mar. 1-Apr. 15	Mar. 1-June 1	Apr. -June 15	May 10-July 1	May 15-June 15	June 1-10
Onion, green	Sept. 15-Jan. 15	Sept. 1-Feb. 1	Aug. 15-Feb. 1	Feb. 15-May 1	Apr. 15-May 1	May 1-31
Onion, dry (seed)	Nov.1-Dec.15	Oct. 15-Jan. 1	Oct. 15-Jan. 1	Jan. 15-Mar. 15 Sept. 15-Nov. 15	Feb. 15-Apr. 15 Oct. 15-Jan. 1	April 1-30 Oct. 15-Jan. 1
Onion, dry (sets)	Nov. 15-Jan. 15	Nov. 1-Feb. 1	Nov. 1-Feb. 15	Sept. 15-Nov. 15 Feb. 15-Apr. 15	Nov. 1-Feb. 1 Apr. 1-15	Nov. 1-Feb. 15 Apr. 15-June 1
Parsley	Oct. 1-Jan. 15	Sept. 1-Jan. 1	Sept. 1-Jan. 15	May 1-June 15	Apr. 1-15	May 1-31
Parsnip	Not adapted	Sept. 1-Jan. 1	Sept. 1-Jan. 15	Mar. 1-May 1	Apr. 1-May 20	April-May
Pea, fall	Sept. 10-Sept. 20	Aug 15-Sept 15	Aug 15-Sept 15	Aug. 25-Oct. 15	Aug. 1-Sept. 1	Not adapted
Pea, spring	Jan. 20-Feb. 15	Oct. 15-Dec. 15	Feb. 1-Mar. 15	Feb. 1-Mar. 15	Feb. 15-Aug. 15	May 1-June 1
Pepper (seed)	Nov.-Jan.	Feb. 1-Mar. 1	Feb 15-Mar 15	Feb. 15-Mar. 30	Mar. 1-Apr. 1	Apr. 1-15
Pepper (plants)	Feb. 1-Mar. 15	Mar. 1-Apr. 1	Apr. 1-June 1	May 10-June 1	May 10-Aug. 25	May 15-June 1
Potato	Sept. 1-Feb. 15	Feb. 1-Mar. 15	Feb. 15-May 1	Mar. 20-Apr. 20 May 10-June 1	May 10-June 1	May 15-June 1
Potato, sweet	Mar. 1-June 20	Mar. 1-June 1	May 1-June 15	May 10-25	May 15-20	<i>Not adapted</i>

Source: The University of Arizona College of Agriculture and Life Sciences Cooperative Extension.

Ten Steps to a Successful Vegetable Garden (AZ1435), www.extension.arizona.edu/pubs.



Arizona Vegetable Planting Calendar

	<u>10 to 1,000'</u>	<u>1,000 to 2,000'</u>	<u>2,000 to 3,000'</u>	<u>3,000 to 4,500'</u>	<u>4,500 to 6,000'</u>	<u>Above 6,000'</u>
Pumpkin	July 15-Aug. 15	July 1-Aug. 1	Apr. 1-July 15	May 15-July 1	May 20-June 15	May 25-June 10
Radish	Sept. 1-Apr. 1	Sept 1-Apr. 15	Aug. 5-May 1	Mar. 1-May 15	Apr. 1-June 15	May 15-June15
Rhubarb	<i>Not adapted</i>	<i>Not adapted</i>	Oct. 1-Mar. 1	Mar. 1-Apr. 20	Mar. 1-Apr. 1	April 1-30
Rutabaga	Sept. 15-Jan. 15	Sept. 1-Feb. 1	Aug. 20-Mar. 1	Mar. 1-Apr. 1	Apr. 1-May 15	May 1-June 1
Spinach	Sept. 15-Feb. 1	Sept. 1-Feb. 1	Aug. 20-Mar. 1	Feb. 15-Apr. 15 Sept. 15-Oct. 15	Apr. 1-May 15	May 1-June 1
Squash, summer	Dec. 15-Apr. 10	Feb. 1-May 1	Mar. 15-July 15	May 10-July 15	May 1-July 1	May 15-June 15
Squash, winter	July 15-Aug. 15	July 1-31	July 1- July 31	May 10-July 1	May 15-July 1	May 15-June 10
Tomato (seed)	Nov.-Jan.	Jan. 1-Mar.1	Jan. 10-Feb. 15	Mar. 1-Apr. 1	Mar. 1-Apr. 1	Apr. 1-10
Tomato (plants)	Jan. 1-Mar. 15	Feb 15-Mar 15	Mar 15- Apr 15	May 1-June 15	May 10-June 1	May 25-June 10
Turnip	Sept. 15-Feb. 1	Sept. 1-Feb. 1	Aug. 15- Mar. 1	Mar. 1-Apr. 15 Aug. 15-Sept.15	Apr. 1-May15	May 15-June 1
Water-melon	Dec. 15-Apr. 1	Feb. 15-Apr. 1	Mar. 15- June 1	May 10-July 15	May 1-June 1	<i>Not adapted</i>

Source: The University of Arizona College of Agriculture and Life Sciences Cooperative Extension.

Ten Steps to a Successful Vegetable Garden (AZ1435), www.extension.arizona.edu/pubs.

Common Crop Chart

Use this chart to plan your garden. However, be sure to refer to seed packets and local experience as you progress. Plant size and time to harvest can vary greatly based on your region and the circumstances of your garden.

Crop W= Warm Season C= Cool Season	Footprint	Planting method	Height	Days to harvest	Some shade ok?	Single or 2-week succession
Asparagus—C	18" x 18"	Row	Tall	1-3 years	Some shade ok	Single
Basil—W	12" x 12"	Row or transplant	Medium	T = 30 S = 60-90	Full sun	Succession
Bean, bush—W	12" x 12"*	Row or banded	Medium	60-90	Some shade ok	Succession
Bean, pole—W	4" x 4" trellised	Row or banded	Tall	60-90	Full sun	Succession
Bean, lima—W	12" x 12"	Row or banded	Medium	60-100	Full sun	Succession
Beet—C	4" x 4"	Row or banded	Short	50-80	Some shade ok	Succession
Broccoli—C	12" x 12"	Row or transplant	Medium	T=55-100 S=120-130	Full sun	Single
Brussel sprouts—C	12" x 12"	Row or transplant	Medium	T=80-120 S=130-150	Full sun	Single
Cabbage—C	12" x 12"	Row or transplant	Medium	T=80-90 S=120-130	Full sun	Single
Cantaloupe—W	48" x 48"	Hill	Medium	80-120	Full sun	Single
Carrot—C	3" x 3"	Row or banded	Short	60-100	Some shade ok	Succession
Cauliflower—C	12" x 12"	Row or transplant	Medium	T=90-100 S=120-130	Full sun	Single
Celery—C	12" x 12"	Row or transplant	Medium	120-150	Full sun	Single
Chard—C	12" x 12"	Row or transplant	Medium	50--90	Some shade ok	Single
Cilantro—C	12" x 12"	Row or transplant	Short	60-90	Some shade ok	Succession
Chinese cabbage—C	12" x 12"	Row	Short, Medium	T=30-45 S=60-80	Full sun	Single
Collard —C	12" x 12"	Row or transplant	Medium	80-100	Some shade ok	Single
Corn, sweet - W	12" x 12"	Row	Tall	70-110	Full sun	Single

KEY	Planting Method	Height		
	Row	Planted in long single row (see seed packet instructions)	Short	Under 12"
	Banded	Seeds sown in wide rows	Medium	12"-35"
	Hill	A grouping of seeds planted close together in a small cluster	Tall	36" or taller
	T = Transplant and S= Seed (under days to harvest)			



Common Crop Chart

Crop W= Warm Season C= Cool Season	Footprint	Planting method	Height	Days to harvest	Some shade ok?	Single or 2-week succession
Corn, Mexican June—W	12" x 12"	Row	Tall	110	Full sun	Single
Cucumber— W	6" x 6" trellised	Hill or transplant	Medium	55-90	Full sun	Single
Eggplant— W	12" x 12"	Hill or transplant	Medium	70-120	Full sun	Single
Endive—C	6" x 6"	Row	Short	40-120	Full sun	Single
Garlic— C	4" x 4"	Row	Short	5-10 months	Full sun	Single
Horseradish—C	12" x 12"	Row	Medium	4-6 months	Full sun	Single
Herbs (perennial)	Variable	Hill or transplant	Medium	Perennial	Some shade ok	Single
Kale— C	12" x 12"	Row or transplant	Medium	60-90	Some shade ok	Single
Kohlrabi—C	12" x 12"	Row	Short, medium	T=45-60 S=50-60	Full sun	Single
Leek— C	4" x 4"	Row or transplant	Short	120-200	Some shade ok	Single
Lettuce, head— C	6" x 6"	Row or banded	Short	50-100	Some shade ok	Succession
Lettuce, leaf—C	6" x 6"	Row or banded	Short	30-90	Some shade ok	Succession
Muskmelon—W	48" x 48"	Hill	Medium	75-120	Full sun	Single
Mustard—C	8" - 18"	Row	Short	30-55	Full sun	Succession
Okra—W	42" x 42"	Row	Tall	50-100	Full sun	Single
Onion, green—C	6" x 6"	Row	Short, medium	60-100	Full sun	Single
Onion, dry — C	4" x 4"	Row or transplant	Short	Sets=3-5 months S=7-8 months	Some shade ok	Single
Parsley— C	12" x 12"	Row or banded	Short	80-90	Some shade ok	Single
Parsnip— C	3" x 3"	Row or banded	Short	100-120	Some shade ok	Single

KEY	Planting Method	Height		
	Row	Planted in long single row (see seed packet instructions)	Short	Under 12"
	Banded	Seeds sown in wide rows	Medium	12"-35"
	Hill	A grouping of seeds planted close together in a small cluster	Tall	36" or taller
	T = Transplant and S= Seed (under days to harvest)			

Common Crop Chart

Crop W= Warm Season C= Cool Season	Footprint	Planting method	Height	Days to harvest	Some shade ok?	Single or 2-week succession
Pea- C	4" x 4" trellised	Row or banded	Medium	60-150	Some shade ok	Succession
Pepper- W	12" x 12"	Hill or transplant	Medium	80-120	Full sun	Single
Potato - C	12" x 12"	Hill	Medium	70-120	Some shade ok	Single
Potato, sweet-W	42" x 42"	Hill	Short	90-160	Full sun	Single
Radish- C	3" x 3"	Row or banded	Short	25-60	Some shade ok	Succession
Rhubarb-C	30" x 30"	Hill	Medium	1 year	Full sun	Single
Rutabaga-C	7" x 7"	Row or banded	Short	100-120	Full sun	Single
Spinach- C	4" x 4"	Row or banded	Short	30-60	Some shade ok	Succession
Squash, summer- W	36" x 36"	Hill or transplant	Medium	55-90	Full sun	Single
Squash, winter- W	6' x 6' vine	Hill or transplant	Medium	90-150	Full sun	Single
Tomato- W	36" x 36"	Row or transplant	Tall	50-120	Full sun	Single
Turnip-C	12" x 12"	Row	Short	50-120	Full sun	Single
Watermelon- W	12" x 12" trellised	Hill or transplant	Medium	55-120	Full sun	Single

Sources: OSU Extension publication EM 9027, Territorial Seed Catalog, Burpee's Seed Catalog

KEY	Planting Method	Height		
	Row	Planted in long single row (see seed packet instructions)	Short	Under 12"
	Banded	Seeds sown in wide rows	Medium	12"-35"
	Hill	A grouping of seeds planted close together in a small cluster	Tall	36" or taller
	T = Transplant and S= Seed (under days to harvest)			



Vegetables & varieties ideal for container gardening

Refer to the Arizona Vegetable Planting Calendar (pages 14-16) for when to plant in your region.
 Flowering Plants (tomatoes, beans, zucchini, etc.) require a minimum of 6 hours of sunlight per day.
 Edible Leaves (lettuce, collards, kale, etc.) require a minimum of 4 hours of sunlight per day.
 Edible roots (turnips, carrots, beets, etc.) require a minimum of 3 hours of sunlight per day.

VEGETABLE	TYPE OF CONTAINER	RECOMMENDED VARIETIES	NOTES
Asian Greens	Minimum container depth: 4-6"	Mizuna, Mustards, PakChoi (Green Fortune), Tatsoi	Fast growing, shallow rooted
Basil	Minimum container depth: 8"	Genovese, Globe, Largeleaf Italian, Purple Ruffles, Red Rubin, Siam Queen, Spicy Globe, Sweet Basil	Grows well with tomatoes
Beans, Green	5 gal. window box, minimum container depth: 6"	Bush types such as Blue Lake, Bush Romano, Contender, Greencrop, Kentucky Wonder, Montepellier, Tender Crop, Topcrop, Tricolor come as both bush and pole bean	Climbing types work too, if you have a good trellis support
Beets	5 gal. window box, minimum container depth: 10"	Chiogga, Detroit Dark Red, Early Red Ball, Early Wonder, Golden, Little Egypt, Scarlet Supreme	Can grow in partial sun
Broccoli	1 plant/5 gal. pot, 3 plants/15 gal. tub	DeCicco, Green Comet, Italian Green Sprouting, Super Blend	Choose early maturing, compact varieties
Brussels Sprouts	1 plant/5 gal. pot, 2 plants/15 gal. tub	Evesham, Jade Cross	
Cabbage	1 plant/5 gal. pot, 3 plants/15 gal. tub	Discovery, Dwarf Modern, Early Jersey Wakefield, Little Leaguer, Red Ace	Take a second crop off a cabbage plant by harvesting the first head, then cutting a cross on the remaining stem which will then produce 4 smaller heads
Carrot	Minimum container depth: 8"	Baby Finger, Baby Finger Nantes, Danvers Half Long, Goldenhart, Little Finger, Minicor, Ox Hart, Royal or Red Cored Chantenay, Short & Sweet, Thumbelina, Tiny Sweet	Smaller, shorter varieties grow best but you can eat the ones you thin, too.
Chard	1 plant/2 gal. pot, minimum container depth: 8"	Bright Lights, Parma Giant, Scarlet Charlotte	
Collard Greens	1 plant/2 gal. pot, minimum container depth: 8"	Any variety	
Cucumber	1 plant/3-5 gal. pot	Burpee Hybrid, Burpless Farly Pik, Bush Champion, Bush Whopper, Crispy, Fanfare, Lemon, Marketmore 86, Parks Burpless Bush, Patio Pik, Pot Luck, Salad Bush, Salty, Spacemaster, Sweet Success	Look for bush variety as opposed to vining

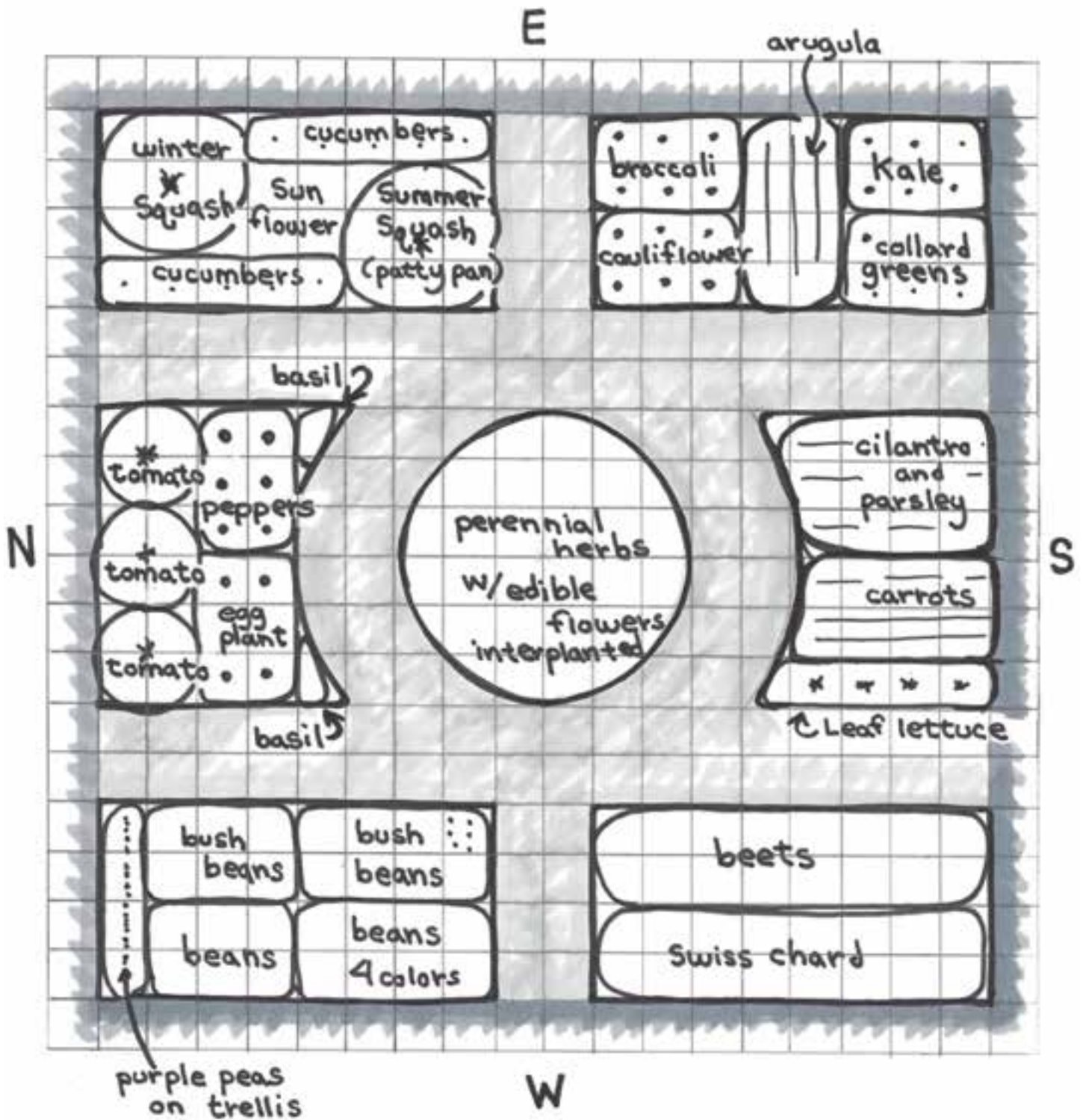
Vegetables & varieties ideal for container gardening

Eggplant	1 plant/3 gal. pot	Asian Bride, Bambino, Black Beauty, Florida Market, Green Goddess, Ichiban, Long Tom, Mission Bell, Modern Midget, Slim Jim, Small Ruffled Red, Thai Green	
Garlic	8" deep container	Most varieties	
Green Onion	Can be grown in a cake pan	Beltsville Bunching, Crystal Eax, Evergreen Bunching	You'll have better luck growing these than full sized onions
Kale	1 plant/2 gal. pot, minimum container depth: 8"	Lacinato, Showbor dwarf	
Lettuce	Minimum container depth: 4"	Bibb, Buttercrunch, Dark Green Boston, Grand Rapids, Little Gem, Oak Leaf (heat tolerant), Romaine, Ruby, Salad Bowl, Tom Thumb	If you eat it as baby lettuce, you can grow lettuce in a very shallow bowl, even a seed flat. Just cut the lettuce leaves and they will grow back. Can be grown in partial shade.
Parsley	Minimum container depth: 8"	Evergreen, Gigante Italian, Moss Curled, Sweet Curly	Can be grown in partial shade
Peas	Minimum container depth: 6-12"	Super Sugar Snap, Oregon Giant (snowpea), Little Marvel, Sugar Bon, Sugar Mel, Laxton's Progress, Sugar Rae, Melting Sugar, Burpee's Blue Bantam, Early Patio, Snowbird	
Pepper	1 plant/2 gal. pot, 5 plants/15 gal. tub	Bell Boy, California Wonder, Canape, Jalapeno, Keystone Resistant, Long Red Cayenne, New Ace, Red Cherry, Sweet Banana, Thai Hot, Yolo Wonder	
Potatoes	Pot should be at least 18" wide, start with 10" of soil in a 3 ft. deep container	Charlotte, Epicure, Irish Cobbler, Kennebec, Red Pontiac. Early (new) potato varieties are best.	To sprout potatoes, stand them in a warm, dark place with the buds pointing upwards. Fill a pot half way with used soil, then place the sprouted potatoes sparsely in soil and cover with 1" of soil. Water well and wait for foliage to appear. Feel around for a tuber to see if they're ready.
Radish	Minimum container depth: 4-6"	Burpee White, Champion, Cherry Belle, Comet, Early Scarlet, French Breakfast, Icicle, Scarlet Globe, Sparkler	Consider inter-planting these in pots among other slower growing vegetables (such as carrots or tomatoes); they'll be ready to harvest by the time the other plants need more space. Can be grown in partial shade.
Spinach	Minimum container depth: 8"	America, Avon Hybrid, Dark Green Bloomsdale, Melody	
Summer Squash	1 plant/5 gal. pot	Baby Crookneck, Creamy, Diplomat, Dixie, Early Prolific Straightneck, Gold Neck, Golden Nugget, Gold Rush, Scallopini, Senator, (Green) Zucco, most Zucchini varieties	Squash can really vary on how compact the plants are. Try for these varieties or anything that lists compact growing.
Tomatoes	1 plant/5 gal. pot bushel baskets	Better Boy VFN, Burpee's Pixie, Early Girl, Patio, Pixie, Red Robin, Saladette, Small Fry, Spring Giant, Sugar Lump, Sweet 100, Tiny Tim, Toy Boy, Tumbly Tom (for hanging baskets)	Lean toward cherry tomatoes and small tomatoes as opposed to Beefsteak tomatoes. Also, varieties that are determinate will be a bush variety which works better for containers. If you grow an indeterminate variety, make sure you have something for the vines to grow on.



Sample planting map 20' x 20' garden space with pathways

1 square = 1 square foot

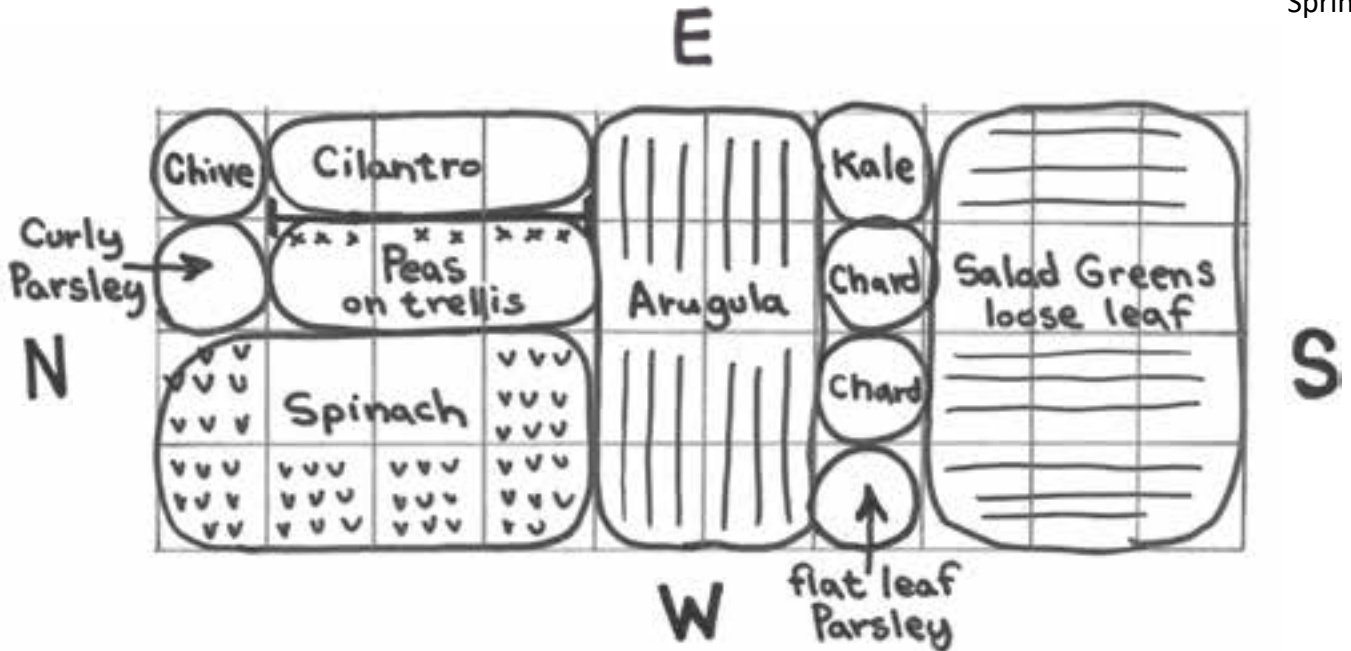


Sample planting map

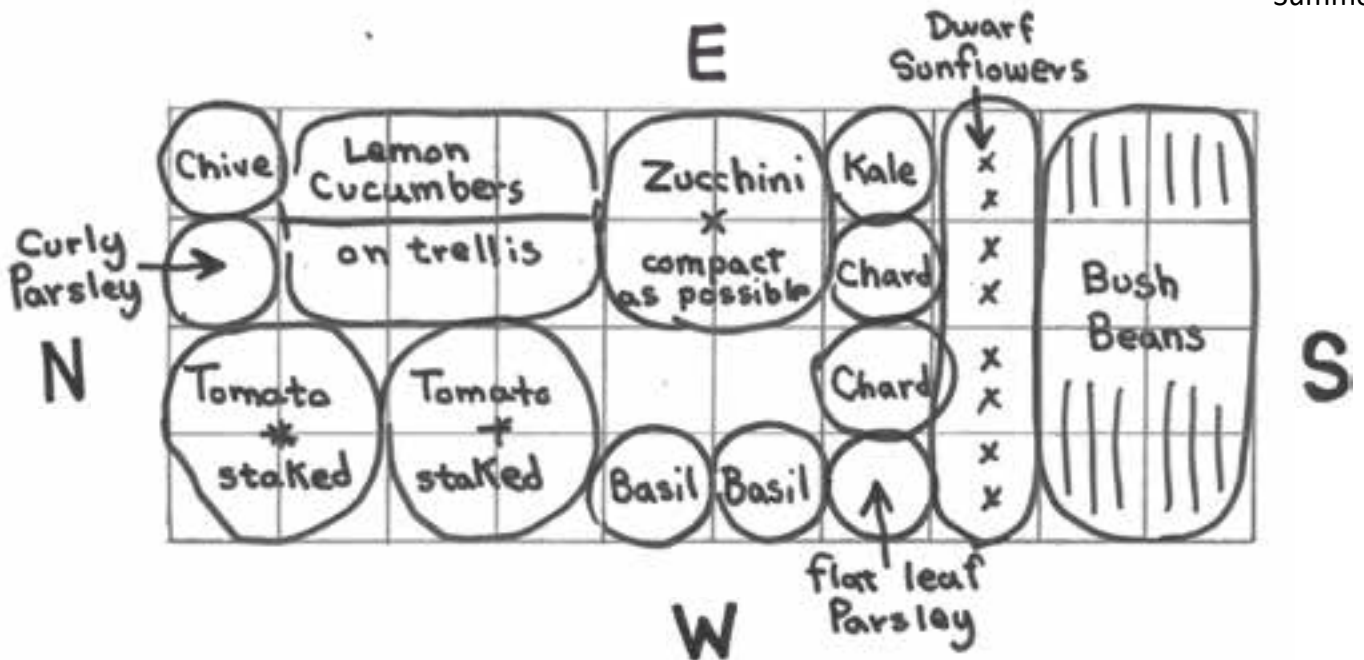
One 4' x 10' bed, two seasons

1 square = 1 square foot

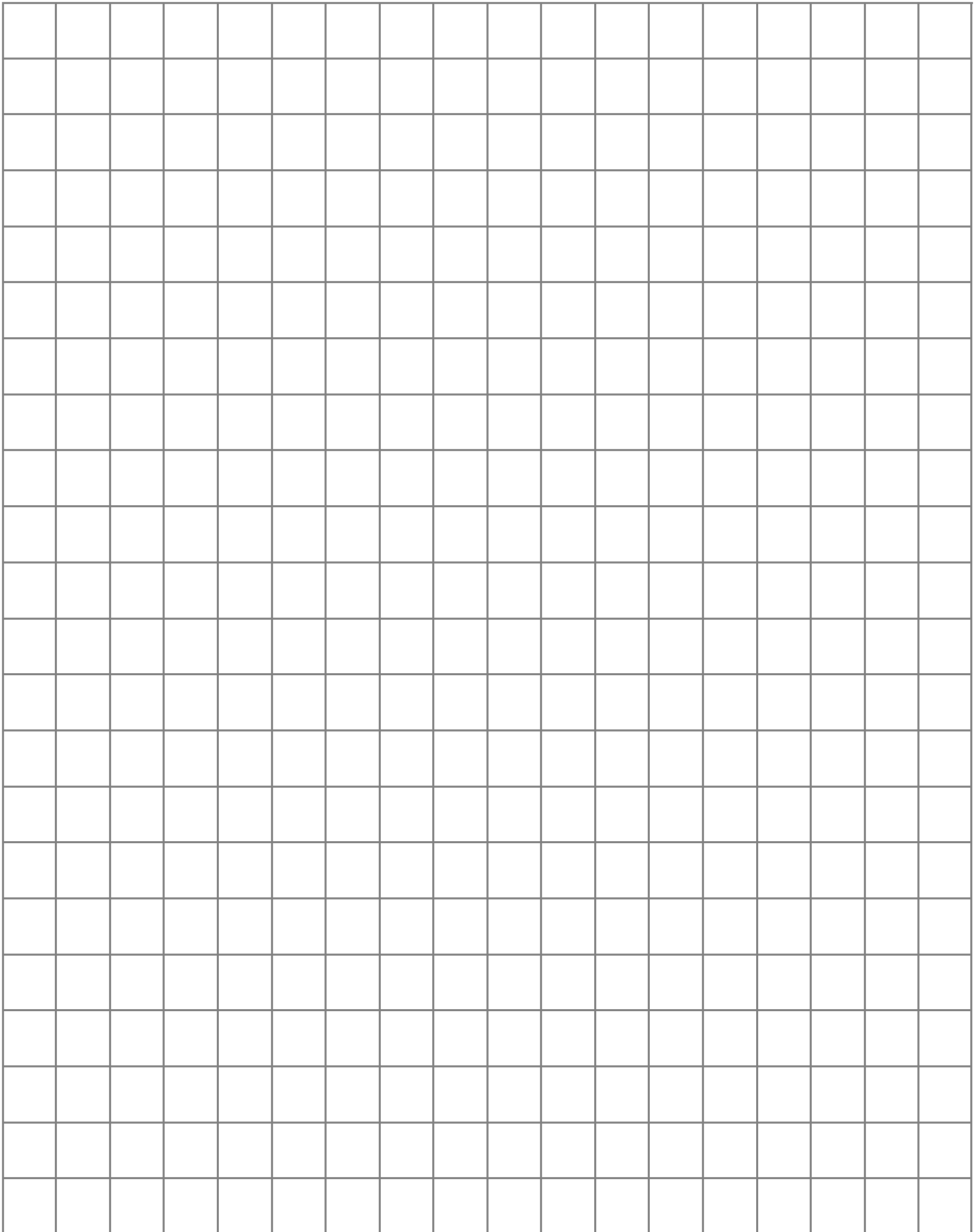
Spring



Summer



Personal planting map



Worksheet: Planning your garden

Define: Vocabulary words for the week

Spend time as a group defining these gardening terms:

Succession planting:

Row planted:

Crop rotation:

Banded:

Plant spacing:

Transplanted:

Planting calendar:

Footprint:

Hill planted:

Planting window:

Reflection:

What's your earliest memory of being in a garden? Was there anything about that garden that you would like to see in your garden today?



Class activity: Planning your garden

Step 1: Write or draw a list of all the fruits or vegetables you would like to eat.

Step 2: Work with a partner to identify which plants on your list will grow well in your region. Refer to the Arizona Vegetable Planting Calendar on page 14-16 for a sample of what grows well in your area. Put a question mark next to the ones you are not sure about.

Step 3: From the list you made in step 2, make a new list of five to ten fruits or vegetables that you would like to grow in your garden this year.

Review: Choosing your site

1. What are some important things to consider when planting a garden?

2. Give some reasons why they are important.

Tip: Remember to think about the direction of the sun. Taller plants will cast shadows on shorter plants. Keep taller plants to the north and west side to avoid shading out the rest of your garden.



Class activity: Crop planning

As a group, choose five crops. Create a planting plan and discuss where plants should be placed and why.

1. Where is the sun? How will it affect the placement of crops?

2. Are you going to be doing succession planting? Explain.

3. What did you learn from this exercise that will help you plan your garden?

How Much To Plant

This sheet is for reference

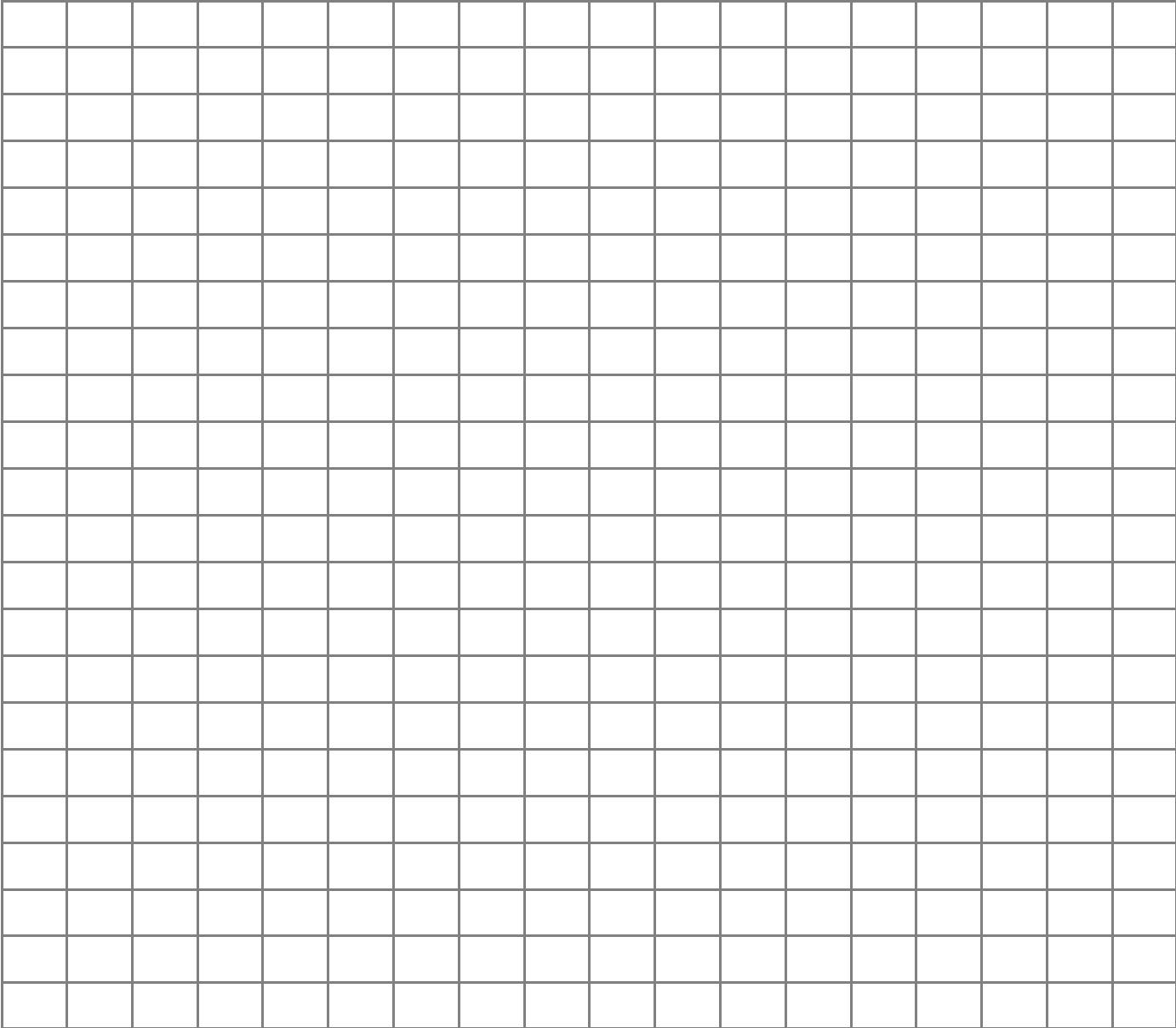
Suggested amounts are for one adult, and assume that the garden is the main source of that vegetable.

Vegetable	Average amount of garden bed feet required	Footprint per plant	# of Plants
Bush Beans	15-20 ft.	12"x12"	15-20
Pole Beans	5-6 ft.	4"x4"	15-18
Beet	5-10 ft.	4"x4"	15-30
Broccoli	3-5 ft.	12"x12"	3-5
Cabbage	5-10 ft.	12"x12"	5-10
Carrot	5-10 ft.	3"x3"	20-40
Cauliflower	3-5 ft.	12"x12"	3-5
Chard	3-5 ft.	12"x12"	3-5
Collards	5-10 ft.	12"x12"	5-10
Sweet corn	10-15 ft.	12"x12"	10-15
Cucumber	4-6 ft. trellised	6"x6"	2-3
Eggplant	2-3 ft.	12"x12"	2-3
Kale	5-10 ft.	12"x12"	5-10
Lettuce	5 ft.	6"x6"	10
Onion	3-5 ft.	4"x4"	9-15
Parsnip	10 ft.	3"x3"	40
Peas	3 ft.	4"x4"	9
Pepper	3-5 ft.	12"x12"	3-5
Potato	25-30 ft.	12"x12"	25-30
Pumpkin	6-12 ft.	6'x6'	1-2
Radish	3-5 ft.	3"x3"	12-20
Spinach	5-10 ft.	4"x4"	15-30
Summer Squash	6 ft.	36"x36"	2
Winter Squash	6-12 ft.	6'x6'	1-2
Tomato	9-15 ft.	36"x36"	3-5
Watermelon	2-4 ft. trellised	12"x12"	2-4



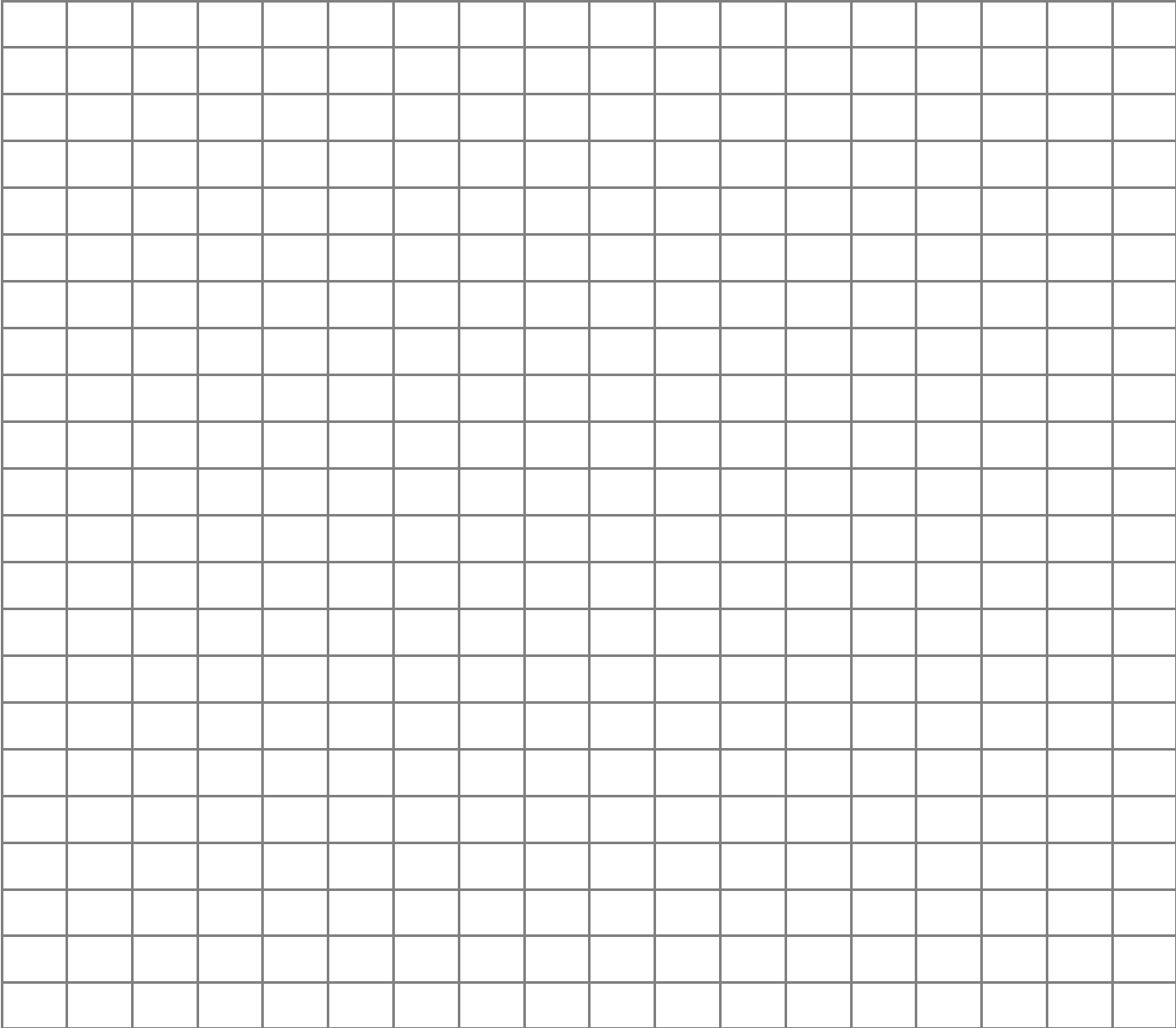
Multi-season garden map:

Summer crops:



Multi-season garden map:

Winter crops:



Wrap Up for Week 1:

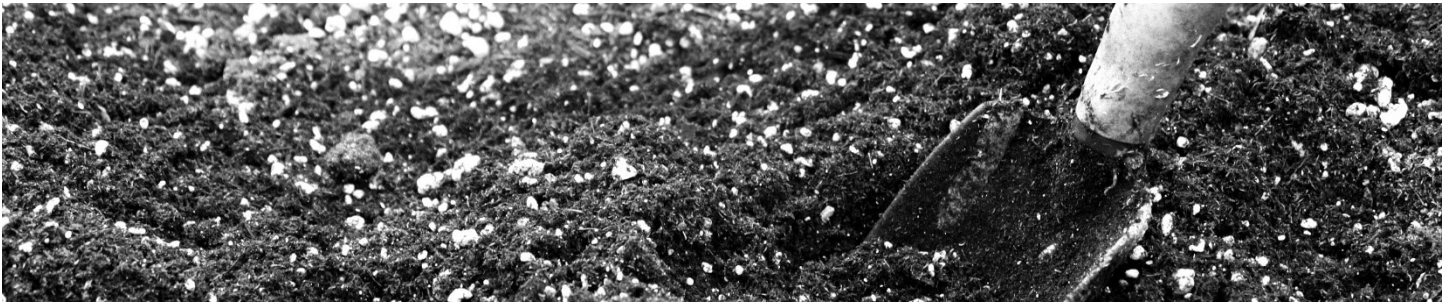
1. What are three things that you took away from this class?

2. What are some things that are still confusing?

Getting ready for next week:

- Bring a soil sample (if you have a garden site).
- Take a photo of your garden or potential location to share (if you have a camera).





Chapter 2: Getting started with healthy soil

In this chapter, you will learn about preparing and building healthy soil, applying compost and fertilizer, and creating different types of garden beds.

Preparing the soil

Planting begins with the soil. Soil provides nutrients and water for plants. Here, you will learn how to improve the condition of your soil, or its tilth. Soil that is 'in good tilth' can support healthy plant life. It is loamy, easy to dig, readily soaks up and stores water, drains well, and makes a good seedbed.

Do not work wet soil. Digging in the soil when it is wet can compact it. Compacted soil stores less water and has poor drainage. You will be able to work your soil more often once you have built up the soil with compost. Soil that contains lots of organic matter is ready for planting earlier because it drains better.

To test your soil moisture, take a handful of soil and squeeze it. If it stays in a mud ball, sticks to your gardening tools, or looks shiny, it is too wet. If it is dry or crumbles freely and feels like a wrung-out sponge, it is just right.

Remove debris.

If you planted a cover crop, you will need to cut it down and remove it or turn it under. Be sure to do this before the cover crop sets seed and at least two to four weeks before planting. You will learn about cover crops in Chapter 4. If you covered your beds with mulch that has not decomposed, remove it before planting.

TOPICS IN THIS CHAPTER

Preparing the soil

Building healthy soil

Composting

Fertilizing

Making garden beds

Worksheets



Building healthy soil

Healthy garden soil encourages healthy plant growth. Many problems in the home garden have nothing to do with disease or insects, but are the result of poor soil. You know the soil is poor if it is dried and cracked in summer, wet and puddled in winter, or hard to dig.

The ideal garden soil is described as loamy. Loamy soil forms into a ball and holds its shape when moist, but it crumbles easily when squeezed. It supports plant roots by providing them with both water and air. Loamy soil also drains well, which helps it warm up in spring so you can plant earlier.

Garden soil is made up of air, water, organic matter (decayed plant material), and particles of broken rock. Air and water sit in the empty spaces, or pore space, between the soil particles. Loamy soil is about 50% pore space. Water fills the small pores, and air fills the large pores. If the broken rock particles are mostly sand, the soil has large pores and holds lots of air but not much water. If the rock particles are mostly clay, the soil has small pores and holds lots of water but not much air. Plants and their roots need both water and air to grow.

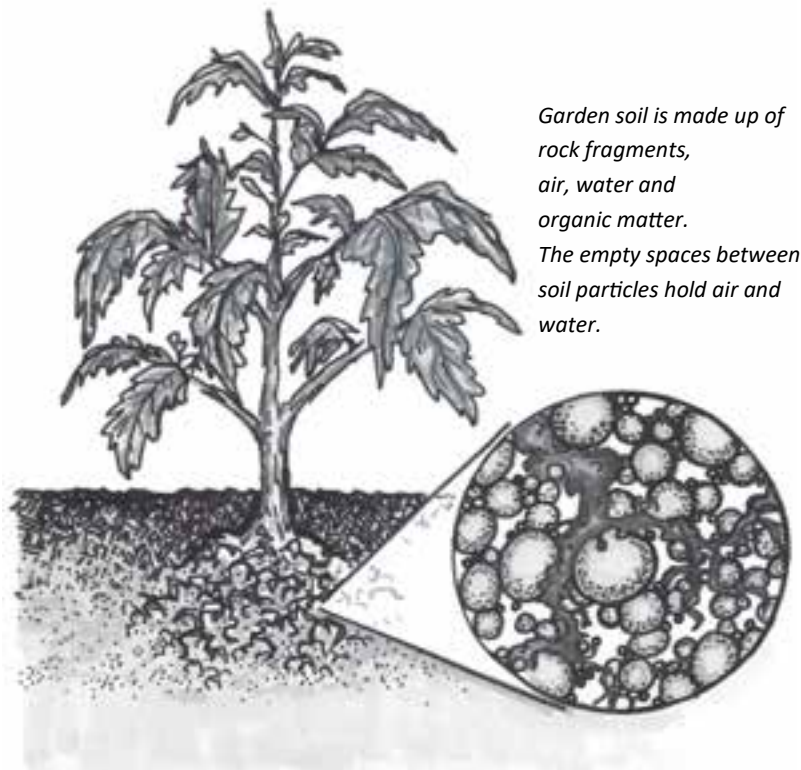


Healthy, "loamy" garden soil is loose and crumbly, but will form into a ball and hold its shape when moist.

Soil pores are the reason you should not step on the soil when you plant and take care of your garden. Compacted or flattened soil has small pores with little or no room for the air that plant roots need. It is a good idea to make permanent beds for your plants and permanent paths to walk in. That way, you can get around the garden and take care of your plants without crushing the soil pores.

TIP

To protect your soil, do not step or kneel in your garden beds. Instead, create permanent walking paths.



Garden soil is made up of rock fragments, air, water and organic matter. The empty spaces between soil particles hold air and water.

Organic matter makes up a very small part of healthy soil, but it is essential in a vegetable garden. Organic matter is anything that was once living and is now broken down in the soil. In nature, soil microorganisms and earthworms break down, or decompose, raw organic materials like fallen leaves, plant trimmings, and food scraps until they cannot be broken down any more. You can then add this decomposed organic matter to your garden beds as compost. Planting in raw organic material can harm your plants, so the material must first decompose, or turn into compost, before you add it to your garden beds.



Soil for container gardening

When plants are growing in the ground, their roots bring up nutrients from the subsoil. Plants are also surrounded by critters that digest coarse matter and make nutrients available. This can't happen in containers, so the growing medium needs to be nutrient rich. This may seem high maintenance, but remember – you're growing food above cement instead of in the ground.

It's not a good idea to use garden soil as a planting medium for containers, as it can't maintain its health and tends to compact too quickly. You can get potting mixes from nurseries that work great. Some contain pasteurized soil, others are soilless. Both contain additives that keep the soil aerated, help to retain nutrients, and allow for rapid drainage while still retaining moisture. Potting soil is "sterile" and will not contain weed seeds or diseases. You can also make your own potting soil from equal parts sand or perlite, loamy garden soil, and peat moss or coconut pith. Depending on your circumstances, this may be cheaper for you.

If your container garden is going to be on a rooftop or balcony, you should consider the more lightweight soilless potting mix if you are concerned about the weight you're adding to the container. You'll have to fertilize more, however, as these soilless mixtures cannot retain nutrients as well as mixes containing soil.

Make sure that the planting medium drains rapidly, but also retains enough moisture to keep the roots evenly moist. Line the base of the pot with newspaper to prevent soil loss (don't put rocks in the bottom of the pot). Add a handful of native soil (dirt from your yard) to help encourage the growth of microorganisms in your potting mix.

Composting

Good soil naturally contains a small amount of organic matter. Adding compost to your garden beds every year will increase the amount of organic matter in the soil and make it better for growing vegetables.

You can make compost yourself or you can buy it already made. If you make compost yourself, you can make it in bins or piles and then move the



Compost-rich soil contains earthworms and microorganisms, which supply nutrients to your plants so you use less fertilizer.

finished compost into your garden beds. You can also make compost directly in your garden beds and wait until it has decomposed before planting.

There are many good reasons to add compost to your garden beds. When you work compost into the beds, the soil can absorb moisture better and hold onto it longer. Moisture evaporates from bare soil, so spreading a layer of compost as *mulch* on top of the soil during the dry season helps the soil hold onto moisture. That means you do not have to water the garden as often. Do not use more than two inches of mulch on beds during the planting and growing seasons. Mulch deeper than two inches limits air and stays too moist.

Soil that has been improved with compost contains earthworms and many types of soil microorganisms such as beneficial bacteria and fungi. The earthworms tunnel through the soil, forming air passages. The earthworms and microorganisms also break down organic matter into nutrients that plants use. As you add compost over time, these microorganisms supply more of the nutrients your plants need so you can use less fertilizer.

Compost also helps to protect the environment. Soil improved with compost acts like a sponge, so more water stays in the soil and less water runs off the surface. When water runs off, nutrients from fertilizer are carried away into the ground water and nearby rivers and lakes, where they can be harmful. With less runoff, the soil holds onto nutrients right where plants can use them.

Making compost

When you make your own compost, you save

This compost system is made from old wooden pallets. It has an open top and bottom, and removable front panels. Turn your pile regularly, mixing the materials as you go. When your compost is ready to use, it will look like garden soil.



Spreading fresh grass clippings in between established plants can protect soil organisms from direct sun exposure and keep soil moist. This reduces the need for watering and provides a slow release of nutrients. For more on “composting in place,” see the sheet mulching section on pages 47-48.

money and recycle nutrients back into your garden. You can build your own compost system or buy pre-made bins.

Building your bins. To make your own compost system, begin by building two bins next to each other. You can make them from wooden pallets, wire fencing, cement blocks, or old boards. The bins should be at least three feet wide by three feet deep by three feet high, but it is okay if they are bigger than that. Leave the top and bottom of each bin open, and make one side removable so that you can easily reach inside the bin. If you do not have materials to build a bin, you can make a

free-standing compost pile instead. If you plan to add large amounts of kitchen scraps to your pile, you might need to rodent-proof your bins by lining them with metal mesh. Some pre-made bins are already rodent proof.

Making your pile. Starting at the bottom of the pile, add brown and green materials in alternating six-inch layers. “Brown” materials, like shredded newspaper and raked leaves, are dry and high in carbon. “Green” materials, like garden scraps and grass clippings, are wet and high in nitrogen. See the “what to put in your compost pile” chart above for a list of brown and green materials. Compost piles that have both brown and green materials decompose faster. The materials also break down faster if they are chopped into small pieces. You can add one cup of high-nitrogen fertilizer like linseed meal or blood meal every few layers to speed up decomposition.

Continue to add layers until your bin is full (about three feet tall for a free-standing pile), or until you run out of material. If it is dry outside, water your pile occasionally to keep it damp, like a wrung-out sponge. Turn your compost pile regularly and add water as needed. The more frequently you turn and water your pile, the faster it will decompose.

When you want to get your compost ready for the garden, let the pile sit for a week or two. Then, fork



What to put in your compost pile	
Brown layers <i>(high in carbon)</i>	Green layers <i>(high in nitrogen)</i>
Dry leaves	Garden waste
Straw	Kitchen scraps
Sawdust	Coffee grounds
Torn paper bags	Grass clippings
Dry corn husks	Pet hair
Shredded newspaper	Composted manure
NO: Meat, dairy, bones, diseased plants, weeds, or poop from people or meat-eating animals like dogs or cats. Never add fireplace ash to the compost pile, as it increases the pH.	



Work compost into the soil with a digging fork.

the materials from the first bin into the second bin. If you created a free-standing pile, fork the materials into an empty spot on the ground. (You can now start a new compost pile in the first bin or spot.) Keep turning and watering the original pile until you cannot recognize the original materials anymore. When your pile looks like garden soil, it is ready to use.

Adding compost

Your garden uses up compost each growing season, so you need to add more every year. You can add finished compost or you can “compost in place,” which means building compost piles directly in your beds.

Adding finished compost.

Add two to six inches of finished compost to your

garden beds each year. The chart below lists the amount of compost needed for different plot sizes. Finished compost has already broken down, so you can add it to your garden beds at any time and you do not have to wait to plant. You can make your own compost, or you can buy finished compost in bags or bulk.

When you are ready to plant, first add the compost to the soil using a digging fork or shovel. If your soil is heavy with clay, you may need to dig and mix in your compost. If your soil is already loose and

How much compost do I need in order to add a two-inch layer to my garden space?		
Plot size	Square feet	Amount of compost
4' x 8'	32 square feet	5.4 cubic feet
10' x 10'	100 square feet	16.2 cubic feet
20' x 20'	400 square feet	67.5 cubic feet

Want to learn more?

Small Scale Composting in the Low Desert of Arizona. Search publication AZ1632 at www.extension.arizona.edu/pubs.

loamy, you can use a digging fork to wiggle in new compost without mixing.

For perennial crops like asparagus, artichokes, and berries, you can spread two inches of compost on top of the soil each year without mixing it in.

In some cases, you can add fertilizer along with the compost and mix them in together. See “how to apply fertilizer” on pages 44-45.

Composting in place. This kind of composting is also called “sheet mulching” or “lasagna gardening.” It is a method for improving soil by building a compost pile directly in a garden bed.

To learn how to compost in place, see “Method 2: Sheet mulching” on pages 47-48.

Fertilizing

You can help your soil hold onto nutrients with good gardening practices, but vegetable gardens need extra nutrients every year. Giving plants the right amount of nutrients at the right time is key to growing a successful garden.

Plants need 16 nutrients. Nitrogen, phosphorus, and potassium are important nutrients that are found in most fertilizer mixes. Plants need them in larger amounts than other nutrients. Plants need much smaller amounts of the other 13 nutrients, or micronutrients.

The three numbers on a fertilizer label tell you the percentages of available nitrogen (N), phosphorus (P), and potassium (K) in the product. For example, a fertilizer labeled 15-5-10 contains 15% nitrogen, 5% phosphorus, and 10% potassium.

For the first two or three years of a new garden bed, a balanced fertilizer is fine. It contains N, P, and K in the same amounts, such as 10-10-10.

Soil testing

Consider testing your soil when you are starting a new garden. A soil test can measure your soil’s pH and the amounts of N, P, K, and other nutrients in your soil before you begin planting.

Testing soil’s pH. The pH number tells you how acidic or alkaline your soil is. Vegetable gardens are



The three numbers on the label of a bagged fertilizer mix tell you the percentages of available nitrogen (N), phosphorus (P), & potassium (K) contained in the product.

most productive when the soil is slightly acidic, between pH 6.0 and 7.0. If a soil test shows that your soil pH is lower than 6.0 (too acidic), then some nutrients will be less available to your plants. Most soils in Arizona are alkaline, meaning they have a pH between 7.0 and 8.5. So, do not add products like agricultural lime that raise soil pH. Talk to your local Master Gardeners about ways to acidify your soil.

Testing soil’s N-P-K. If you have added a balanced fertilizer for several years, enough phosphorus and potassium may already be in your soil. These nutrients move through the soil slowly. On the other hand, nitrogen leaches out of the soil quickly with too much watering or heavy rainfall. You may want to have your soil tested every three to five years to see if you need to supply any nutrients other than nitrogen.

Organic and chemical fertilizers

You can grow a successful garden using either organic or chemical fertilizer. Each has advantages



and disadvantages. Look at the comparison chart below and decide which type of fertilizer you want to use. You might base your decision on the needs of your plants, how much you want to spend, the materials that are available to you, or your personal values.

How to apply fertilizer

There are several ways to apply fertilizer. The method you choose depends on the kind of fertilizer you have and when you are using it. For a homemade organic fertilizer, you can broadcast, band, side-dress, or place a quarter cup of it “in the hole.” For a pre-mixed or liquid fertilizer, be sure to read the instructions on the container before using it.

Broadcast. Scatter the fertilizer over the surface, just like sprinkling cinnamon-sugar on toast. Then work it into the soil with a shovel, digging fork, or rake. To save time and labor, add the fertilizer and compost at the same time, then mix them into the soil together.

Band. Use the corner of a hoe to dig a trench about three inches deep, and sprinkle fertilizer in the trench. Cover the trench with soil, then sow seeds one and a half to two inches above and to the side of the filled trench. As the seeds germinate, the

plant roots will grow downward into the fertilizer and absorb the nutrients. Banding is also a good way to fertilize a row of transplants or to add fertilizer to plants that are already growing.

Side-dress. Scatter the fertilizer on the surface of the soil, close to growing plants. Keep the fertilizer off leaves to prevent burning. Lightly scratch it into the top inch of garden soil with your gloved fingers or a hand cultivator, taking care to avoid plant roots. Water the fertilizer in so the plants can absorb the nutrients.

Side-dress when you need to give plants extra nutrients during the growing season.

“In the hole.” Use this method when you are transplanting vegetables into the garden. Put a small scoop of fertilizer in each planting hole and mix it into the soil at the bottom of the hole. For homemade organic fertilizers, put a quarter cup of it in the hole. For pre-mixed fertilizers, check the instructions on the container.

When to apply fertilizer

Fertilize before you sow seeds or transplant starts. The timing depends on the type of fertilizer you are using.

When to apply organic fertilizer. In the first year of



Measure pH at home with a home soil test.

Many Cooperative Extension offices also offer free pH soil testing.

Organic and chemical fertilizer comparison	
Organic fertilizers	Chemical fertilizers
Organic fertilizers, such as seed meal, bone meal, and kelp, come directly from plant or animal sources. They are sold on their own and in pre-packaged complete mixes.	Chemical fertilizers (also called “commercial,” “synthetic,” or “conventional” fertilizers) are manufactured in a chemical process. They are sold as pre-packaged complete mixes.
<p>Advantages:</p> <ul style="list-style-type: none"> • Support soil microorganisms, which are good for long-term soil health and tilth • Contain micronutrients essential to plant health • Release nutrients more slowly, so more nutrients stay in the soil instead of washing into groundwater and damaging the environment • Slower release also means less chance of damage to plants <p>Disadvantages:</p> <ul style="list-style-type: none"> • Nutrients are in a form that must be broken down by soil microorganisms, which means nutrients are not immediately available for plant use • Microorganisms are less active in cool temperatures, which slows the release of the nutrients • Sometimes more expensive in the short run • Bone meal is ineffective in soils with a pH over 7. 	<p>Advantages:</p> <ul style="list-style-type: none"> • Made to be water-soluble, so nutrients are immediately available to plants after the fertilizer is watered in • Sometimes less expensive in the short run <p>Disadvantages:</p> <ul style="list-style-type: none"> • Usually supply only N, P, and K, with micronutrients missing • Do not supply organic matter • Unless the formula is time-released, nitrogen leaves the soil quickly • Many chemical fertilizers are concentrated and very water-soluble, so it is easier to apply too much and damage plants

To broadcast fertilizer, scatter it on top of soil, like sprinkling cinnamon-sugar on toast.



a new garden, fertilize about a month before you sow seeds or transplant in spring. This gives the soil microorganisms time to break down the fertilizer into a form that the plants can use. After a season or two of organic gardening, you will be able to fertilize at planting time without needing to wait. For “in the hole” fertilizer applications, fertilize when you transplant your starts.

When to apply chemical fertilizer. If you choose to use a chemical fertilizer, follow the directions on the package.

Fertilizing during the growing season

Plants need nitrogen for healthy growth. If your plants look pale green or yellow and their growth slows down about four to five weeks after planting,

they may need more nitrogen. Side-dress a small amount of quick-release nitrogen fertilizer, like fish fertilizer, and then water the plants. Do not give extra nitrogen to plants grown for their fruits, like tomatoes, cucumbers, squash, and peas. That extra dose of nitrogen can make these plants produce only leaves and no fruit.

Fertilizing with containers

Containers also lose nutrients quickly. Liquid fish emulsion or liquid seaweed are good fertilizers for container gardens. Follow the instructions on the container for the amount to use. Containers should be fertilized once a week after the plant is firmly established. This might seem like a lot, but it’s one of the things we do to make up for the fact that the plants are growing in places besides the actual ground.

Making garden beds

Garden size

How big should your garden be? That depends on your answers to these questions:

Why are you gardening? Are you gardening to feed yourself? Your family? Your community? Will your garden also be a play space for your children, grandchildren, or pets?

Who will do the work? Will the garden be a group project, with family members or friends helping out? Or will it just be you?

How much time do you have to spend gardening? Be honest with yourself about how much time you can spend in the garden. Gardens need some

Nutrient content of organic fertilizer

	% Nitrogen (N)	% Phosphorus (P)	% Potassium (K)
Cottonseed meal	6-7	2	1
Blood meal	12-15	1	1
Bat Guano	10	3	1
Fish meal	10	4	0
Fish emulsion	3-5	1	1
Bone meal	1-4	12-24	0
Rock Phosphate	0	25-30	0
Greensand	0	0	3-7
Kelp meal, liquid kelp	1	0.1	2-5



attention everyday!

How much room do you have? If you have a large area for gardening, you might feel like you need to grow a large garden. However, a small, weed-free garden produces more and will give you more pleasure than a big, weedy mess. If you find that you have the time and energy for a larger garden, you can always make your garden bigger next year.

As you design your garden, make sure you can work in your beds without stepping on and compacting the soil. Build your beds so that you can easily reach the middle from the paths on both sides of the bed. Beds are usually three to four feet wide, and can be as long as your space allows. If you have several beds, separate them with paths. You will need at least 18 inches for a footpath and 24 to 36 inches for a wheelbarrow or garden cart.

Raised beds

A raised bed is any type of garden bed that is raised above the ground. Raised beds help you avoid stepping on the soil and compacting it. They help you focus on the areas where plants will be growing, so they help you save on fertilizer, compost, water, and your own time and labor. Raised beds also drain well and warm up sooner in spring so you can plant earlier.

Some raised beds have retaining walls, and some do not. Retaining walls can help to hold the soil in place, but they are expensive and usually unnecessary. They also create hiding places for

slugs and other pests. Retaining walls are useful if you want to create beds with special shapes, use narrower paths, or make it easier for people with limited mobility to reach the beds. If you choose to build retaining walls, you can use concrete blocks, rocks, or boards (but not pressure-treated boards manufactured before 2002 or boards that could have lead paint on them).

Method 1:

Making a basic raised bed

This is an easy way to start a new bed.

Step 1: If the soil is compacted, loosen it two to three inches deep with a shovel or digging fork. Do not rush this step. Wait until the soil is dry enough to crumble when you loosen it.

Step 2: Spread about two inches of finished compost in a layer over the soil. The chart on page 42 lists the amount of compost needed for different plot sizes.

Step 3: If you plan to use an organic fertilizer, add it now. Broadcast it, meaning scatter it evenly, over the layer of compost like cinnamon-sugar on toast.

Step 4: With a shovel or digging fork, dig the compost into the soil to about six inches deep. You can also use a tiller.

Step 5: Make 36- to 48-inch-wide beds by shoveling paths between the beds. Make each path 18 to 36 inches wide and six inches deep. Add the shoveled



A raised bed is any garden bed raised above the ground. Make beds three to four feet wide, with paths between 18 and 36 inches wide.

soil to the top of the beds. You now have a soil and compost mixture about eight inches deep.

Step 6: Rake the beds level. The slope of the soil at the edges will leave about 36 inches of flat planting space on top of each 48-inch-wide bed.

Once you finish shaping the beds, walk only in the paths. Add sawdust, fallen leaves, wood chips, bark, or straw on top of the paths to reduce mud and smother weeds.



Raised beds can help you avoid stepping on your garden soil.

Method 2:

Sheet mulching

Sheet mulching turns raw organic material like grass clippings, fallen leaves, and vegetable scraps into planting soil. It is also called “composting in place” or “lasagna gardening.”

Like other compost piles, sheet-mulched beds need dry, brown, carbon-rich materials and green, wet, nitrogen-rich materials placed in layers. The “What to put in your compost pile” chart on page 42 lists different kinds of brown and green materials that you can use. Small amounts of nitrogen fertilizer like linseed meal or fish fertilizer can help sheet-mulched beds turn into garden soil faster.

Begin sheet mulching in your bed several months before you want to plant. The material will break down slowly over a season and will be ready for planting in the next season.

Step 1: Begin by mowing or trimming grass or other vegetation as low as you can in the area where you plan to make your bed. Next, mark off your new garden bed with stakes and twine.

Step 2: Loosen the soil in the bed to several inches deep with a digging fork to make sure there is good drainage.

Step 3: Remove weeds from the bed and put them in your green waste bin or garbage bin. (For more on weeding, see Chapter 5.)

Step 4: Cover the bed with four to six overlapping layers of newspaper or cardboard to smother the grass and weeds. The newspaper or cardboard will break down and become part of the soil.

Step 5: Soak the newspaper or cardboard. Then cover it with a thin layer of nitrogen fertilizer like linseed meal.

Step 6: Top the nitrogen fertilizer with one to five inches of brown material like dead leaves, straw, or shredded newspaper. Make sure that the material is loose and not clumped together.

Step 7: Add one to five inches of green material like kitchen scraps, green yard waste, coffee grounds, or composted manure. Never add raw animal manure directly to your garden. (The brown and green layers should be the same thickness.)

Step 8: Continue to add alternating layers of brown and green materials until you reach a final height of about 18 inches. Sprinkle a little nitrogen fertilizer every four layers or so to speed up the composting.

Step 9: As you collect more materials, you can add more alternating layers of brown and green up to the height you want for your bed. Keep in mind that taller beds take longer to break down into garden soil. When you add more layers, always end with a brown layer. This top layer is the “blanket” that keeps flies away. You can also cover the top layer with burlap sacks to keep the pile neat and in place. Remove the burlap at planting time.

If a pile gets too wet, cover it with a sheet of black plastic. Keep the plastic in place with bricks at each corner. The plastic will help to warm the pile so it breaks down faster. It will also help keep nutrients



from leaching through the soil and past the plant roots during the rainy season.

Sheet mulching is a slow process. A garden bed using this process may take six months to become ready for planting. A bed is “finished” when the green and brown layers have broken down and you can no longer recognize what they were. The pile should look and smell like fresh earth.

In future years, when you are composting in an existing bed and not making a new bed, you will need only a couple of green and brown layers.

Method 3:

Double digging

Double digging turns heavy, compacted soil into a bed that is ready for planting right away. However, it is hard work and time-consuming. As described below, use a long-handled square shovel to dig efficiently and protect your back. Use a digging fork to loosen the soil.

Step 1: Dig a trench (one foot wide by one foot deep) at one end of the bed, and put the soil you dug up into a garden cart or wheelbarrow or set it aside.

Step 2: Lay two to four inches of compost in the bottom of the trench, and break up compacted soil in the trench. To do this, push a shovel or digging fork into the soil, and wiggle it back and forth.

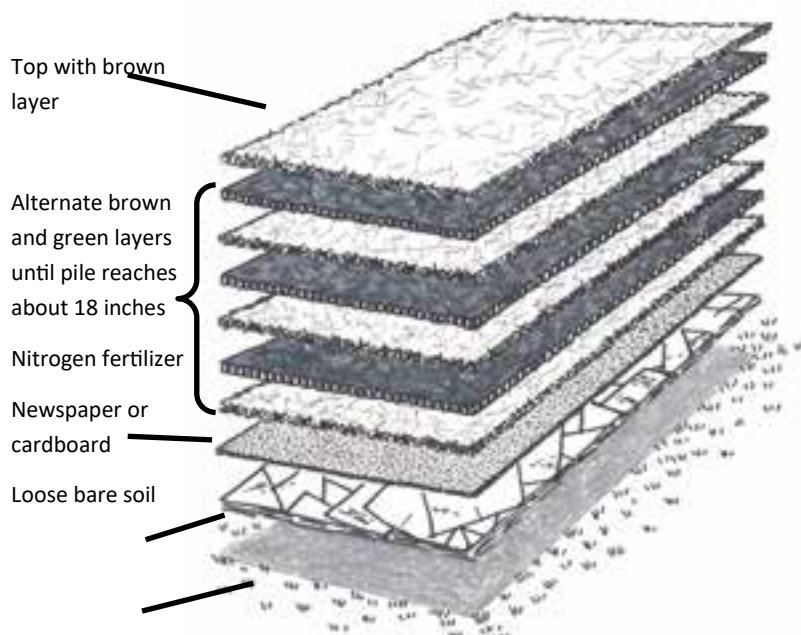
Step 3: Dig a second trench next to the first trench, and put the soil from the second trench on top of the compost in the first trench (grass-side down). Lay two to four inches of compost in the bottom of the second trench, and mix as in Step 2.

Step 4: Repeat Step 3 until you finish the whole length of the bed. Mix the soil you dug up from the first trench with compost before returning it to the bed. The loosened soil and all the compost you added will raise the level of the bed.

Method 4:

The no-dig method

The no-dig method is a quick and easy way to build a bed that is ready for planting right away. But it



Sheet mulching turns raw organic material, like grass clippings, leaves, and vegetable scraps, into planting soil.

can be more expensive because you need to start with a pre-made planting mix.

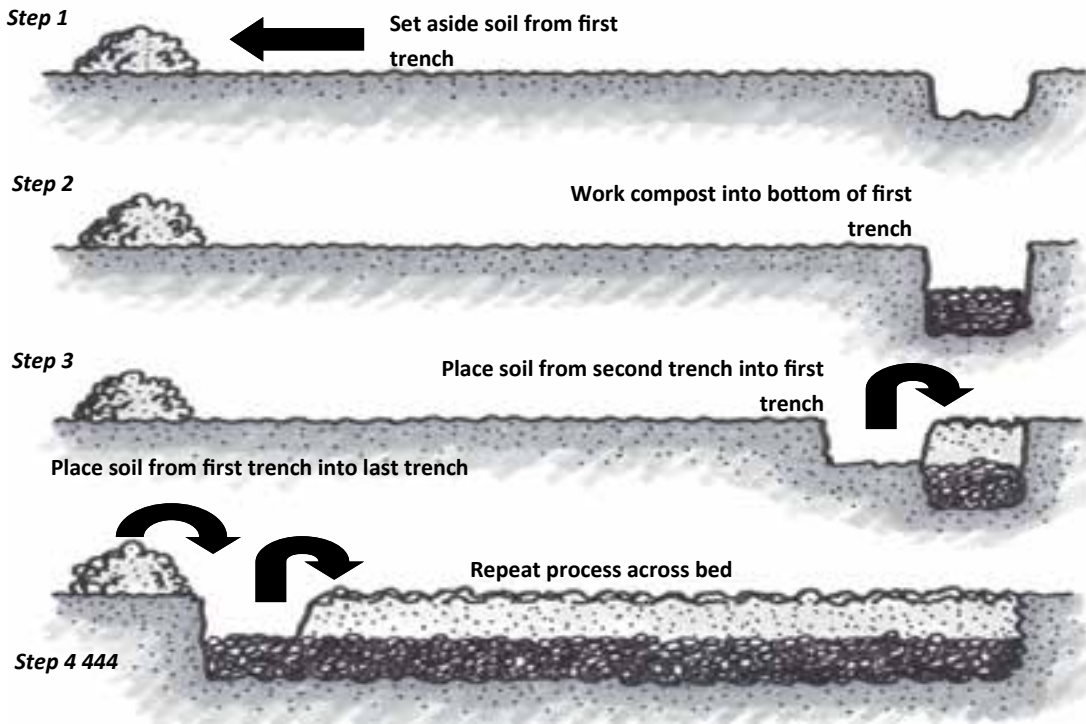
Step 1: Clear the area of weeds. Then put down layers of cardboard or newspaper to smother grass and weeds and keep them from growing up into your bed. Soak this material.

Step 2: Mound four to eight inches of pre-made planting soil over the cardboard or newspaper. If your bed is shallow, you can plant shallow-rooted crops like lettuce and spinach to start with. As you add compost in the future, your bed will become part of the soil below and you will be able to plant crops that have deeper roots..



Top your sheet mulched beds with a layer of brown material like straw or burlap. This acts like a “blanket” to protect the beds and keep them tidy.





Double digging is a way to build a good garden bed in heavy, compacted soil.

The no-dig method is a quick and easy way to build a garden bed, but can be more expensive than other methods.



Courtesy of RosemaryOnTheTV.com

Worksheet: Getting started with healthy soil

Define: Vocabulary words for the week

Spend time as a group defining these gardening terms:

pH test:

Sand:

Compost:

Silt:

Fertilizer:

Greens:

Clay:

Browns:

Loam:

Reflection:

Do you have a memory of playing in the dirt when you were younger?

Do you feel differently about dirt now?



Class activity: Soil

Use a soil sample that you brought from home.

1. Describe your soil's characteristics.

Things to look for: color, smell, texture, moisture, bugs or worms, plant debris

2. What are some of the main components of healthy soil?

3. What is organic matter?

Class activity: pH *Reference page 43*

Take the pH of the soil samples in class, and discuss what that means for plant health.

1. What do the numbers mean?

2. What does it mean when the soil is too acidic? How do you fix that?

3. What does it mean when the soil is too alkaline? How do you fix that?

Review: Container soil

What are some different ways to care for container soil and garden soil?



Class activity: Compost

Reference pages 40-43

Work in pairs:

1. What are the main components of compost?

2. Create a list of the materials you can use to make compost at home.

Discuss if they would go in the green or brown category, and why.

Greens	Browns

3. Do you compost? If so, do you have any tips for the class or did you get any tips from the class?

Review: Fertilizer *Reference pages 43-45*

1. Choose a specific fertilizer to look at it. What are the ingredients? What are the quantities of N-P-K?

In general, when using fertilizers:

2. Where do you put it?

3. When do you use it?

4. Why do you use it?



Class activity: Container depth *Reference pages 20-21*

For each size of container, write a list of vegetables that can grow in that size pot.

6 in. deep



8 in. deep



10 in. deep



3 gallon pot



5 gallon pot



Wrap Up for Week 2:

1. What are three things that you took away from this class?

2. What are some things that are still confusing?

Getting ready for next week:

- Bring in a container, or take a picture of a container garden that you have seen.





Chapter 3:

Planting your garden

You have prepared your site and planned your garden, and now it is time to plant! In this chapter, you will learn about selecting and preparing your containers, timing your plantings, and starting your garden with transplants or seeds.

Choosing a container

If you are gardening with containers, there are many options to consider. Planter boxes, hanging baskets, and terra cotta pots are what first come to mind, but don't stop there! You can grow delicious food in something far less glamorous and expensive. Bigger is going to be better when we're talking vegetables, but you can grow food in containers as small as a cake pan. Here are some things to consider when choosing a container:

- Choose the right size container for the plant. Think about the root system of the plant you are growing, and plant accordingly. If a vegetable needs a large space between plants in the garden, the same is true of a container. You may only get one plant in a container.
- Whatever you use for a container will need drainage holes. Holes should be about a half inch across.
- Avoid containers with narrow openings. Cheap plastic pots will deteriorate faster, but they will get the job done.
- Use containers that are between one and five gallon capacity. Small pots restrict the root area and dry out very quickly. The size and number of plants to be grown will determine the size of the container used. Deep-rooted vegetables require deep pots.
- Set containers on bricks or blocks to allow free drainage.

TOPICS IN THIS CHAPTER

Container selection
Seeds or transplants?
Direct seeding
Transplanting
Worksheets



- Wooden containers are susceptible to rot but redwood and cedar are relatively rot resistant. Avoid painted wood, and wood treated with creosote, penta, or other toxic compounds, as the vapors can damage the plants.
- In hot climates, use light-colored containers to lessen heat absorption and discourage uneven root growth.
- Make sure your container is not see-through in any way, or the roots will burn.
- Avoid using tires, as they break down and leach toxic metals and chemicals into the soil.
- For more information on sourcing cheap or free containers for your garden, refer to the “resources for gardening on a budget” section on page 150-151.

Seeds or transplants?

Before planting your garden, you must decide which crops to seed directly into the soil and which crops to transplant into the garden as plant starts.

Seeds can be less expensive than plant starts, so direct seeding can give you more plants for less money. Seeds also give you a bigger choice of plant varieties, because most stores have space for only a few varieties of plant starts.

Transplanting has its advantages too. Many favorite summer crops need a longer growing season than we have in the higher elevation regions of Arizona. Plant starts for these crops are grown in a warm greenhouse, so they get a jump on the growing season. When you transplant them into your garden, you give them plenty of time to produce a crop before the first frost kills them. Also, transplants are already big enough to get a head start on weeds, while young plants can get crowded out by weeds.

Direct seed leafy greens and crops with large seeds or long taproots.

Transplant long-season crops like tomatoes, tomatillos, and eggplant. These crops from tropical or subtropical climates need an early start in a greenhouse to ripen fruit at higher elevations.

Many other crops can be either direct seeded or transplanted. These include members of the cabbage family, the beet family, the onion family, and many herbs. Experiment to see what works for you.

Knowing when to plant

Whether you plant seeds directly in the garden or use transplants, it is important to plant each crop at the right time. Air and soil temperatures are important for healthy plant growth, so plants that go into the garden too early or too late may do poorly.

Your seed packet will tell you the minimum soil temperature the seeds need to germinate. Gardening calendars may list dates when the soil is warm enough, but temperatures can change from year to year. Checking the actual temperature with a soil thermometer will help you plant at the right time.

Choosing seeds or transplants		
Direct seed		
Large seeds	Deep taproots	Others
Corn	Radishes	Garlic (cloves)
Beans	Beets	Leaf lettuce
Peas	Turnips	Arugula
Squash	Carrots	Mustard
Pumpkins	Rutabaga	Potatoes
Cucumbers	Parsnips	(called “seed” potatoes)
Melons		
Consider transplanting		
Long-season crops		
Tomatoes	Tomatillos	Eggplant
Hot peppers	Bell peppers	Basil
Direct seed or transplant		
Cabbage family	Beet family	Onion family
Broccoli	Chard	Onions
Cauliflower	Spinach	Leeks
Collard greens	Quinoa	Chives
Cabbage	Herbs	Others
Kale	Parsley	Head lettuce
Kohlrabi	Cilantro	
Bok choy		

Direct seeding

Reading a seed packet

All seed packets list the same basic information: when to plant, how deep to plant, distance between plants, and days until harvest. Learning to read seed packets will help you to make good decisions when you grow crops from seed.

Buying and storing seeds

Try to buy only enough seeds for this one planting year. Some seeds can last for several years if you store them properly, but they germinate best in the year stamped on the packet.

You can store leftover seeds in a cool, dry, and dark

place like a refrigerator, closet, or basement. Put leftover seed packets in a sealed jar with a drying agent (such as a silica packet from a pill bottle) to absorb moisture.

What seeds need to germinate

To germinate, or break out of their shells and begin to grow, seeds need moisture and warmth.

Soil temperature affects germination. When the soil is cold, seeds will sometimes rot before they have a chance to sprout. You might be able to plant large seeds like beans, peas, and corn in cold soils if you pre-sprout the seeds.

Read the seed package for planting instructions. Seed packets contain important information to help you make good decisions when planting.

How to read a seed packet

General seed type: TOMATOES

Specific variety: TM877 Gold Nugget CHERRY TOMATO

Distance between mature plants: 18-30"

How much sun the plant needs: full sun

Number of days it takes for the first leaves to come up: 6-14

When to start your seeds indoors and outdoors, in relation to average last frost date. (Some crops, like tomatoes, are not suited to sowing outdoors.): 60 days. The compact bushes are covered with golden fruits that have an unusually rich, sweet taste. Determinate habit.

Year when seed will germinate best: 2010

How deep to sow the seeds: 1/4"

How warm the soil needs to be for seeds to sprout: 70-90°

Thin Plants to	18-30"
Light Requirements	full sun
Days To Germination	6-14
Soil Temp. For Germ.	70-90°
Seed Depth	1/4"

TOMATOES *Lycopersicon esculentum*

Sowing Indoors-Start seeds in sterile seedling mix, **6-8 weeks before your average last frost date.** Water lightly after planted and cover with a grow dome or plastic to ensure that seeds do not dry out. When the first set of true leaves have emerged, transplant into a larger pot, burying the stem to a point just below the first set of leaves. At this point, make sure not to overwater, so the stem will have time to adapt in the soil and develop roots.

Sowing Outdoors-Not recommended.

Growing Tips-Cover the young plants with floating row covers or protect them with "Wallo' Waters" to help promote good early growth. The use of Red Plastic Mulch can also increase yields.

Fertilization Tips-As transplants, fertilize with fish emulsion or dilute fertilizer solution every 10-14 days. Apply 1/4 cup of our blended organic fertilizer into the soil around each plant. A handful of bone meal should also be added around each plant if the soil is acidic.

Seed Specs-Min. germ. standard: 80%. Usual seed life: 3 years.

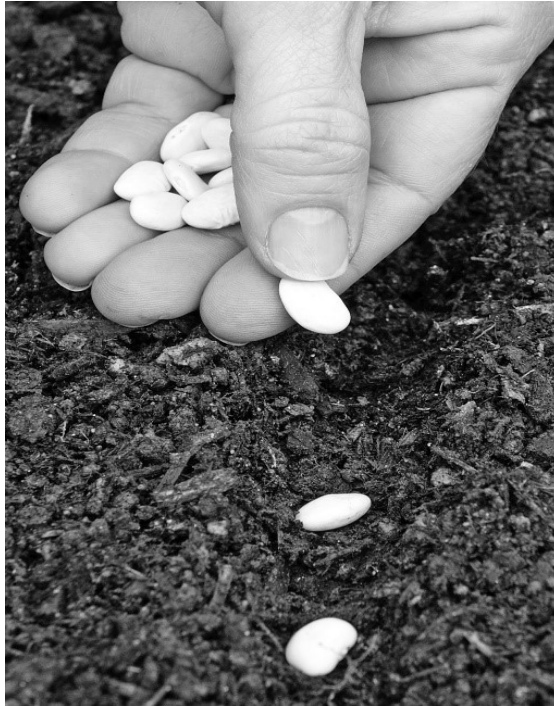
PLEASE READ OUR SEED WARRANTY BEFORE OPENING THIS ENVELOPE

Phone orders and catalog requests: 541-942-9547
 Fax orders: 888-657-3131
 Web site: <http://www.territorial-seed.com>

Days from sowing until harvest: 60 days

Territorial Seed Company
 P.O. Box 158, Cottage Grove, Oregon 97424

Sow twice as many seeds as you need and thin the seedbed later.



Courtesy of Billy Cox

To pre-sprout, spread the seeds out between two layers of damp paper towels, and place the towels in a plastic bag. Keep the bag in a warm place until you see small roots breaking out of the seeds. Once the seeds have sprouted, plant them as usual. Handle them carefully to avoid breaking off the tiny roots.

Preparing your seedbed

Loosen the soil with a digging fork or shovel, then rake the seedbed smooth to create a loose, even “tabletop” to your bed.

To make less work for yourself, spread your compost and any fertilizer you are broadcasting before you loosen the soil. Mix the compost and fertilizer in as you work the bed.

Sowing patterns

When you sow your seeds, you can choose one of these patterns: row planting, banded planting, or hill planting.

Row planting. Seed packets usually have directions for planting in long, single rows. The packet will tell you how deep the rows should be, how far apart to plant the seeds, and how far apart to space the rows.

Draw rows in the soil using your finger or the

edge of a garden tool. You can sow large seeds in the rows one-by-one. For smaller seeds, you can tap the seeds out of the packet or sprinkle them down the row using your thumb and pointer finger. Once the seeds are in place, check your seed packet to see how deep the seeds should be, and cover them with that amount of soil. Wait until you sow all the seeds before covering them so you can see if you missed any spots.

Some of the seeds will not germinate, and others will be eaten by birds or other garden pests. As insurance, sow twice as many seeds as you need and plan to thin the seedbed later.

Row planting works for all plants, but the distance you must leave between rows may waste space in a small garden. You may want to use a different sowing pattern for some crops.

Banded planting. You can sow seeds in a wide row instead of long, single rows. Radishes, spinach, beans, peas, beets, lettuce, and carrots grow especially well in banded rows.

Outline your banded row with stakes or twine, or

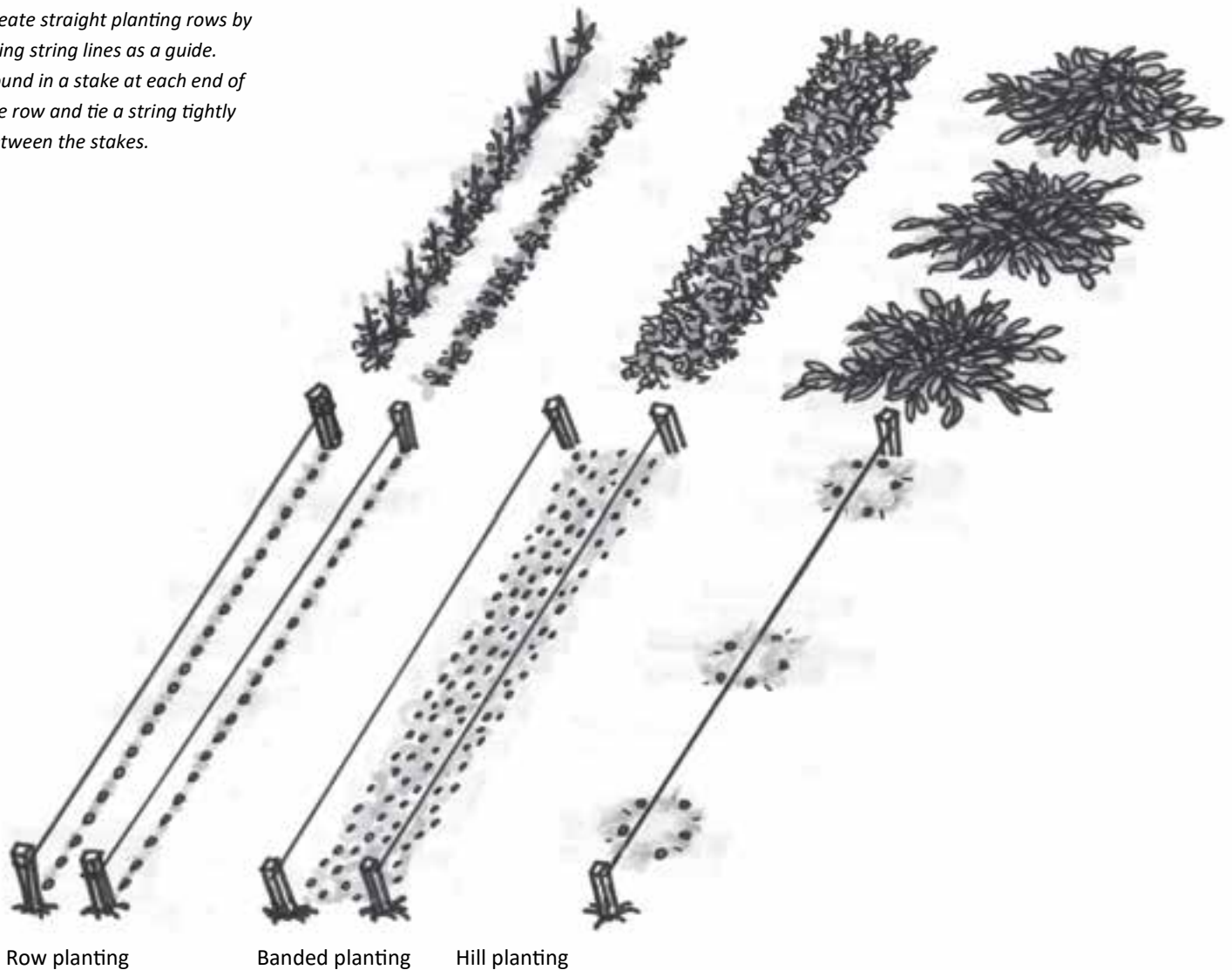
Minimum soil temperatures for germination

Crop	Temperature (°F)
Beans, snap	48-50
Cabbage	38-40
Carrots	39-41
Corn*	60-65
Eggplant	55-60
Melons	55-60
Onions	34-36
Peas	34-36
Peppers	55-60
Potatoes	39-41
Radishes	48-50
Tomatoes	50-55

*Supersweet varieties are especially sensitive to low temperatures.



Create straight planting rows by using string lines as a guide. Pound in a stake at each end of the row and tie a string tightly between the stakes.



Row planting

Banded planting

Hill planting

draw the outline in the soil with your hand or the edge of a garden tool. Broadcast your seeds evenly in the row. Sow more seeds than you think you need. Rake them in and gently cover them with the correct depth of soil. As the seedlings grow, thin some of the plants to give the others room to grow. You can read more about thinning on page 63.

Weeding a banded planting can be more time-consuming than weeding a row planting, because you cannot easily run a hoe between your crops.

Hill planting. A “hill” is a grouping of seeds planted close to each other in a small cluster. This is a good way to plant larger vegetables with big seeds, like watermelon, squash, corn, and cucumbers. Planting several seeds in each cluster helps you make sure that at least one seed will germinate and grow.

Look at the planting depth on your seed packet, then poke four or five holes in a small cluster. Put one seed in each hole and gently cover the seeds with soil. After the seeds germinate, thin each cluster to two or three plants. When the seedlings get bigger, thin each cluster to one plant. Cut the smaller seedlings to the ground and let the strongest seedling grow. The distance between clusters should be the same as the crop’s footprint.

Planting depth

How deep to plant seeds depends on the crop. Check your seed packet for information. If there are no directions on the seed packet, then follow this general rule: sow as deep as four times the longest part of the seed. If the seed is about a quarter-inch long, then plant it about one inch deep.

But if your soil is particularly heavy, sow seeds only

two or three times as deep as the longest part of the seed. In heavy soil, cover the seeds with light potting soil instead of garden soil. The potting soil will make it easier for seedlings to push through.

In any kind of soil, seeds that are sown too deep may never germinate. If seeds are not deep enough, they may wash away, dry out, or be carried off by birds or insects before they germinate.

Watering seeds

Seeds need moisture to germinate. Mist or lightly water often enough to keep a seedbed moist but not soggy. The soil should feel like a wrung-out sponge. Water new seedbeds every day or two. If the weather is very dry and hot, you may need to water a new seedbed several times a day.

Use a hose nozzle with a mist setting to avoid pushing the seeds too deep into the soil or washing them out. Water the seedbed until water begins to puddle. Let the water soak in, then continue watering until it puddles again. You may have to start and stop a few times to get the seedbed evenly moist.

Seedlings have shallow, tender roots, so you will have to water often until the roots grow deeper and are stronger. As the plants grow, increase the amount of water so that moisture goes deeper into the soil. Let the soil dry slightly between waterings.

Thinning

When you thin, you remove some seedlings to give the remaining ones space to grow strong roots and leaves. Thinning lets the remaining plants fill out their footprint.

These squash were planted using the hill planting method. Each cluster has been thinned down to the strongest plant.



TIP

If you are not sure how deep to plant your seeds, follow this general rule: Sow four times as deep as the longest part of the seed.

A vegetable garden is not productive when plants are growing too close together. Plants that are too close together compete with each other for sunlight, water, air, and nutrients. They are also easy targets for diseases and pests such as slugs.

Begin to thin seedlings as soon as plants develop their first set of true leaves. These are their mature leaves, which look different from their seed leaves. Thin about once a week until the plants are as far apart as they are supposed to be for mature growth. Remove the seedlings that look weaker and let the stronger ones grow. Gently pull up the weaker seedlings or snip them off at the ground. Water the seedbed well after thinning to keep the remaining plants from drying out. Some thinned seedlings, like lettuce, beets, chard, kale, collard greens, and spinach, can even be eaten as 'sprouts' or 'baby greens.'

Transplanting

Instead of sowing seeds, you can start off with transplants. Broccoli, cabbage, cauliflower, eggplant, tomatoes, and peppers all do well when transplanted into a garden as seedlings.

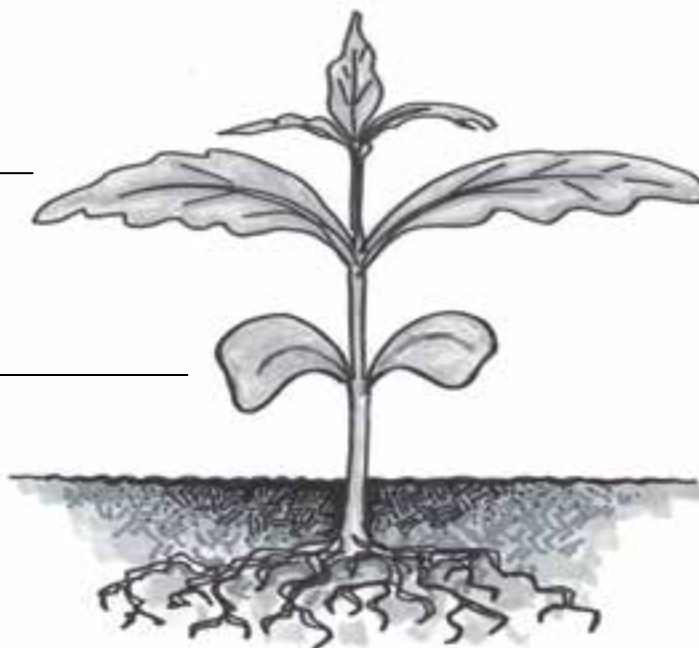
When you buy seedlings, choose stocky, disease-free plants. Transplants should have a few sets of leaves and well-developed roots. Avoid plants that look yellow, are woody, or are already flowering.



True leaves



Seed leaves



Begin thinning seedlings as soon as plants develop their first set of true leaves.

Also avoid plants that have been in the pot so long that roots are long and wound together. To check the root system on smaller plants in plastic pots, gently tip the plant out of the pot into your hand. Do this by tapping the bottom of the pot while holding the main stem between your middle and pointer fingers just above the soil.

Sometimes transplants have just come from the greenhouse and did not have time to “harden off.” When plants are hardened off, they are moved outdoors from the warm, humid greenhouse to get used to garden conditions. Harden off your young transplants when you bring them home. Take them outside during the day, and bring them in at night. Also expose them to a bit more sunlight each day. Do this for three to five days.

Space your transplants according to their footprint so they have plenty of room to grow. Nursery transplants often come with more than one plant in a single pot. If you are able to gently separate the roots without breaking them, you can plant each seedling separately. If the seedlings are too hard to separate, choose the healthiest looking plant and cut off the rest at soil level to keep them from competing with each other. Remember that even a well-weeded garden will produce less if the plants are too close together.

Transplant starts in early morning or early evening to prevent wilting. Water the starts several hours

before transplanting them. Handle them carefully to avoid damaging roots or bruising stems.

How to transplant

Dig a hole that is wider and slightly deeper than the root ball. The hole should be big enough that the top of the root ball does not stick up above the soil line. Place fertilizer in the planting hole and mix it into the soil in the bottom of the hole. (You do not have to do this if you added fertilizer when you prepared your bed.)

Set the transplant gently in the hole. The bottom leaves should be at or just below the top of the planting hole. Tomatoes are an exception. Dig a deeper hole, cut off the bottom sets of leaves, and

The plant start on the left has been in its pot too long. Choose transplants that are stocky and disease-free, like the one on the right.



Courtesy of OSU Extension



Transplant “starts” in early morning or early evening to prevent wilting.

plant the tomato so that only two or three sets of leaves are above soil level.

Gently backfill the hole with loose soil, being careful not to compact it. Be sure that the root ball is not sticking up above soil level.

Water the transplant well, but gently. This first watering keeps the young plant from drying out and helps settle the soil into any large air pockets below the surface. You may need to add more soil if the area around the transplant sinks during the first watering.

To make sure that your transplants take root, keep them well-watered during their first week in the garden.

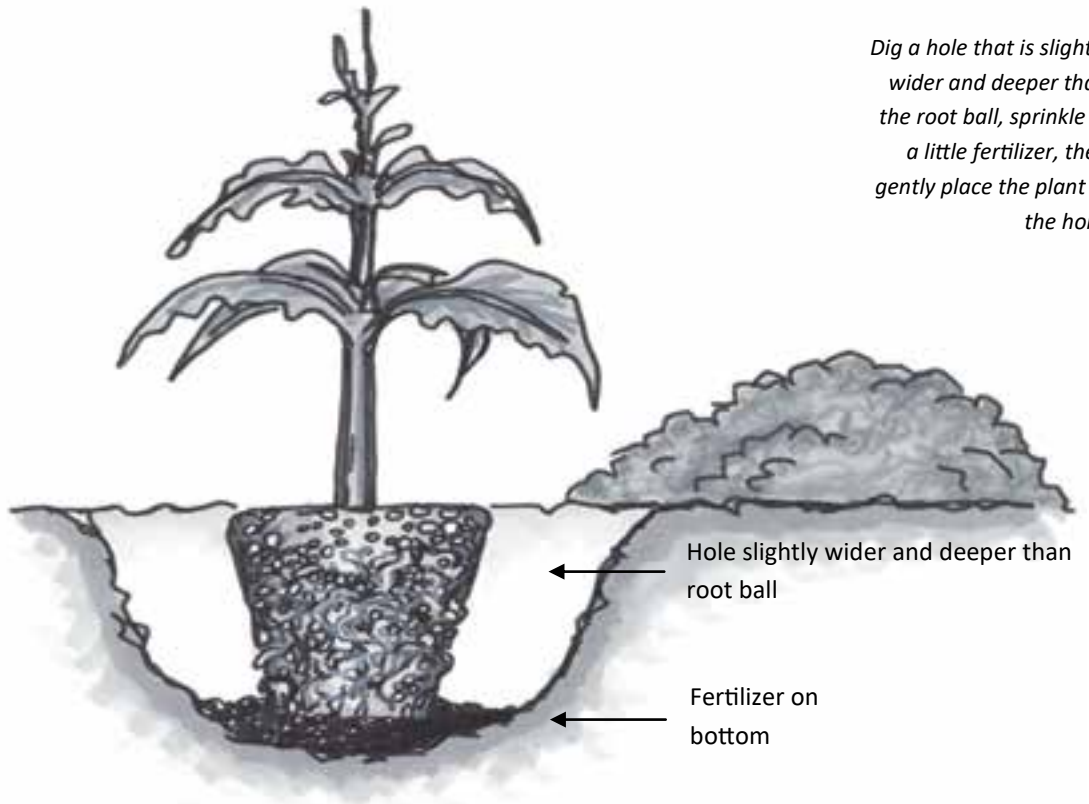


Recently transplanted tomato starts. _____





Wait until outdoor temperatures are warm enough before transplanting summer crops such as tomatoes and peppers.



Worksheet: Planting your garden

Define: Vocabulary words for the week

Spend time as a group defining these gardening terms:

Row cover:

Transplant:

Direct seed:

Planting pattern:

Trellis:

Thinning:

Reflection:

Do you have a memory of eating something freshly harvested from a garden?



Class activity: Soil temperature *Reference pages 60-61*

Consider the temperature of soil at different times during a garden season. Discuss how temperature differences can affect when and how you plant different crops.

1. What are some seeds that can tolerate the colder soil?

2. What are some seeds that need warm soil?

Class activity: Direct seed or transplant? *Reference page 59*

Refer to your planting plan. Which plants will you direct seed and which will you transplant? What are some things to consider to determine if a plant on this list should be direct seeded or transplanted?

(For example, if you are looking for a quick harvest, you might want to use a transplant. However, direct seeding is often cheaper than purchasing transplants.)

Direct Seed	Where might you get these seeds?
Either transplant or direct seed	
Transplant	Where might you get these transplants?



Review: Types of sowing patterns *Reference pages 60-61*

1. What are different types of sowing patterns? Which crops would you plant in each pattern? List three crops for each type of pattern.

2. Which of the above crops would you need to thin?

Activity: Reading a seed packet *Reference page 60*

Using the chart below, find out what a seed packet is telling you in terms of the crop's growing needs and planting window.

Crop	Varieties	Date to plant	Days to Harvest	Foot-print	Height	Some shade ok?	Planting method	Single or 2-week succession	Number of plants /seeds	Notes
<i>Example: Tomatoes</i>	<i>Stupice, Sungold,</i>	<i>May 30</i>	<i>60-65</i>	<i>36"x36"</i>	<i>Tall</i>	<i>Full sun only</i>	<i>Transplant</i>	<i>Single</i>	<i>3</i>	<i>need to be supported</i>

1. What are some important things to look for on a seed packet?

2. What's a good way to store seeds at home? How could you check to see if they are still viable?



Class activity: Garden resources

Discuss where to find the following things in your community:

- Bark/Mulch
- Seeds
- Compost
- Land to garden
- Trellising materials
- Fertilizer
- Transplants
- Tools
- Vertical structures



Wrap Up for Week 3:

1. What are three things that you took away from this class?

2. What are some things that are still confusing?

Getting ready for next week:

- Bring in a picture (or drawing) of a trellis or vertical garden.



Chapter 4:

Caring for your growing garden

(part 1)

Now that your garden is planted, you can focus on keeping it healthy. Maintenance can be the most time-consuming part of vegetable gardening, but it is good for your plants - and good for you too! In this chapter you will learn about watering, and protecting young, tender plants as they begin to grow. You will also learn about improving soil health, and ways to maximize your space through vertical gardening techniques.

Watering

Plants need water to be healthy and productive. In Arizona, vegetable gardens need regular watering year-round. When monsoon season arrives around July and August, you may be able to skip waterings depending on the amount and frequency of rainfall. As you plan your garden, think about how you will give your plants the water they need.

Sandy, clay, and loamy soil types absorb water differently. Water moves through sandy soil about twice as fast as it moves through clay soil, so it takes longer to water clay soil. Loamy soil lies between these two extremes—it holds onto water *and* drains well, making it the best soil for growing plants.

No matter what soil type you have, your watering should be deep and infrequent. In general, watering two or three times a week is enough as long as you water deeply. Seedbeds and new transplants are exceptions - they need water every day or two. If you are not sure if the soil is moist enough, you can use your hands to feel for moisture below the first inch or two of soil. If it feels like a wrung-out sponge, it is just right!

You can also check your watering by filling a jar or yogurt container with garden soil and placing it near plants before you water them. If the soil at the bottom of the container is still bone-dry after you

TOPICS IN THIS CHAPTER

Watering

Protecting young plants

Vertical gardening

Improving and protecting
soil health

Worksheets



water, you will need to keep going so that the water reaches the roots of your plants. Aim for plant roots instead of leaves when you water.

Methods of watering

Watering for containers

Container plants lose moisture quickly. They'll need to be monitored, and most likely watered every day in the heat of summer. Also, think about how far away your containers are from the water source.

There are three basic watering methods: hand watering with a hose or watering can; soaker hoses and drip irrigation systems; and portable sprinklers. The method you choose will depend on the size of your garden, your budget, and your available time.

Hand watering with a hose or watering can delivers water directly to plants' roots and cuts down on waste. Water deeply, but gently. Remember, hand watering takes time. Be careful to water all parts of your beds where plants are growing.

For leaf lettuce and other greens growing close together, it is okay to get water on the leaves. Aim your hose upward so the water falls down on the bed like a gentle rain. Water until the soil stays "shiny" for 10 to 15 seconds after watering. This tells you that the soil has soaked up as much water as it can.

For all other crops, especially cucumbers and tomatoes, keep the leaves dry when you water. Water gently at the base of the plant and avoid blasting the soil, seeds, or roots with a heavy stream of water.

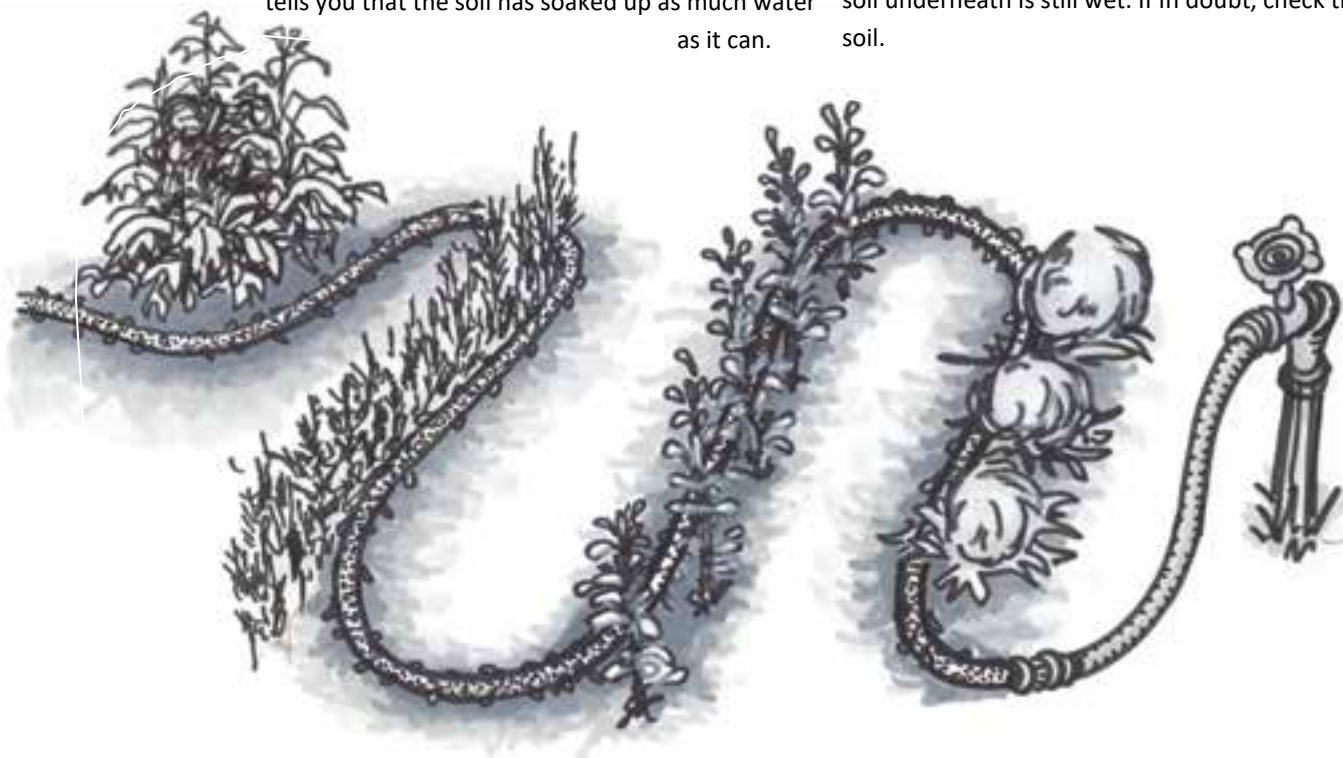
Soaker hoses and drip irrigation systems are less wasteful than overhead watering with a sprinkler. A drip system slowly places water right over the plant roots. Soaker hoses and emitter drip lines have tiny holes that let water seep or drip slowly along the length of the hose.

Emitter-type drip systems deliver water to individual plants. You can change an emitter system anytime during the growing season as you add or remove plants. A disadvantage of emitter systems is that they can be expensive and difficult to set up.

Soaker hoses and drip irrigation systems help reduce leaf diseases because they keep water off leaves. They cut down on weeds by watering plant roots and not bare soil.

A typical drip system runs for one to two hours, once or twice a week. You may need to make adjustments depending on the type of soil, raised or in-ground garden, number of emitters, gallons per hour, and time of year. Be careful not to overwater. The surface may look dry even if the soil underneath is still wet. If in doubt, check the soil.

Soaker hoses and drip irrigation systems place water directly at plant roots. They help reduce diseases and weeds.



Portable overhead sprinklers take less of the gardener's time than other watering methods—you can just turn them on and walk away. But sprinklers wet plant leaves, so they can cause leaf diseases. They also waste water by watering paths and other bare spots in the garden, encouraging weeds to grow.

If you use an oscillating or rotating sprinkler, raise it above the tallest plants so that the plants do not block the flow of water. If you run more than one sprinkler at once, place sprinklers so their patterns overlap to make sure all your plants get water. If water runs off into your paths, you need to water at a slower rate. Overhead sprinklers lose water to evaporation and wind, so avoid using them in windy weather.

How often to water

No matter how you water your garden, the goal is to water the roots of your plants at about the same rate that the soil dries out. Take into account your soil, your plants, and recent weather as you think about how much and how often to water your garden. Clay soil holds much more water than sandy soil. Larger plants use more water than seedlings, but shallow roots mean seedlings dry out fast. Hot, windy weather also dries the soil.

Watch your plants to figure out when to water. If your plants begin to wilt, you have waited too long.

Different plants, different watering needs

Germinating seeds and seedlings need to stay moist all the time, but be careful not to wash them away. Water them with a gentle spray every day or two. In hot weather, you may need to water twice a day.

Developing plants need deep, infrequent watering to encourage root growth. Water at least six inches deep, and then let the top inch or two of soil dry out completely before watering again.

Shallow-rooted plants, like lettuce and onions, draw water from the top one foot of soil. Once your shallow-rooted crops are established, allow the top inch or two of soil to dry out and then thoroughly soak the area around the roots.



Courtesy of www.istockphoto.com

Do not wait for plants to wilt before you water them.

Deep-rooted plants, like tomatoes, parsnips, and winter squash, draw water from the top two feet of soil. They need water less often than shallow-rooted plants, but they need more water each time to reach their deep roots.

In general, properly watered crops develop healthy root systems and need a deep watering only two to three times a week in hot weather.

Common watering problems

Avoid these common watering problems:

Frequent, shallow watering. Plants develop roots near the soil surface. These plants are easily stressed by dry weather and disturbances from weeding.

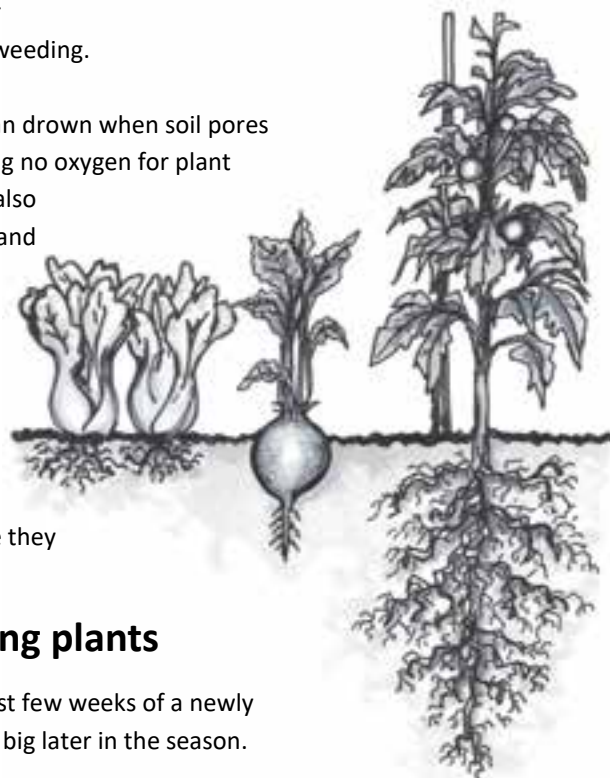
Overwatering. Plants can drown when soil pores fill up with water, leaving no oxygen for plant roots. Too much water also leaches away nutrients and can cause pollution.

Waiting too long to water. Plants dry out very quickly in hot weather. Monitor your plants, and water them as soon as they look like they need it.

Protecting young plants

Extra care during the first few weeks of a newly planted garden pays off big later in the season.

Deep-rooted crops and shallow-rooted crops have different watering needs.





Avoid overwatering.

Mature plants need a deep watering only two to three times a week in hot weather.

Early protection. For the first few days after transplanting, protect young plants from wind and sun. Use newspaper or cardboard to shield the south side of transplants, where the sun is strongest. Use plastic bottles with the bottoms cut off to protect tender young plants from cold temperatures, winds, and bird and insect damage.

Hoop houses. Hoop houses, also called high tunnels, are low-tech, greenhouse-like structures. They can be used to protect both transplants and direct-sown seeds in your garden, and provide a few degrees of protection during a cold snap. You can also use shade cover on your hoop houses for protection in the summer.

Hoop houses can be built from a variety of materials. You can drape greenhouse plastic, lightweight row cover fabric, or landscape fabric over metal or plastic tubing to form small, low tunnels. These materials will last several seasons. You can also use plastic sheeting, but it may last only one season.

Secure the edges to protect crops from insects, cats, and other uninvited garden visitors. You can bury the edges in the soil, or hold them in place with bricks, rocks, or landscape staples.

Vertical Gardening

Vertical gardening is the use of trellises, nets, strings, cages, or poles to support plants as they grow upward. Plants grown vertically take up much

less space than plants grown on the ground.

Good candidates for vertical gardening are vining and sprawling plants like cucumbers, tomatoes, melons, and pole beans. Some plants attach themselves to the support, but others need to be tied on. Install support structures at planting time to avoid accidentally damaging your plants. It is also easier to train plants onto a structure from the time they begin to grow.

You can buy tomato cages and other support structures at hardware stores and nurseries, but many gardeners save money by building their own out of materials they have on hand.

When trellising heavy fruits like squash and melons, tie old cloth or nylons under the fruit to support it and keep it from dropping off the vine.

Because vertically grown plants are more exposed, they dry out faster and need more water than when they are spread over the ground. Keep them well-watered.

When plants are grown vertically, they are often grown closer together. Soil under these plants should be deep and well-drained, so that plant roots can reach downward to find water and nutrients.

Vertical plantings are tall, so they cast a shadow. Depending on your climate, locate them on the north or west sides of the garden. Placing tall plants on the north side avoids shading your other plants. Placing tall plants on the west side shades plants from the afternoon sun. Plant shade-



Remove the bottoms from plastic bottles, then place the bottles over your seedlings to protect them from birds and cold temperatures.





Row cover is a white fabric that protects crops from pests and cold weather.

tolerant crops near vertical ones to get the most use from your growing space. See the appendix on pages 152-153 for more vertical gardening ideas.

If you are using containers, you can maximize

vertical space for climbing veggies and espalier fruit by placing the container next to something climbable (such as a railing, some string, or rebar posts).

Improving and protecting soil health

As you add more compost each year, you will see your soil improve. It will be more fertile, easier to dig, and will drain better. Your soil will keep improving as long as you protect it.

Protecting your soil

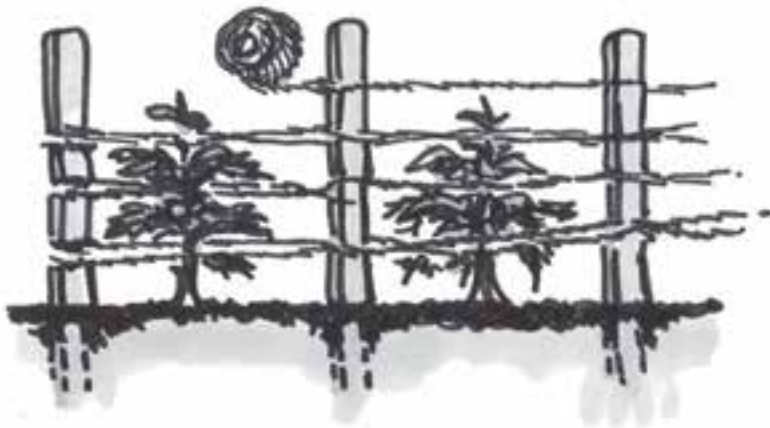
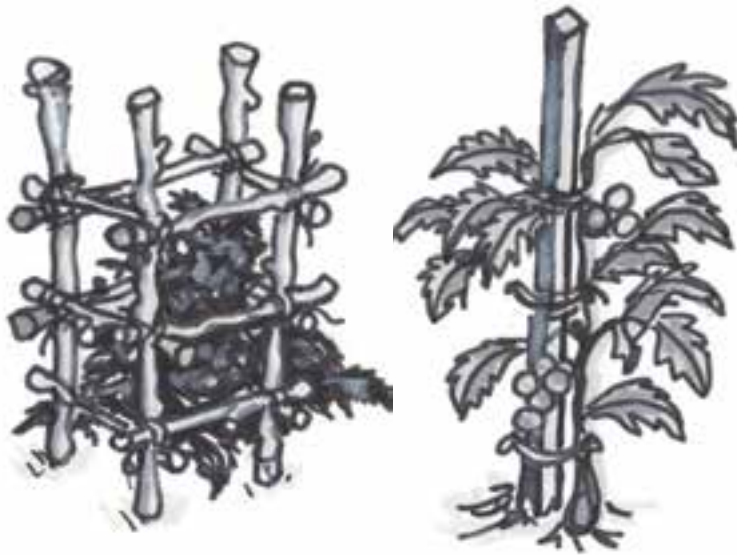
If you are not growing a summer or winter crop, you can use those seasons to improve your soil by mulching or growing a cover crop.

Mulching. Mulch is any material that you spread on top of the soil to stop weeds and protect roots. Types of mulch include black or clear plastic, and organic materials like newspaper, cardboard, chopped leaves, straw, and compost. Organic mulches help improve the soil when they break down.

Spread a thick layer (four to six inches) of organic mulch over the beds and paths at the end of the growing season. The mulch will keep down weeds, and prevent soil compaction. In spring and fall, you

When trellising heavy fruits like squash and melons, tie old cloth or nylons under the fruits to support them and prevent them from dropping off the vine.





Tomato cages can be expensive. Make your own tomato supports with common materials like bamboo, wooden stakes, and twine.

can mix the mulch into the beds if it has broken down into compost. If the mulch has not broken down pull it off the beds before planting.

During the growing season, you can also spread mulch around the base of plants to keep water in the soil and prevent weeds from growing. Except for finished compost, do not let the mulch sit right up against the plant stems.

Growing a cover crop. Cover crops, also called “green manure,” are placeholder crops that you plant during the off-season and then cut down before planting a crop for harvest. Cover crops help build up soil nutrients and prevent erosion. Planting cover crops is an easy, inexpensive way to build better soil for gardening. Gardeners in higher elevation regions usually grow cover crops in the fall and remove them in the spring. Gardeners in

the lower elevation regions usually grow cover crops in summer and/or winter.

As they grow and cover the soil, cover crops help reduce the impact of heavy rains, which can compact garden soil or wash it away. The roots of cover crops loosen heavy soil and improve the movement of air and water in the soil. Legume cover crops, like field peas and vetch, add nitrogen to the soil. When you turn cover crops under, you are adding organic material to the soil and improving soil structure and fertility.

In higher elevation gardens, you can plant cover crops in your garden from about mid-August through early October. Alfalfa, peas, beans, clover, cereal rye, and hairy vetch make good cover crops for our home gardens. In lower elevations, you can plant summer cover crops in late spring and turn over at the end of the summer. You can also plant winter cover crops in late fall and turn over around February, depending on the temperatures. Cowpeas, soybeans, alfalfa, and buckwheat are good summer cover crops in the lower elevations



Vertical gardening allows for easier harvesting for both younger and older gardeners.





Spread mulch over the soil during the growing season or before winter to suppress weeds and protect roots.

regions. Tepary beans grow in the monsoon season and can be used as a cover crop.

Cover crop seeds are available at most garden stores and in seed catalogs. Be sure to follow the instructions on your seed packet when planting. Plant the seeds early enough so the cover crops are well established before the cold or hot weather arrives (depending on which season you plant). If vegetable crops are still growing in your garden, you can sow your cover crop seeds between the rows.

When the soil dries out a bit but before the cover crop begins to flower, pull out the cover crop or cut it down to the ground. You can use the pulled cover crop to build a compost pile, or you can dig or till it into the soil. You may need a garden tiller to incorporate the cover crop into the soil. If you decide to dig or till in your cover crop, do it at least three weeks before planting so it has time to decompose.

If you run out of time, you can add your pulled cover crop to your green waste bin instead.

Growing a cover crop is good for your garden whether you mix it back in or not.

Protecting soil life

As you add compost over time, you will not need to dig or turn the soil as much. Your soil will begin to build an ecosystem of healthy fungi and bacteria, roots, fibers, plant debris, air pockets, and soil particles. This will help loosen the soil, improve drainage, and increase air circulation in the soil.

Digging, tilling, or turning healthy garden soil can disturb the soil's natural structure and cause soil erosion and compaction. When you spread finished compost over a healthy, established garden bed, you can wiggle a digging fork in the soil to work in the compost instead of tilling or turning it under with a shovel. You can also lay finished compost on top of the bed and plant directly in it.

Container gardening: At the end of the season

Reusing potting soil can be a great way to cut down on the hassle and cost of purchasing new soil season after season. As long as you take the necessary precautions to ensure that your potting soil has an adequate amount of nutrients added back in, your soil can be used for many seasons. When preparing container gardens for the new growing season, it is a good practice to revitalize the soil each season by adding compost so that your plants will get the nutrients they need



Legume cover crops like fava beans, field peas, and vetch add nitrogen to the soil.



Cover crops prevent erosion and build up soil nutrients during the winter months.

to reach their full maturity the next season.

Best practices for container gardening recommend that you empty out your pots at the end of the growing season. This gives you an opportunity to sift through the soil and remove any stowaway insects, weeds, or debris. It also offers you the opportunity to clean and dry your pots thoroughly to ensure that there are no residual bacteria, fungi, or viruses from the previous season.

Scrub your containers with eco-friendly dishwashing soap, let them dry, then wipe them out with a diluted solution (20:1) of hydrogen peroxide bleach. Rinsing with water may remove other materials like dirt and insect eggs, but it will not sterilize the pots.

To ensure that weed seeds, insect eggs, larva and pathogens have been destroyed, bake the soil in the sun. This can be done by placing the soil in dark plastic bags and leaving them in the sun until they are very warm. Similarly to composting, the high temperatures act to kill the pests and seeds so they won't present a problem in the coming season.

Once you have baked the soil in the sun, tip out the spent soil onto a tarp or plastic sheet, then add about 15-25% (by volume) of rich compost or well-rotted manure; you could also add a few handfuls of straw to improve drainage, as well as mineral supplements. Add some native soil (dirt from your

yard) to encourage the growth of microorganisms. Lift up the ends of the sheet and roll everything backwards and forwards to mix it up and improve aeration. You can safely renew spent soil three or four times before starting again from scratch.



Once your beds are established, protect the soil by “wiggling” compost in with a shovel or digging fork instead of turning.





A wide variety of good containers for gardening



Worksheet: Caring for your garden

Define: Vocabulary words for the week

Spend time as a group defining these gardening terms:

Watering methods:

Cover crop:

Hoop house:

Drip irrigation:

Soaker hose:

Reflection:

Have you seen any creative ways to conserve water in a garden?



Review: Watering

Which plants need more water and which need less? How could you plan your garden around water requirements?

1. What are some examples of plants that need more water?

2. What are some examples of plants that need less water?

3. What's something that you learned about watering that you didn't know before?

Class activity: Trellis ideas

Make a list of some of the things that can be used to make trellises for vertical gardening.

Sketch some ideas for your garden site. *Reference page 152-153*



Review: Protecting young plants & caring for your garden

1. What are some ways you can protect young plants from harsh weather?

Reference page 78-79

2. Is there anything different that you have done in the past to protect your plants?

3. What does mulching do for your garden? What mulching materials do you have available locally?

4. What does a cover crop do for your garden? Where can you get some locally?

Wrap Up for Week 4:

1. What are three things that you took away from this class?

2. What are some things that are still confusing?

Getting ready for next week:

- Bring in photos or live specimens of bugs and weeds from your garden.





Chapter 5:

Caring for your growing garden

(part 2)

Gardening is a time for quiet thinking, and it gives you and your family a chance to enjoy exercise, fresh air, and good company. If harvest time is the “destination,” then garden maintenance is the “journey.” In this chapter, you will learn about weeding, identifying beneficial insects and how to attract them, and identifying common pests and how to manage them.

Weeding

Weeds are just plants growing in the wrong place, but they compete with your crops for sunlight, water, nutrients, and space to grow. This can be a big problem, especially when your crops are still young and small.

Weeds can also bring pests and diseases into your garden. By controlling weeds, you give your plants a better chance to succeed.

Weed seeds can stay alive for years, and will come to the surface when you begin to work the soil. Removing weeds before they make seeds will save you time and work in the years to come. The easiest way to control weeds is to stop them from getting started in the first place. Begin with a well-prepared seedbed, which means getting rid of all weeds before you plant.

There are many ways to keep your garden weed-free. Try a few of them to see what works best for you.

Organic mulches. Use materials like shredded leaves, straw, or compost over a layer of cardboard or newspaper to help control weeds. These mulches also add organic matter to the soil as they break down.

They keep the soil loose, so weeds that do come up are easier to pull. Add several layers of newspaper or cardboard and two to three inches of mulch to smother weeds. A few types of leaves, such as

TOPICS IN THIS CHAPTER

Weeding

Using integrated pest management (IPM)

Identifying common pests

Worksheets



Organic mulches control weeds and hold in moisture. When a mulch like straw breaks down, it turns into compost and improves the soil.



Courtesy of Billy Cox

walnut, oak, and cottonwood leaves can stunt the growth of your plants. Avoid using them.

Plastic mulch. Black plastic does a good job of blocking light and stopping weed growth. (Clear plastic does not stop weeds, so do not use it for weed control.) You can use black plastic to kill weeds in an empty bed, or to control weeds in a bed full of transplants. Cut holes in the plastic for your plants to grow through, and make the openings big enough for watering by hand. If you are using drip irrigation or soaker hoses, place the tubing on the soil before laying down the plastic.

Landscape fabric. This fabric lets moisture pass through to the soil, so you can continue to water your plants as you normally would. One disadvantage of landscape fabric is that it is thicker than plastic and can cool the soil instead of

warming it.

Water management. Just like crops, weeds need water to germinate and grow. How you water can mean more weeds or fewer weeds. Drip irrigation, soaker hoses, and careful hand watering all put water close to your plants and leave unplanted soil dry. That means fewer weeds will grow. Sprinklers water a large area, including unplanted soil. That encourages more weeds to grow.

Close spacing. When plants are as close together as they can be, their outer leaves touch and form an umbrella that shades out weeds. On the other hand, close spacing can make it harder to find weeds that do grow. Also, you need to pull weeds by hand because hoeing could damage your crop. (See the footprint sizes of common crops on pages 17-19 to find out how close you can space plants.)

Mowing. Keep grass cut, and get rid of any weeds growing near your vegetable garden. You do not want grasses and weeds to make seeds, which could drift into the garden.

Cover crops. Plant a cover crop once a year. This will help the soil hold onto nutrients and stop weeds from growing in the bare soil during the off-season. See pages 81-82 for more about cover crops.

Rotation. Crop rotation can reduce weed problems. Group crops by family and rotate them into new sections of your garden every year. See page 10 for more about crop rotation.

Using transplants. Transplants have a head start against weed seeds.

Cultivation. Despite your best efforts, you cannot

Black plastic mulch warms the soil, helping you grow heat-loving crops like melons and squash.



Courtesy of Shannon Nelson





A Warren-type hoe has a pointed tip that is good for detailed weeding in tight spaces.

avoid at least some weeds. The best approach is to weed early and weed often. Young, tender weeds are easy to hoe, hand pull, or till. Remove them during the heat of the day between waterings. Do not let them grow, because bigger weeds are harder to get rid of.

How to weed

Hand pulling and hand digging work well in small gardens. A hoe, especially a scuffle hoe, works well in larger areas. Tillers are practical only in large, open areas. They can damage roots or stems if they come too close to your plants. In general, hand weeding and hoeing are the best ways to weed in the home garden, because they let you weed close to your plants without damaging the roots.

Pull or hoe weeds when the soil is damp, but not wet. Working wet soil damages soil structure, especially if the soil is heavy. On the other hand, weeds are hard to remove when the soil is too dry. Try to weed a day or two after you water, or after the rain has stopped.

There are different types of garden hoes. The lightweight Warren hoe has a pointy tip and is

good for weeding between plants. The hula (or action) hoe is a lightweight scuffle hoe. You use it by pushing and pulling it just under the soil surface. It pulls up small weeds, but does not work as well against bigger, older weeds.

Small hand tools like the Korean hand plow are good for weeding small areas and between plants that are close together. Another useful tool is the dandelion digger, also called a weeder or asparagus knife. It works well for prying up weeds with long taproots.

Disposing of weeds

It is best to take weeds out with the trash or put them in your yard waste bin. Some weeds will die as soon as you remove them, but others will re-sprout in your compost pile from just a small piece of stem or root. If you are not sure what type of weeds you have, take them all out to the curb.

Weed triage

If weeds have taken over your garden or you do not have much time, start weeding in order of importance:

First, dig up any weeds that are going to seed. Do not let them form seeds!

Next, remove all grasses and invasive weeds, such as bermudagrass, nutsedge, london rocket, and thistle. Never put these weeds in your compost pile, because they can re-sprout from just a small



Run a hula hoe just under the surface of the soil to quickly remove weed seedlings.

Note: This method is not effective on bermuda grass because of how deep their roots grow.



Weeds are just plants growing in the wrong place, but they compete with your crops for sunlight, water, nutrients, and space.

piece of stem or root. Throw them in your yard

waste bin.

Finally, when you have the time, remove the other, less-invasive weeds.

Using integrated pest management (IPM)

All gardeners have pest problems from time to time. Plant diseases, insects, slugs, and various animals can damage plants, but they will not necessarily kill them. How you react to a pest problem will depend on how much you value the damaged crop, how much it will cost to fight the pest, your feelings about pesticides, and your personal approach to gardening.

Many gardeners do not like to use pesticides because of the potential harm to the gardener, the

environment, children, pets, or other living things. Integrated pest management (IPM) is a holistic approach to garden maintenance. It predicts and prevents pest activity before it can take hold, which reduces the need for pesticides. With IPM, you decide how much damage you can tolerate, keep an eye on pest activity, prevent as many pest problems as you can, and control pests using the least toxic method.

Prevention

Remember, “An ounce of prevention is worth a pound of cure.” Before taking any pest control measures, follow these steps:

Grow healthy plants. The most important way to protect your plants is to give them what they need: sunlight, water, air, and nutrients. Healthy plants have fewer problems with pests.

Choose disease-resistant varieties. Plant breeders have bred disease resistance into many plant varieties. Check seed catalogs and seed packets to see which varieties are resistant.

Rotate your crops. When crops change locations every year, pests have a harder time making a permanent home in your garden. See page 10 for more information.

Rule out other causes for garden problems. Most problems are caused by human error, such as planting in the wrong spot, overwatering, or not using enough fertilizer. Things like a cat running through the garden or a pesticide drifting from a neighbor’s garden can also cause problems that you might think were caused by an insect or disease.

Set a tolerance level. A few holes in the leaves do not mean the whole plant is going to die. Decide how much damage you can live with. You might come to see a few holes as a sign of your garden’s healthy ecosystem!

Check plants regularly for insect damage. If you think you have a problem, check your plants several times a week and at different times of the day. Be sure to look at the undersides of leaves, where insects often hide. Catching problems early will make them easier to control.

Remember that not all bugs are bad. Most insects are harmless, helpful, or even necessary to the

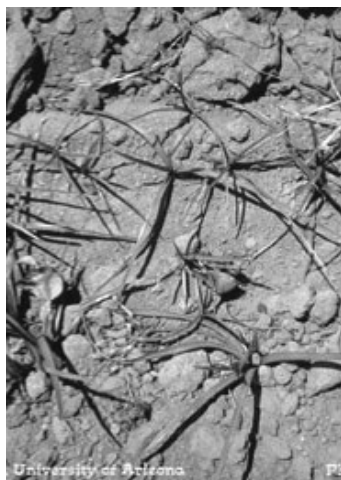
Some invasive weeds can re-sprout from just a small section of root.

To be safe, put all weeds in the garbage or yard waste bin - not in your home compost pile.

Invasive Weeds



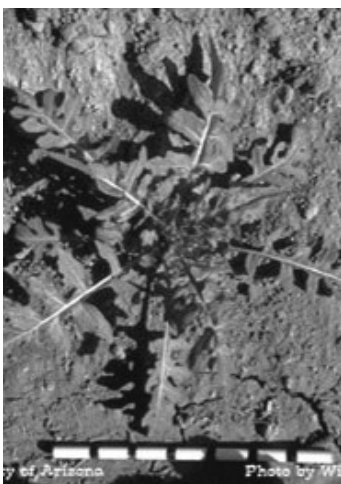
Bermudagrass



Nutsedge



Thistle



London rocket



success of your garden. Make sure that the insects you see are actually a problem before rushing to get rid of them. The chart to the right shows some common beneficial insects.

You can invite beneficial insects to your garden by growing a habitat for them. Some flowers, like alyssum and phacelia, attract beneficial insects. Try planting a border of these flowers near your vegetables. Certain vegetable plants will attract pollinators and other beneficial insects if they are allowed to bloom. Try letting a few of your carrot, arugula, or cilantro plants blossom.

Also, use a coarse mulch like wood chips as a home for beneficial insects.

Pest control methods

If you find out that insects are the cause of your problem, you will need to bring the pest population back to acceptable levels using physical, biological, or chemical controls.

Physical controls

There are many ways to physically remove pests from plants.

Hand picking large or slow-moving insects, slugs, and snails can keep pests in check in small gardens. Be sure to look for pests on the undersides and in the folds of leaves.

A strong stream of water from your garden hose can knock off, injure, or drown small, soft-bodied pests. This works well on aphids, mites, mealybugs, and spittlebugs. The water must hit the pests directly, so aim at the undersides of leaves too. Spray water early in the day so plants have a chance to dry before evening. You may need to repeat every few days as new insects hatch.

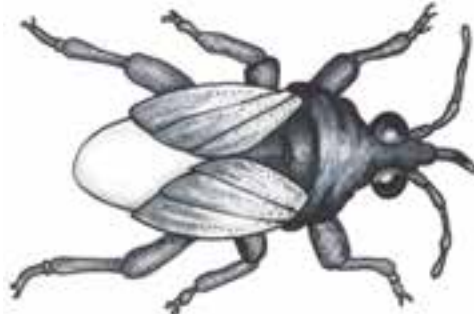
Use clippers to prune out clusters of insects like aphids, or single leaves that look unhealthy.

Hang netting over your plants, especially corn and bean seedlings, to keep out birds, cats and squirrels. Garden netting will last for a few years before it needs replacing.

Floating row cover is a lightweight white fabric used to cover garden beds. It keeps out pests but lets air, light, and water reach the plants growing underneath. Lay down the fabric right after sowing seeds, and bury the edges or hold them in place with bricks, rocks, or landscape staples. You may

Beneficial Insects

Beneficial insects like these help in your garden by eating pest insects.



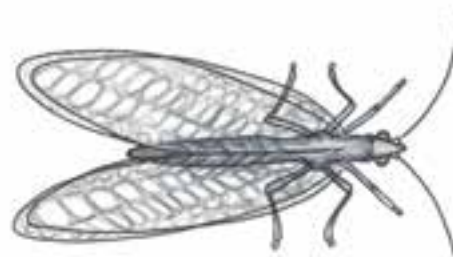
Minute Pirate Bug



Western Damsel Bug



Ladybug/Lady Beetle



Green Lacewing

Need help identifying an insect?
Ask a Master Gardener!

Plant collars protect against cutworm. Use toilet paper tubes, tin cans, or paper cups to form a tube around each seedling.



Courtesy of Billy Cox

want to leave the cover on all season. Just loosen it as your plants grow.

Check underneath your row cover now and then to make sure you did not accidentally trap pests in with your plants. Remove or loosen row covers to increase airflow if temperatures underneath get too hot. Also remove row covers when cucumbers, squash, or other plants that produce fruit begin to bloom. That will let pollinating insects reach the flowers.

Plant collars can protect seedlings from cutworm damage. Use toilet paper tubes, tin cans, or paper cups to form a collar around each seedling. Bury the edge one inch deep.

Shiny objects can scare birds away from your crops. Drape shiny ribbon through plantings of tall or vining plants like corn and pole peas and beans. Hang old CDs or place shiny pinwheels in your garden beds.

Chicken wire keeps cats, birds, and squirrels from scratching in the soil. After you sow seeds, place the wire directly on the soil or raise it slightly above the bed. Remove it once the seeds start to grow.

Biological controls

Beneficial insects, birds, bats, snakes, frogs, toads, and moles keep insect pests under control in a well-balanced ecosystem. Competition from other microorganisms keeps disease-causing organisms

from taking over. When things get out of balance, you can use the following biological methods to control pests:

Encourage beneficial insects like ladybugs, green lacewings, and minute pirate bugs. They eat large numbers of “bad” bugs. You can buy them online or in garden stores.

B.t. (*Bacillus thuringiensis*) is a bacterium that is poisonous to some insects. When a pest insect eats B.t., it stops feeding and dies. B.t. is harmless to most beneficial insects and is safe around humans, plants, and other animals. You can buy B.t. where garden products are sold.

Companion planting is the practice of planting two or more plant species close together to gain benefits of growth, flavor, or pest control. One of the oldest examples of companion planting is often referred to as the “three sisters garden.” The “three sisters” are corn, beans, and pumpkin or squash planted together in groups or hills.

Benefits of companion planting include pest control, nitrogen fixation, enhancing nutrient uptake, and improving water conservation. Companion planting relationships can take several forms: they may improve the health or flavor of a companion, they may interfere with the growth of a neighbor plant, they may repel or trap an



Courtesy of www.istockphoto.com

Place netting or chicken wire directly over the soil to keep cats, birds, and squirrels from scratching in your beds and damaging your seedlings.



undesirable insect, or they may attract a beneficial insect.

Plants, like people, influence one another; and some get along better together than others. Although there are lots of common findings about plant relationships, the science of companion planting is still considered to be anecdotal. The best way to see how plants interact with each other in your garden is to observe them and keep careful records of your successes and failures. Try out some of the basic combinations listed in the chart below, and then experiment with your own. Just as every person is different, no two gardens are alike; your own experimentation and observation will be key to learning what works in your garden.

Chemical controls

IPM focuses on using prevention, physical controls, and biological controls first, but there may be times when you decide to use a pesticide.

Pesticides can be made from either synthetic or natural chemicals. Some are even okay for use in organic gardening. But any chemical method of pest control raises concerns about human safety, toxicity to beneficial insects, runoff, leaching, disposal problems, and possible residue on food crops. Pesticides should be a last resort. Use them only if nothing else works, and always follow the directions on the label.

When choosing a pesticide, be sure that it is labeled for the plant you plan to use it on. This is especially important for edible plants. Choose pesticides that are:

- Least toxic to you
- Most specific to the pest you are targeting
- Least harmful to the environment

Options for organic gardeners:

Insecticidal soap is one of the safer pesticides for controlling insect pests. Soap kills by damaging an

Companion planting suggestions		
Crop	Compatible	Incompatible
Asparagus	Tomato, parsley, basil	Onion, garlic, potato
Basil	Tomato, marigold, pepper	
Bean	Carrot, cauliflower, cabbage, carrots, celery, chard, lettuce	Onion, garlic, fennel, kohlrabi
Beet	Cabbage and onion families, lettuce	Pole beans, mustard
Cabbage family	Aromatic herbs, celery, beets, onions, spinach, chard	Tomato, pole beans, strawberries
Carrot	Lettuce, onions, leeks, rosemary, sage, beans, cabbage, radish, tomato	Dill, parsnip, celery
Celery	Onion, cabbage, tomato, bush beans, nasturtiums	
Corn	Potato, peas, beans, cucumber, pumpkin, squash	Tomato
Cucumber	Beans, corn, sunflowers, radish	Potato, aromatic herbs
Eggplant	Beans, marigold	
Lettuce	Radish, strawberry, cucumber and carrot	
Onion	Cabbage family, beets, tomato, strawberry, lettuce, summer savory	Peas, beans
Parsley	Tomato, asparagus	
Pepper	Basil	
Potato	Beans, corn, cabbage family, marigolds	Squash, tomato, cucumber, sunflower
Radish	Nasturtium, lettuce, cucumber	
Spinach	Strawberry, fava beans	
Squash	Nasturtium, corn, marigold	Potato
Tomato	Chives, onion, marigold, nasturtiums, carrot, parsley	Potato, fennel, cabbage, collards, kale, broccoli, cauliflower

insect's outer skeleton. It is useful against soft-bodied pests like aphids, thrips, mites, and some caterpillars. Insecticidal soap is virtually non-toxic to humans and other animals.

Insecticidal soap must touch the pests directly to kill them. It works only while it is still wet, and there is no residue after it dries. It does not kill insect eggs, so repeat sprays often are needed to control newly hatched pests.

Soap can damage certain plants, so be sure to follow the directions on the label. Any pesticide containing oils, including insecticidal soap and Neem oil, are best applied during the cooler times of the day, either in the early morning or as the sun begins to set.

Neem oil is a natural pesticide that is effective and safe to use in vegetable gardens. It kills fungus growth on plants. It is even used on tomatoes and melons, where fungus can spread too fast for synthetic fungicides to work. Neem is also used to smother insect eggs and soft-bodied pests like aphids, mites, and white flies.

Iron phosphate granules The wheat smell of this non-toxic bait attracts slugs. Slugs stop feeding, dry out, and die in three to six days after eating the bait. The bait stays active for about a week or longer, depending on the weather.

Neem oil, iron phosphate granules, and insecticidal soap are some of the pesticide options available to organic gardeners.

All of these products are sold at most garden centers. Other pesticides are also available. Contact your local Master Gardeners to learn more.

Identifying common pests

Aphids

Aphids are tiny, slow-moving, soft-bodied insects that may be green, yellow, or black, sometimes with wings and sometimes without. They weaken plants by sucking juices from tender growth and spreading disease. Damage includes curled leaves, yellowish spots, and shiny leaves from "honeydew," a sticky substance the aphids produce.

Why is this pest in my garden? Almost every vegetable has at least one species of aphid that likes to feed on it. Most plants can live with a little aphid damage. Plants that are sickly, stressed, under-watered, under-fertilized, or over-fertilized have trouble protecting themselves from aphids.

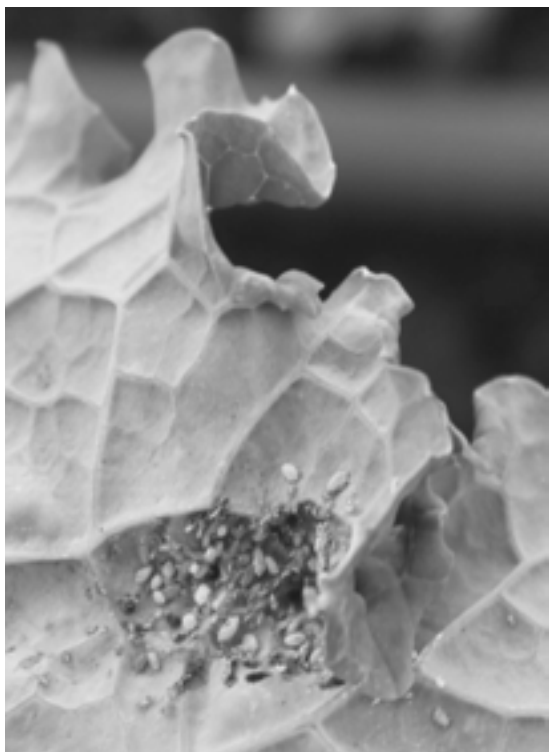
Control methods: Keep plants healthy by giving them enough nutrients, water, and sunlight. Use organic fertilizers, which release nitrogen slowly into the soil. Introduce natural predators like ladybugs and green lacewings. Avoid broad-spectrum pesticides, which kill a wide range of insects, including natural predators. Plant "trap crops" like nasturtium and sunflowers to lure aphids away from your vegetables. Use a strong stream of water from a hose to blast aphids off plants or crush the aphids by hand. Be sure to check the undersides of leaves so you get all the aphids on the plant. Insecticidal soap is a good control for aphids, but you have to spray it directly on the aphids to kill them.

Cabbage maggots

Cabbage maggots feed on the stems and roots of cabbage family crops, such as broccoli, cabbage, Brussels sprouts, radishes, and turnips. They stunt the plants, cause them to wilt during the day, and sometimes even kill them. Root crops with cabbage maggot damage may be too full of holes to eat by the time you harvest them.

Why is this pest in my garden? Cabbage maggots can lie dormant in old plant material in late fall and emerge as adult flies the following spring. Wild mustard is also a home for this pest.





Aphids clustered on the underside of a kale leaf.

Control methods: Clean up and destroy plant debris in late fall. Also, get rid of any wild mustard around your garden. Cover plants with floating row covers to keep the adult flies from laying eggs on or near the plants. Those eggs will develop into cabbage maggots. A paper disc on the soil around the stems of your plant might help keep maggots from moving off your plants and into the roots.

Cabbage loopers

These small green caterpillars are the young form, or larvae, of the imported cabbage butterfly. They attack cabbage family varieties, such as kale, broccoli, and collard greens, by chewing large, jagged holes in the leaves. The size of the caterpillars depends on their age. They are usually easy to see on stems or the undersides of leaves.

Why is this pest in my garden? Cabbage loopers can come in on a plant from a nursery. They can also be in the soil or plant debris from previous seasons. Remove all plant debris from previous seasons and before buying plants from a nursery, be sure to thoroughly check them over for potential pest issues.

Control methods: Older plants can handle some damage from cabbage loopers. Cover young cabbage family plants with floating row cover to prevent the adult butterflies from laying eggs on the plants. Those eggs will develop into cabbage loopers. Remove loopers by hand picking. Don't forget to look under the leaves, too. Remove cabbage family plants at the end of the season.

Cucumber beetles

These small but easy-to-see beetles look like green ladybugs with black spots. They chew holes in cucumber, zucchini, squash, and melon leaves. As they feed on the plants, they spread plant diseases.

Why is this pest in my garden? In higher elevations gardens, cucumber beetles spend the winter in protected sites (such as under old plant material, in wooded areas, and in cracks of buildings and fence posts). They come out when the temperature reaches about 50°F in spring. In summer, cucumber beetles like the moist soil under cucumber, melon, and squash fruits. In lower elevation gardens, cucumber beetles seek protection the spring and summer and come out in fall when temperatures reach about 50°F.

Control methods: Use floating row covers to protect young squash, melon, and cucumber



Courtesy of University of Minnesota, Dept. of Entomology

Typical cabbage maggot damage on a root crop.

seedlings. Remove the covers when the plants start to bloom so that bees can pollinate them. Take away hiding spots by growing plants vertically. In late summer, water only the roots of plants to limit cucumber beetle damage. After harvest, remove old plant material, especially roots and fruits. Hand pick and squish cucumber beetles when you see them.

Flea beetles

These tiny, blue-black beetles eat holes in the leaves of many vegetables. Leaves with flea beetle damage look like they have been hit with a spray of tiny bullets. The beetles are about the size of a pinhead and jump like fleas when you get near them.

Why is this pest in my garden? Flea beetles feed on many crops, including beans, beets, cabbage family members, corn, mustard and other greens, eggplant, peppers, potatoes, and tomatoes. They like small, tender leaves and do more damage to young seedlings than older plants, which have “outgrown” them.

Control methods: Older plants can handle a lot of flea beetle damage without suffering, so control may not be necessary. You could plant large, healthy transplants that will quickly outgrow flea beetles. Or you could use floating row cover to protect seedlings and small transplants.



Courtesy of Billy Cox

Cucumber beetles look like green ladybugs with black spots.

Leafminers

Leafminers are tiny white or yellowish maggots that live inside leaves. You will notice leafminer damage before you notice the maggots. Leafminers feed on the plant tissue between the upper and lower surfaces of the leaves. They make squiggly, hollow tunnels as they move through the leaves. If you notice this damage, you can tear one of the mined leaves in half to see the tiny maggot inside. The maggots grow into adult leafminer flies.

Why is this pest in my garden? Leafminers feed on beets, chard, spinach, and other members of the beet family, including common weeds like lamb’s quarters and pigweed. They lie dormant in the soil near crops that they fed on the year before. Then they come out in April or May to feed on leaves.

Control methods: Place floating row covers over your beet, cabbage, chard, cucumber, melon, lettuce, potato, spinach, squash, and tomato plants as soon as you seed them. This will keep leafminer flies from laying eggs on the plants. Crop rotation helps to keep dormant leafminers from reaching next year’s crop. Rotate your crops to new spots in your garden each season. Keep your garden free of weeds, especially lamb’s quarters and pigweed. If you find damaged leaves, cut them off your plants and put them in your green waste or garbage bin, not your compost.

Leafhoppers

Leafhoppers are wedge-shaped insects, about 1/8 inch long with jumping legs. They are capable of strong flight. Leafhoppers spread curly top virus

Cabbage worms chew large, jagged holes in plant leaves.



Courtesy of Frank Meuschke/NYCGARDEN





Leaves with flea beetle damage look like they have been hit with a spray of tiny bullets.

the #1 tomato disease in the Southwestern U.S. As the name suggests, leaves of infected tomato plants curl upward and turn yellow. If you find 'curly tops' on your tomatoes, remove the plants immediately.

Slugs

Slugs are like snails without a shell. They are soft-bodied and slimy, and can be less than an inch to several inches long. Slug damage on a plant is easy to see. The plant has slime trails and irregular holes with smooth edges.

Why is this pest in my garden? Slugs prefer moist soil conditions. The amount of slug damage depends mainly on wet conditions and nighttime temperatures. Slugs need soil moisture, and they feed only when temperatures are over 50°F. They hide and lay eggs in places like grass, mulch, soil cracks, rocks, boards, debris, and worm tunnels. Slugs lay eggs during monsoon season after rains start. It is best to control slugs before they lay eggs.

Control methods

Hand picking. Slugs come out at night, so hand pick them off plants about two hours after sunset. Slice them in half, sprinkle them with salt, or scrape

them into soapy water. In the daytime, turn over boards and other hiding places, and get rid of the slugs you find.

Trap boards. Slugs look for shelter during daylight. Place small, flat boards under plants and between garden rows. Get rid of the slugs you find under the boards each morning.

Beer traps. The smell of yeast attracts slugs. To make a beer trap, cut a two-inch hole about two-thirds of the way up the side of an empty margarine or yogurt container. Bury the container so the hole is just above ground. Add two to three inches of beer, and cover with a lid. Instead of beer, you could mix together one tablespoon of yeast, one tablespoon of flour, one tablespoon of sugar, and one cup of water. Remove dead slugs every day. Replace with new beer or yeast mixture every week.

Trap crops. Slugs love marigolds. Plant marigolds along your vegetable garden border, and hand pick slugs at night.

Baits. Iron phosphate granules kill slugs by freezing up their digestive systems so that they can no longer eat. Slugs cause the most damage to vegetable gardens when plants are young. Use the bait just before or when you plant or seed. If the soil is dry, sprinkle it with water just before putting down the bait. That will encourage slugs to come out of their hiding places. Put out bait again in early fall, before slugs start laying their eggs. Bait once more a little later in fall to kill slugs that just hatched. Read the product label before using. \

Small Animals & Wildlife

Depending on where you live, you may deal with birds, rabbits, gophers, squirrels, cats, javelinas, deer, or other mammals growing fond of your garden. In addition to eating and damaging your plants, animal pests pose a food safety risk due to

Leafminers create hollow tunnels in spinach, chard, and beet leaves.



contamination from feces. Regardless of whether you find evidence of animals or not, using good food safety practices when harvesting from your garden is crucial.

Why is this pest in my garden? Animals pests are in your garden to eat your crops. The damage to your plants will vary by animal, but you should monitor your garden for common signs:

- *Large parts of the plant are chewed off*
- *Leaves are nibbled; stems cut*
- *New growth is uniformly nibbled off*
- *Plants are eaten to the ground*
- *Fruits are damaged or removed*
- *Fecal material in or near garden beds*

Control methods

If you find evidence of animals in your garden, the first thing to do is figure out what kind of animal it is. Contact your local Master Gardeners for help identifying pests and choosing a realistic and affordable way to manage them.

Exclusion. The most certain method for keeping animals out of your garden is exclusion. Exclusion means putting up a fence or other barrier to block animals from getting into the garden. As a general guideline, fences should be at least 4 feet tall and buried at least 8 inches into the ground. Netting or caging is effective for birds.

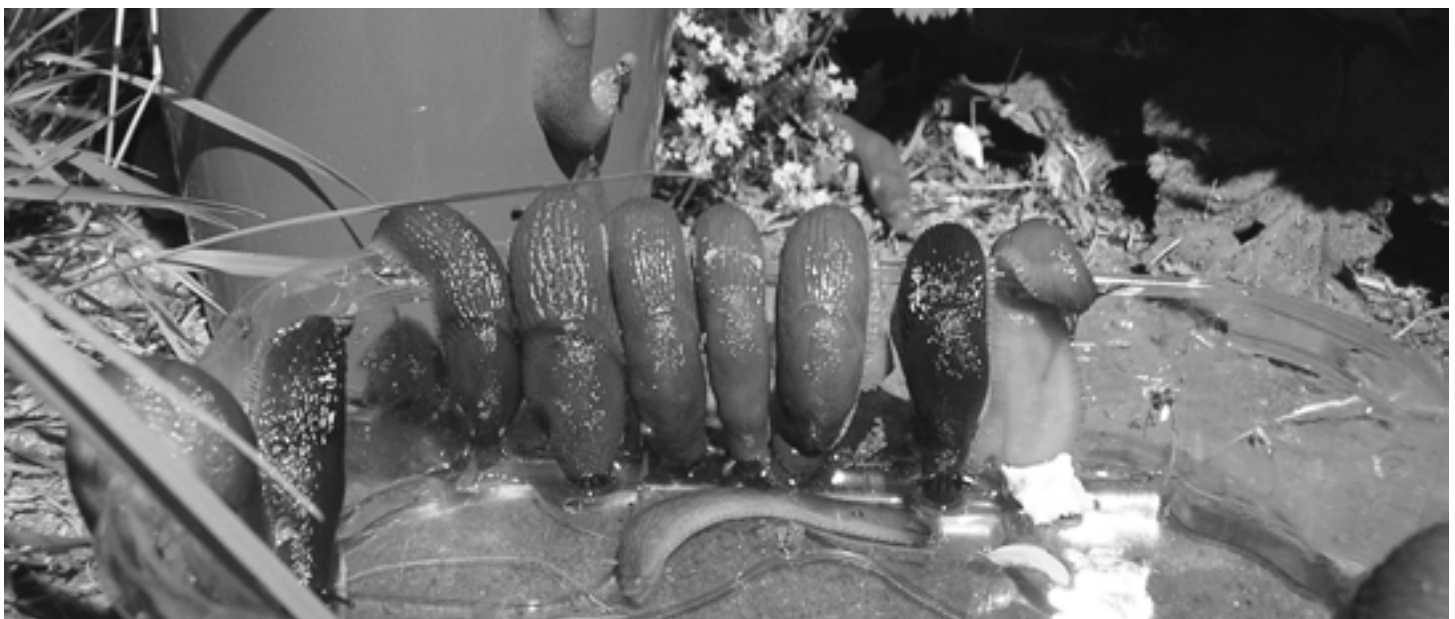
Other methods. With the exception of trapping for gophers and squirrels, exclusion is likely the best

control for most animals. Be wary of other methods for controlling animal pests. Products or devices claiming to repel animals are often expensive but may not be effective. See pages 157 in the appendix for further information about specific garden pests in Arizona.

Descriptions of animal pest symptoms provided by The Center for Food, Agriculture, and Environment at UMassAmherst.

Control method information provided by University of Arizona Cooperative Backyard Gardener

Slugs are attracted to the smell of yeast and will drown in a "beer trap."



Courtesy of Anneliese Emmons Dean, thebigbuzz.biz



Worksheet: Caring for your garden

Define: Vocabulary words for the week

Spend time as a group defining these gardening terms:

Integrated pest management:

Insecticidal soap:

Neem oil:

Physical control methods:

Biological control methods:

Weeds:

Threshold:

Trap crop:

Companion planting:

Reflection:

Do you have a favorite flower? What role might that flower play in vegetable gardening?

Class activity: Beneficial insect vs. pest discussion

Using photos, specimens or insects you see on a garden tour, break into small groups and discuss the following questions:

Can you identify the bugs? Are they pests or friends? How do they contribute to the garden? How would you attract more of them if they are good, and how would you prevent or control them if they are bad?

After a few minutes, come back together as a class to share what you talked about. Use this discussion to lead into the “Good Bug / Bad Bug” activity below:

Activity: Good bug | Bad bug

Use this activity to recognize what good and bad bugs look like.

Reference pages 148-149



Review: Pest management

1. How can you prevent pests from damaging your crops?
2. What physical barriers could you use to keep pests off your plants?
3. Discuss other methods that can be used to combat infestations.

Review: Beneficial flowers & insects

1. What does it mean to be beneficial? What are some bugs and insects that help your garden?

2. What are some flowers that can be planted to benefit your garden?

3. What are the benefits of having these bugs/insects in your garden?



Activity: Weed identification

1. Describe any weeds that you see in your garden:

Show the ones you have brought into class.

2. What is a weed?

3. What does it mean to control weeds? *Reference pages 90-93*

Biologically:

Physically:

Chemically:

Common Weeds of Arizona

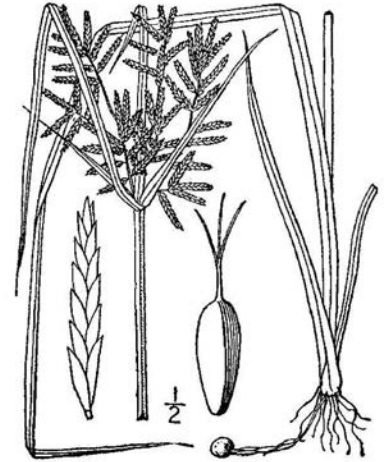
Puncture vine:



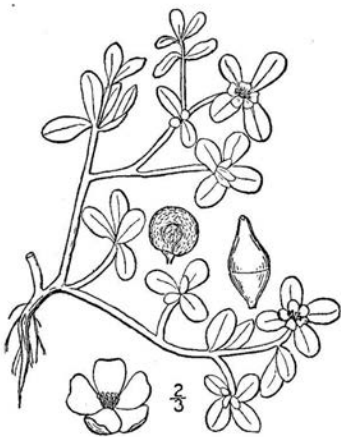
Bermuda grass:



Nut sedge:



Purslane:



Sow thistle:



Palmer amaranth:



Common Weeds of Arizona

Camphorweed:



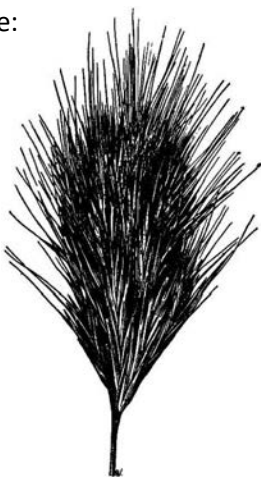
Pigweed:



Johnson grass:



Red brome:



Sow thistle:



Redstem filaree:



Wrap Up for Week 5:

1. What are three things that you took away from this class?

2. What are some things that are still confusing?

Getting ready for next week:

- Which crops do you want to learn more about harvesting, preserving and storing?
- Do you have a recipe that you are willing to share with the class?





Chapter 6:

Harvesting and using your bounty

It is harvest time! This chapter tells you how to harvest, store, and use all the different crops you can grow in your garden. It ends with some simple, delicious recipes for cooking the vegetables you harvested.

Gardening for your health

Can your garden help you enjoy a healthy, active lifestyle? Yes, it can! MyPlate, which replaced the Food Pyramid in 2011, recommends filling half your plate with fruits and vegetables. The Dietary Guidelines for Americans suggest that we should increase our intake of fruits and vegetables, and eat them in greater variety. According to the Guidelines, just two and a half cups of vegetables a day can help to reduce your risk of heart disease, and some fruits and vegetables may protect against cancer.

Eating a rainbow from your garden

The color of a fruit or vegetable tells you about the nutrients it contains, and it can help you make smart decisions about what to eat. When you eat fruits and vegetables in a variety of colors (“eat a rainbow”), you get a healthy mix of vitamins and nutrients.

TOPICS IN THIS CHAPTER

Gardening for your health

Harvest, storage, and nutrition

Cooking from your garden





ChooseMyPlate.gov recommends filling half your plate with fruits and vegetables.

Calories and fiber

The Dietary Guidelines for Americans recommend eating less high-calorie food and eating more low-calorie, nutrient-rich food like fruits and vegetables. Most of the crops you grow in your garden are also good sources of dietary fiber. Fiber helps you feel full and keeps you regular.

“Eating a rainbow” —or eating fruits and vegetables of a variety of colors— can help you get a healthy mix of essential vitamins and nutrients into your diet.

Eat a rainbow from your garden Color-by-color health benefits of common garden vegetables	
Red	Orange & Yellow
<ul style="list-style-type: none"> • A healthy heart • Memory function • A lower risk of some cancers • Urinary tract health <p><i>Examples: tomatoes, peppers & beets</i></p>	<ul style="list-style-type: none"> • A healthy heart • Vision health • A healthy immune system • A lower risk of some cancers <p><i>Examples: carrots, winter & summer squash</i></p>
Green	White, Tan & Brown
<ul style="list-style-type: none"> • A lower risk of some cancers • Vision health • Strong bones and teeth <p><i>Examples: kale, chard, collards & peas</i></p>	<ul style="list-style-type: none"> • A healthy heart • A lower risk of some cancers • Maintains healthy cholesterol levels <p><i>Examples: onions, garlic, parsnips & potatoes</i></p>
Blue and Purple	
<ul style="list-style-type: none"> • A lower risk of some cancers • Urinary tract health 	<ul style="list-style-type: none"> • Memory function • Healthy aging
<p><i>Examples: eggplant, purple carrots & purple peppers</i></p>	

Some information in this chapter reprinted with permission from Robbins, J., W. Colt., and M. Raidl. 2003. Harvesting and Storing Fresh Garden Vegetables. Bulletin 617. University of Idaho Extension, Moscow.



Crop-by-crop guide to harvest, storage, and nutrition

In this section you will find basic information about 30 common garden crops, listed in alphabetical order. You will find information about how to harvest and what each crop should look like when it is ready to pick. You will also find tips on preparing and storing food, as well as nutrition facts.

Harvesting for freshness

At the moment of harvest, your garden produce is at the peak of its quality, nutritional value, and flavor. To get the most out of your garden, try to harvest only what you need for a meal and use it right away.

Harvest in the morning when the vegetables are cool and will take handling better. Try not to bruise or damage your harvest. Keep the food you just picked out of direct sunlight and use it or store it as soon as possible.

Basil

How to harvest: Wait until basil leaves are about three to six inches long and rich green or purple, depending on variety. Basil plants grow and produce leaves all summer, and picking encourages more growth. Harvest by picking a few leaves from each plant instead of all the leaves from one plant.

When flowers appear, pinch off the top three or four sets of leaves to remove the flowers. Getting rid of the flowers helps the plant send its energy into the leaves. Use the leaves that you pinched off as part of your harvest.

How to use and store: Basil is best right after harvest. Eat the leaves whole or chopped, and use them fresh, sautéed, or baked in many summer meals.

Store fresh basil with its stems in a cup of water (like cut flowers) for up to seven days. Cover the

basil with a plastic bag with holes poked in it, and keep it out of direct sunlight. Store basil leaves in a dry, airtight plastic bag in your refrigerator for several days. At the end of the season, you can hang whole basil plants upside down to dry. Blend fresh basil leaves with vegetable oil, freeze in ziplock bags, and use a little at a time in fall and winter. Pesto, a green sauce made from basil, garlic, nuts, cheese, and oil, can be pre-made and frozen in ice cube trays. Pop out the frozen pesto cubes and store them in a ziplock bag in the freezer for later use. For best flavor, add the cheese only after thawing.

Nutrition facts: There is just one calorie in two teaspoons of chopped basil. Basil has small amounts of vitamins A and K, niacin, folic acid, and fiber.

Beans, snap (bush or pole)

How to harvest: Snap beans (also called green beans) come in various colors, shapes, and sizes. In general, snap beans are ready to pick when they are about as thick as a pencil and before the pods fill out. Harvest by holding the plant with one hand and pulling the beans off with the other hand.

Pick often to encourage the plant to produce more beans. Look carefully to find beans that are hiding. If you miss some beans and the pods get full, you





Harvest snap beans when they are as thick as a pencil.

can still pick them and eat the soft beans inside. If the pods have dried out, you can shell them and keep the dry beans for replanting next year.

How to use and store: You can eat snap beans fresh, steamed, boiled, sautéed, or baked. Also use them in soups, salads, and stir-fries.

Store snap beans in a plastic bag in your refrigerator for seven to ten days.

Nutrition facts: One half cup of cooked snap beans contains 22 calories and two grams of fiber. Snap beans are a good source of vitamin C.

Beets (roots and greens)

How to harvest: Pick beet greens just like chard (a cousin of beets). Harvest the leaves one at a time when they are four to six inches long, and leave the root in the ground to harvest later.

Beet roots are ready to harvest when the “shoulders,” or top part of the root, stick out above the soil. You can wait to harvest beets until they reach the size you want. The roots can range from golf ball to grapefruit size. Smaller beets are tender and flavorful, while larger beets are usually tougher and more fibrous. The root should be firm and dark, with a smooth surface. To harvest, hold the area where the leaves meet the root and pull gently. You can also use a shovel or hand trowel to dig around and below the beet to loosen the soil. It is easiest to harvest beets when the soil is slightly damp.

How to use and store: Eat beet roots raw, roasted, baked, boiled, steamed, or microwaved. Use them in salads, soups, and roasts. Red varieties add bright color to a meal, but be aware that the red color can stain. Use beet greens the same way you use spinach and chard.

Unless you plan to use beet roots right after harvest, do not wash them. Just brush the dirt off and let them dry slightly before storing. You can store beets with greens still attached in a plastic bag in the refrigerator for one to two weeks. Beets with the greens cut off will last for three to five months in a plastic bag in the refrigerator. Wash the beet roots just before using them. Store unwashed beet greens in a plastic bag in the refrigerator for up to five days.

Nutrition facts: One half cup of cooked beet root contains 110 calories, 1.5 grams of fiber, and small amounts of iron, vitamin C, and folate. One half cup cooked beet greens contains 19 calories and two grams of fiber. The greens are an excellent source of vitamins A and C.



Beets are ready for harvest when their “shoulders” stick out above the soil line.



Broccoli

How to harvest: Harvest broccoli heads when they are tight, compact, and blue-greenish. Be sure to harvest before the small yellow flower buds appear. The yellow flowers are edible, but they mean that the broccoli is bolting (going to seed). Harvest by cutting the stalk five to six inches below the head.

Broccoli will continue to send out smaller side shoots for several weeks after you cut off the central head. Harvest these smaller stalks by cutting them off several inches from the main stalk.

How to use and store: Enjoy broccoli raw, roasted, steamed, boiled, microwaved, or baked. Use it in soups, stews, casseroles, and salads. It also makes a great snack or side dish.

Broccoli stems and leaves are nutritious and tasty, so eat them too!

Broccoli tastes best when it is kept cool. Harvest it early in the morning and store it in a plastic bag in the refrigerator right away. It will keep in the refrigerator for 10 to 14 days.

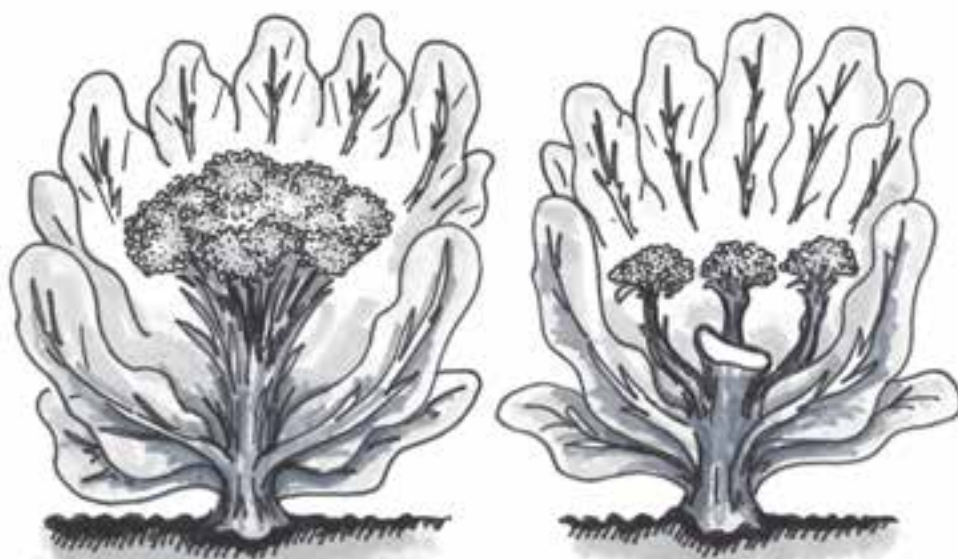
Nutrition facts: One half cup of cooked broccoli contains 22 calories and two grams of fiber. Broccoli is an excellent source of vitamins C and A, and a good source of folate.

Cabbage

How to harvest: Harvest cabbage any time after the head develops. A head of cabbage can range from softball to soccer ball size, depending on variety and maturity. For best flavor, harvest cabbage heads when they are compact and feel firm, and before they begin to split open. Harvest by cutting the stem as close to the head as possible with clippers or a sharp knife.

After you harvest the head, “cabbage sprouts” (like

Broccoli head and side-shoots



Central head

Side shoots coming up after head is cut

Brussels sprouts) will grow at the base of each remaining leaf. The sprouts are ready to harvest when they feel firm and are two to four inches wide. Harvest by cutting or twisting the sprouts free of the stalk.

How to use and store: Enjoy cabbage raw, steamed, boiled, sautéed, roasted, baked, or pickled. Use it in salads, soups, and stews, and for pickling into sauerkraut and kimchi.

Like broccoli, cabbage tastes best when it is kept cool.

Harvest early in the morning, wrap the head in a plastic bag or plastic wrap, and put it in the refrigerator right away. Cabbage picked in summer and early fall will keep for three to six weeks. Cabbage picked in the colder months will keep three to four months.

Nutrition facts: One cup of chopped raw cabbage contains 22 calories and two grams of fiber.

Broccoli will continue to send out smaller side shoots from the main stem for several weeks after the central head has been cut.

Depending upon variety and maturity, a head of cabbage can range from softball to soccer ball size.

Courtesy of Billy Cox



Cabbage is an excellent source of vitamin C.

Carrots

How to harvest: You can begin harvesting carrots when they reach about one half inch wide. Keep harvesting for three to four more weeks as they grow. Carrots planted in summer are frost hardy and will keep growing when an early frost is followed by warmer weather. Carrots get sweeter as they grow, but they can become bitter and woody if they get too large and begin to split.

To harvest carrots, use one hand to hold the leaves close to the base and wiggle and pull the carrot. Use your other hand to loosen the soil next to the root with a hand trowel or other digging tool. Loosening the soil will help you avoid breaking the top off the carrot. It is easier to harvest carrots when the soil is damp.

How to use and store: Enjoy carrots raw, boiled, sautéed, roasted, or steamed. Cut off the green tops and place the carrots in a plastic bag or crisper drawer in the refrigerator. Properly stored carrots will keep for four to six months.

Nutrition facts: One half cup of cooked carrots contains 35 calories and 2.5 grams of fiber. Carrots are an excellent source of vitamin A.

Cauliflower

How to harvest: Cauliflower is ready to harvest

when the head is about six to eight inches wide and the “curd” (the bumpy top part of the head) is firm, smooth, and compact. Be sure to harvest before the curd begins to separate. When the curd separates, the head will look a little like rice.

Harvest cauliflower by cutting the main stem just below the head. Leave a few green leaves around the head for freshness.

How to use and store: Enjoy cauliflower raw, steamed, roasted, boiled, or sautéed. Use it in soups, stews, and curries, and as a raw snack on a veggie platter. Boil and mash cauliflower to make a tasty, low-carb replacement for mashed potatoes.

Like cabbage and broccoli, cauliflower stores best when it is harvested early in the morning and cooled right away. Cauliflower will keep for two to four weeks in plastic wrap or in the crisper drawer in the refrigerator.

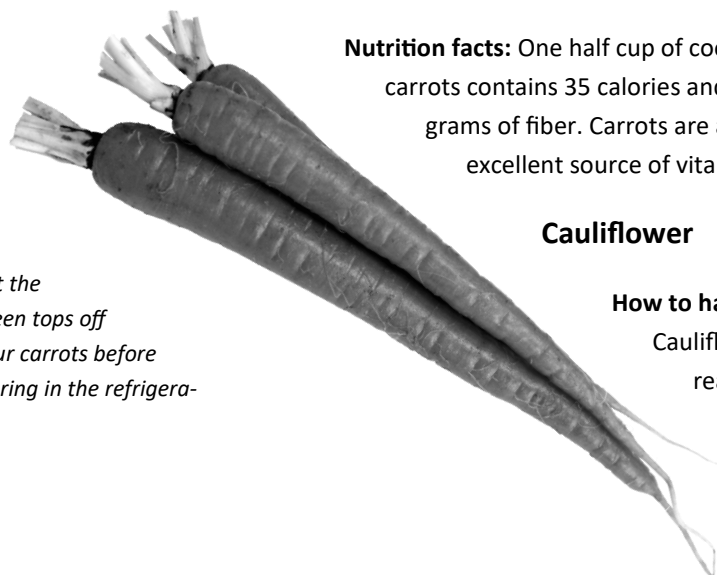
To blanch, fit a wire basket into a large pot with a lid. Use one gallon of water per pound of cauliflower. Put cauliflower into boiling water and seal with lid. Boil for three minutes. Rinse with cold water and drain. Once dry, seal in a plastic bag and freeze for six months to a year.

Nutrition facts: One half cup of cooked cauliflower contains 14 calories and 1.7 grams of fiber. Cauliflower is an excellent source of vitamin C.

Chard (Swiss chard)

How to harvest: Chard leaves can be eaten at any size. When you thin chard seedlings to make space for the crop to grow, use the thinnings as “baby chard.” When you pick leaves from a mature plant, use the cut-and-come-again method to make your harvest last longer. Cut the largest leaves from the outside of each plant about one and a half inches from the main stalk, and let the inner leaves keep growing. Mature plants grow about one to two feet tall and can keep producing for several months. Chard becomes tougher and more fibrous as it ages. If you prefer tender greens, begin harvesting when leaves are about eight to twelve inches long.

Cut the green tops off your carrots before storing in the refrigerator.



How to use and store: Mature chard leaves have two edible parts: the tender greens and the more fibrous stems. The greens cook quickly and are delicious raw, sautéed, or added to omelets, soups, stews, lasagnas, and gratins. Use them as you would spinach or beet greens. The stems take a bit longer to cook. Enjoy them steamed, sautéed, boiled, or roasted. Use them as you would celery or asparagus. To separate the stem from the leaf, use a knife to cut the leaf away or strip it off with your thumb and pointer finger.

Chard is very perishable. It tastes best fresh, so try to harvest only what you need for your meal. If you harvest more than you can eat right away, store it unwashed in a plastic bag in the refrigerator. It will last for two to three days.

Nutrition facts: One cup of raw chard contains seven calories and 0.6 grams of fiber. Chard is an excellent source of vitamin A and a good source of vitamin C.

Cilantro, coriander

How to harvest: Cilantro plants can produce both an herb and a spice. The leaves (herb) are called cilantro. The seeds (spice) are called coriander. If you want cilantro leaves, begin harvesting when the plant is about six inches tall. Use scissors to cut close to the ground. Use the cut-and-come-again method to harvest bright green leaves from the outside of the plant.

When the temperature warms to about 75°F, the plant starts to bolt (go to seed). As the plant sends up a tall flower stalk and puts its energy into making seeds, the leaves become less tasty. Harvest coriander seeds when the plant begins to turn brown and the flowers have become little round seeds. Be sure to harvest before any seeds burst open. Cut the whole plant and hang it upside down in a paper bag. Shake the bag once in a while to loosen the seeds. After several weeks, you will need to “thresh” the dry seeds by beating them in the paper bag or rubbing them between your fingers. Threshing separates the inner seeds from the hard outer shells (the “chaff”).

How to use and store: Use chopped or whole cilantro leaves to add a fresh, zesty flavor to your meal. Sprinkle the leaves on salads, stir-fries, or meat dishes. Blend the leaves into guacamole, salsa, or pesto, or cook it into sauces and soups.

Like most herbs, cilantro tastes best just after harvest, so try to pick only what you need for your meal. If you harvest more than you can use, place the stems in a cup of water (like cut flowers). Cover with a plastic bag with holes poked in it, and keep in the refrigerator for up to seven days. You can also freeze cilantro. Lay several sprigs flat in an airtight bag and freeze for up to six months. Do not thaw cilantro before using it—add it straight from the freezer to a dish you are cooking.

Use coriander seeds to flavor Indian and Middle Eastern dishes, omelets, rice, pickles, casseroles, burgers, and baked goods. First, toast the seeds in a dry pan without any oil, and grind the toasted seeds with a mortar and pestle.

Store coriander seeds whole without toasting or grinding them. Be sure the seeds are dry before you store them. Keep them in an airtight container in a cupboard or other cool, dark, dry place.

Spices lose flavor over time, but whole coriander seeds should be good for one to two years when they are stored properly.

Nutrition facts: One quarter cup of cilantro leaves contains one calorie and 0.1 grams of fiber. Cilantro is an excellent source of vitamin K and a good source of vitamin A.

Collard greens (collards)

How to harvest: Collards are a nutritious, hardy crop that keeps growing in the colder months. All aboveground parts of collard plants are edible at any stage of growth. For smaller, tender greens, grow collards close together and harvest when the plants are six to ten inches tall.

Harvest by pulling up the entire plant and clipping



“Blanching” cauliflower helps it keep for six months up to a year.

Use the cut-and-come-again method to extend your chard harvest. Cut the outside leaves and let the inside leaves grow.



off the roots. For an extended harvest, wait until the plants are 10 to 12 inches tall. Then begin harvesting larger, older leaves from the outside of the plant using the cut-and-come-again method. For the best flavor, harvest in the cool of the morning or after a light frost.

Overwintered collards produce broccoli-like florets called “collard raab” in spring. Harvest collard raab by cutting the florets where they meet the stalk. Be sure to do it before yellow flower petals emerge. Leave the central stalk in place and the plant will continue to produce florets for several weeks.

How to use and store: Collards are a hardy, sweet green that you can use in the same ways you use chard or kale. Like chard, mature collards have a fibrous, edible stem that takes a bit longer to cook. Strip the stem from the leaf with a knife. Enjoy collards chopped or sliced and added to soups, omelets, pastas, and even smoothies. Try collards steamed, braised in broth, stir-fried, used as a wrap with a filling inside, or eaten raw.

Place collard greens in a plastic bag and store them for 10 to 14 days in the refrigerator.

Nutrition facts: One cup of chopped raw collards contains 11 calories and 1.3 grams of fiber. Collards are an excellent source of vitamins A and C and a good source of folate.

Corn (sweet corn)

How to harvest: Corn is ready for harvest about 20 days after the first silk strands poke out from the ear. The tip of the ear should feel flat and not pointed. The kernels should be plump. Use a fingernail to pierce a kernel a few rows down from the top to see if there is milky liquid inside. But if you can, avoid peeling the leaves away from the ear until you are ready to cook the corn. This will help preserve flavor.

To harvest an ear of corn, hold it with one hand and twist until it comes loose from the stalk.

How to use and store: Enjoy corn raw or cooked in salads and soups, and use it in baked dishes. Cook corn on the cob or cut the kernels off the cob before or after cooking.

Corn tastes best just after harvest, but it will keep in a plastic bag in the refrigerator for two to ten days.

Nutrition facts: One half cup of cooked corn contains 89 calories and 2.3 grams of fiber. Corn is a good source of thiamin.

Cucumbers

How to harvest: There are many cucumber varieties. Harvest size and color depend on the variety you are growing. Be sure to check your seed packet for harvesting information. In general, cucumbers are ready when the fruit is firm, bright, and green, with no dullness or yellowing, and before the seeds begin to harden. Harvest slicing cucumbers when they are six to eight inches long. Harvest pickling cucumbers when they are two to six inches long. Harvest lemon cucumbers, a round cucumber variety, when the skin is firm and light green with a hint of yellow. Cucumbers become seedy and bitter as they get bigger, so harvest early and often.

To pick a cucumber, support it with your hand while you clip the stem about a quarter inch above the fruit.

Cilantro plants can produce both an herb and a spice. The leaves (herb) are called cilantro, and the seeds (spice) are called coriander.





Collard greens: cut the tough stem away from the tender leaf and cook separately.

Clipping will help prevent damage to the fruit or the vine. Harvest every day or so. If you leave cucumbers on the vine, your plant will stop producing. Clip off any stunted, rotten, or browning fruit to help the plant direct its energy to producing healthy fruit.

How to use and store: Enjoy slicing cucumbers and lemon cucumbers in salads and as fresh snacks. Also try them juiced, chopped into sauces and salsas, pureed into cold soups (gazpacho), and stir-fried. As the name suggests, pickling cucumbers make great pickles!

Store cucumbers in plastic wrap or in the crisper drawer of the refrigerator for 10 to 14 days.

Nutrition facts: One half cup of raw cucumber contains 15 calories and 0.4 grams of fiber. Cucumbers contain small amounts of vitamin C and folate.

Eggplant

How to harvest: The size, shape, and color of a ripe eggplant depends on which variety you are growing. Read your plant tag or check in a seed catalog for information about your variety before you harvest. In general, a ripe eggplant should be glossy and firm with only a slight give when you press it with your thumb. Fruits picked on the smaller side taste best.

To harvest an eggplant, hold the fruit while you clip it from the plant close to the stalk. To keep the harvest going all summer, harvest ripe eggplant fruits early and often.

How to use and store: Enjoy eggplant grilled, roasted, stuffed, or stewed. Mix it into soups, curries, casseroles, stir-fries, pasta dishes, and dips. Raw eggplant can cause digestive upset, so it is best to cook it.

Keep eggplant wrapped in plastic in the refrigerator for up to a week.

Nutrition facts: One half cup of cooked eggplant contains 14 calories and 1.2 grams of fiber. Eggplant contains small amounts of folate, vitamin C, and iron.

Garlic

How to harvest: After overwintering in the garden, garlic leaves begin to turn yellow and dry out in early summer as the bulb reaches maturity. Garlic bulbs are mature and ready for storage when half of the leaves have turned yellow and half remain green. “Green garlic” (immature garlic) can be harvested throughout springtime, but it does not store well. To harvest mature or green garlic, use a digging fork, shovel, or hand trowel to loosen the soil around the garlic. Be careful not to damage the bulb. Hold the leaves close to the bulb and wiggle until the bulb comes loose from the soil.

“Hardneck” garlic varieties send up an edible curly flower stalk called a garlic scape. Harvest the scape while it is still green, before the flower opens. Clip the scape off close to where it meets the leaves and leave the bulb in the ground until it matures.

How to use and store: Garlic adds flavor to meals without adding fat or salt. Use it to flavor soups, stews, casseroles, pasta sauces, salad dressings, curries, roasts, and marinades. Garlic gets sweet and creamy when you roast it. Roast whole heads of garlic and spread on crackers.

Garlic bulbs will store for six to seven months when cured properly. To cure garlic, shake any loose soil off the bulb and lay it flat with its leaves still



Corn is ready for harvest about 20 days after the first silk strands appear.



Cucumbers become seedy and bitter as they get bigger, so harvest early and often.

attached in a dry place out of direct sunlight for three to six weeks. After curing, trim off the roots close to the bulb with scissors, and wipe loose dirt from the bulb with a dry cloth. Be careful not to remove the outer layer of skin from the bulb. If you accidentally remove any skin, use that garlic first because it will not store well.

“Softneck” varieties have flexible leaves. You can clip off the tops to an inch above the bulb, or braid the leaves together.

“Hardneck” varieties have stiff leaves and are hard to braid. Clip the tops to an inch above the

bulb. Always store garlic in a dark space with good air circulation.

Nutrition facts: One clove of garlic contains five calories and no fat, sodium, or cholesterol. Scientific studies suggest that garlic may lower blood pressure and cholesterol levels.

Herbs (perennial)

How to harvest: You can begin harvesting small amounts of leaves as soon as your herb transplants establish themselves. You can harvest most perennial herbs at any time of year. Both the leaves and flowers of chives are edible and can be picked anytime. Culinary sage, mint, oregano, rosemary, sweet marjoram, thyme, and winter savory are most flavorful when harvested just as their flower buds begin to appear, but before they bloom.

Use scissors or clippers to harvest herbs. Snip just below a pair of leaves, leaving four to six inches of stem below for new growth. Harvest chives by cutting just above ground level. You can harvest just what you need for a meal, or you can harvest heavily for drying and storage. As a general rule, do not harvest more than one-third of the plant at once.

How to use and store: Herbs add flavor and depth

to meals without adding fat or salt. Use sage to flavor meatloaf, stews, and bean dishes. Try mint on meats, in salads, and as a tea. Use oregano, marjoram, savory, and thyme to flavor soups, pastas, pizzas, and roasts. Enjoy chives in salads and egg dishes. Dried herbs are stronger than fresh herbs. If you are following a recipe that calls for dried herbs and you are using fresh, just use a little more of the fresh herb.

Fresh herbs will keep for up to a week in a plastic bag in the refrigerator, but it is best to harvest only what you need for a meal. Herbs can also be dried and then stored in airtight containers away from light and heat. You can air-dry them in a warm, dark place for several weeks, oven-dry them at 180°F for four hours, or microwave-dry them on high for one to three minutes.

Nutrition facts: Herbs are low-calorie, low-sodium, fat-free foods.

Kale

How to harvest: Kale can be smooth, bumpy, curly, or lacy, and frosty green to deep purple, depending on the variety. It is a cold-hardy crop that will grow all year, but cold weather improves the flavor. Kale is best when planted in late summer and harvested in the colder months. The leaves are edible at any stage of growth. For an extended harvest, use the cut-and-come-again method. Harvest the outer leaves while they are still tender and about eight inches long or less. To pick kale, clip or twist the base of the leaves closest to the stalk. You can also harvest the entire plant at any time by pulling it up by the roots and clipping off the leaves. For best flavor, harvest in early morning or after a frost.



Eggplant types vary in size, color, and shape.



How to use and store: You can eat kale raw or cooked. Mature kale leaves have a thick stem that takes longer to cook. Strip it out and cook it separately. Cut the leaves into strips and steam them, or massage them with oil and salt to soften. Mix kale into salads, pastas, soups, stews, bean dishes, and stir-fries. Blend it into smoothies and juices. Bake it into kale chips (see the recipe on page 135).

Wrap kale in a plastic bag and store it in the refrigerator for 10 to 14 days.

Nutrition facts: One cup of chopped raw kale contains 34 calories and 1.3 grams of fiber. Kale is an excellent source of vitamins C and A.

Leeks

How to harvest: A leek is like a long onion without a bulb and with flat leaves. Leeks withstand freezing temperatures and can grow year-round. They are ready for harvest when the base of the stem is one to two inches wide.

Dig leeks by pushing a digging fork, shovel, or hand trowel straight down next to the plant. Hold the leek with one hand and use the tool to loosen the soil until the leek comes up.

Growing tip: “Blanch” leeks to make more of the stem edible. When the stem is about as thick as a pencil, mound soil up to the level of the first leaves. Any part of the leek that is hidden from sunlight will be white and tender.

How to use and store: Leeks are milder than onions or garlic. You can eat them raw or cooked. First, rinse them very well because they collect soil between their layers. Leeks are a good substitute for onions in recipes that take a long time to cook. They are especially good in soups and stews.

Leeks will store for one to three months in a plastic bag in the refrigerator. Wipe the soil away, then cut off the roots and the top, leaving just one to two inches of green leaves.

Nutrition facts: One half cup of cooked leeks contains 16 calories and 0.5 grams of fiber. Leeks



also contain small amounts of iron and vitamin C.

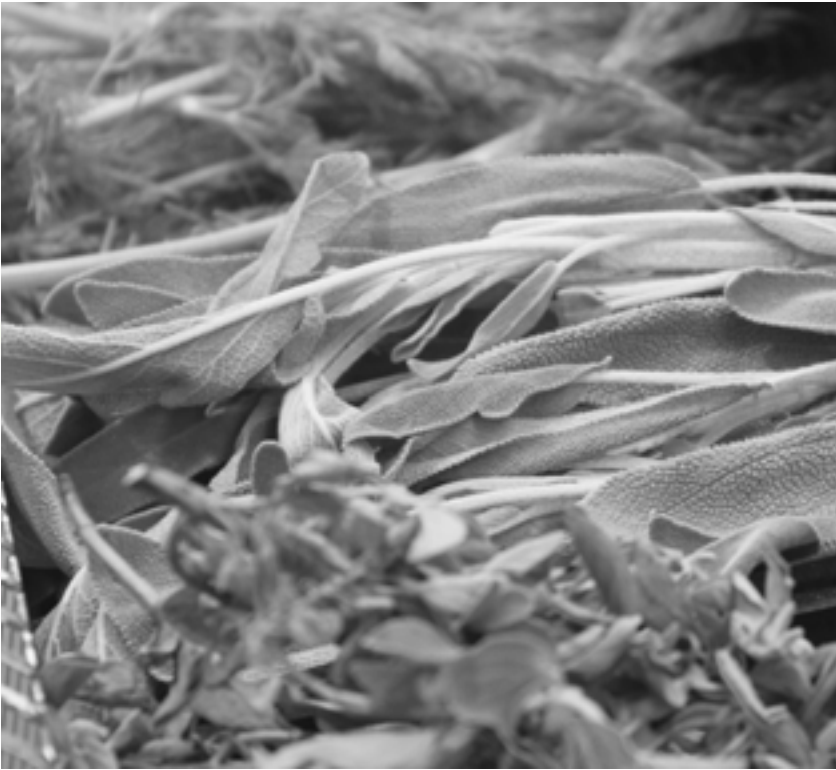
After curing your garlic, trim the roots close to the bulb with scissors and wipe off loose dirt with a dry cloth.

Lettuce

How to harvest: Harvesting depends on whether you are growing “leaf” lettuce or “head” lettuce. Pick leaf lettuce at any stage of growth. Wait to harvest head lettuce until it forms a tight, compact head. Lettuce grows best in spring and fall weather. It tends to bolt (send up a flower stalk) in hot summer weather, which makes it bitter and much less tasty. For all lettuce varieties, be sure to harvest before the plant bolts.

Use the cut-and-come-again method to harvest leaf lettuce. Snip a few of the outer leaves about an inch above the ground. The center leaves will keep growing, and you can harvest more every week or so. Harvest head lettuce by removing the whole plant. Clip the bottom of the plant at soil level or pull the plant up by the roots.

How to use and store: Use lettuce in salads and sandwiches. Wrap a lettuce leaf around cold cuts. Shred lettuce and use it to top tacos and bean dishes. Try something new: include lettuce in a smoothie, brush lettuce leaves with olive oil and grill them, or blend lettuce into a cold summer soup.



Herbs add flavor and depth to your meals without adding fat or salt.

Lettuce tastes best fresh from the garden, but you can store it in plastic wrap in the refrigerator for two to three weeks.

Nutrition facts: One cup of raw shredded lettuce contains seven calories and less than one gram of fiber. Lettuce also contains small amounts of vitamins C and A.

Onions

How to harvest: Harvest onions anytime during their growing season to use right away. You can also harvest at the end of the season for storage. Onions come in white, yellow, red, and purple varieties. “Green onions” (also called “spring onions”) are onions that you harvest before they reach maturity. When you thin your onion bed in spring, eat the thinnings as green onions. In general, harvest green onions when the tops are about as thick as a pencil. When mature onions are ready to harvest, their tops fall over. When a quarter or more of the tops have fallen, pull all the onions out of the ground within a week. Onions that have “bolted” (sent up a flower stalk) do not taste good.

To harvest green or mature onions, use a digging

fork or hand trowel to loosen the soil around the roots. Hold the top of the plant with your hand and gently pull the onion loose from the soil.

How to use and store: Cooked onions add flavor to soups, stews, roasts, stir-fries, and omelets. Use raw onions in salads, sandwiches, salsas, and wraps.

Use green onions soon after harvest. They will keep in the refrigerator for only up to a week.

To store mature onions, you must cure them first. Right after harvest, lay them flat with their leaves still attached in a dark place at room temperature (60° to 80°F) for 10 to 14 days. When the leaves have dried, cut the tops off one to three inches above the bulb. Trim off the roots, and dust off any loose soil. Do not rinse the onions in water or remove the outer skin. Store the onions in a cool, dark, well-ventilated place, like a pantry, for up to eight months.

Nutrition facts: One half cup of cooked onion contains 46 calories and 1.5 grams of fiber. Onions also contain small amounts of vitamin C, calcium, and iron.

Parsley

How to harvest: Two types of parsley are common in home gardens: curly parsley and Italian parsley (also called “flat leaf” parsley). Begin harvesting both types once the plants are well established, or when the outer stems are three to four inches long.

Harvest parsley using the cut-and-come-again method. Use scissors to snip the outer stems close to the ground. Harvest only as much as you need for a meal.

Growing tip: Parsley is a biennial herb, meaning that it will flower and die in its second year. In cool-summer climates, it is possible to extend the harvest into the second year. To do this, pinch off the flower stalk before it can grow and keep harvesting leaves.

How to use and store: Parsley adds flavor and





Mature kale can be smooth, bumpy, curly, or lacy. Kale can range in color from frosty green to deep purple.

depth to a meal without being overpowering. Curly parsley is mild. Use it as a garnish for salads, soups, and meat dishes. Italian parsley is more flavorful. Use it cooked or raw in herbed roasts, stews, soups, and salsas. It is also wonderful in vegetable, bean, pasta, and Middle Eastern dishes.

Parsley will keep in a plastic bag in the refrigerator for one to two months.

Nutrition facts: One tablespoon of raw parsley contains 1.4 calories, 0.1 grams of fiber, and small amounts of vitamins C and A.

Parsnips

How to harvest: Parsnips look like long, fat, white carrots. They are sweetest when temperatures drop below 40°F, so begin harvesting in late fall after the tops freeze back. You can leave parsnips in the ground and harvest them during winter. Protect them by covering the ground with mulch (straw is a good choice). Parsnips get woody when the roots are large and when the plant begins to flower. Try to harvest when the roots are still small to medium-sized and tender.

Harvest parsnips the same way you harvest carrots. Use one hand to hold the leaves close to the base and to wiggle and pull the parsnip. Use your other hand to loosen the soil with a hand trowel or other digging tool.

How to use and store: Parsnips have a sweet, nutty

flavor. Use them in much the same way as you use carrots. Roast them with other vegetables. Add them to soups and stews. Grate them raw into salads. Bake them into cakes and muffins.

To store parsnips, first cut off the tops and dust off any soil. They will keep in a plastic bag in the crisper drawer of the refrigerator for two to six months.

Nutrition facts: One half cup of cooked parsnips contains 63 calories and three grams of fiber. Parsnips are a good source of vitamin C and folate.



They contain

To grow tender, white stems, blanch leeks by mounding soil around the base of the plants as they grow.

small amounts of calcium and iron.

Peas, snap or snow

How to harvest: Snap peas and snow peas have edible pods that are crisp and sweet. Snap peas are sweeter after the pods begin to fill out. Harvest snap pea pods when they are about as thick as your little finger. The pod should snap when you break it in half. Snow peas have flat pods. Harvest snow pea pods when the peas are barely visible through the skin. Pick both kinds of peas by holding the plant with one hand and the pea pod with the other, close to where it attaches to the plant. Gently pull the pod free of the plant. Take care to avoid ripping either the pod or the plant.

How to use and store: Peas are one of the first sweet crops you can pick in late spring and early summer. Enjoy snap pea pods raw as a snack, or mix them into salads, salad rolls, or pasta dishes. Add snow pea pods to stir-fries, soups, noodle dishes, and Asian-inspired meals.

Wash and dry snap and snow peas before storing them. They will keep in a plastic bag in the refrigerator for one to three weeks.

Lettuce tastes bitter once it bolts (sends up a flower stalk) in hot weather.



Courtesy of Elaine Rickett, awomanofthe-soil.blogspot.com



Green onions are just onions that you harvest before they reach maturity.

Jalapeños will turn red if left on the plant long enough, but they are usually harvested green.

To harvest a pepper, hold it in your hand and pop it off the plant. It should come off easily. To avoid damage to the plant, you can also harvest peppers with clippers or scissors.

Some gardeners are sensitive to handling hot peppers. Avoid rubbing your eyes after harvesting or wear gloves.

How to use and store: Peppers can be eaten raw or cooked. They add loads of flavor to sauces, salsas, soups, stews, stir-fries, and pasta dishes.

Fresh peppers will keep in a plastic bag in the refrigerator for eight to ten days. Dried peppers stored in a sealed container will last for six months to a year. Dry the peppers in a food dehydrator or at 180°F in the oven.

Nutrition facts: One large uncooked green bell pepper contains 20 calories and no fiber. Peppers are an excellent source of vitamins C and A. Hot peppers are usually not eaten in great enough quantity to contribute to nutrition, but they are also high in vitamins C and A.

Potatoes

How to harvest: Potatoes grow underground, so you need to look for clues to know when they are ready for harvest. If you are growing potatoes for storage, dig them in September or October, after the aboveground stems and leaves have mostly died back. You can dig “new potatoes,” which are



just immature potatoes, at any time and any size. Use them right away because they do not store well.

To harvest potatoes for storage, dig up the whole potato bed all at once. To harvest new potatoes, dig up only small sections and take as many potatoes as you need. Gently sink a digging fork four to six inches straight down into your potato bed and pull the handle toward you. Set potatoes aside as they begin to pop up. If you accidentally stab a potato with the fork, use it right away because damaged potatoes do not store well. Any potatoes left in the ground will re-sprout the next year, so do your best to clean out the bed at the end of the season.



When mature onions are ready for harvest, their tops fall over.

Growing tip: If your potatoes are green, they were exposed to too much light. This green portion is bitter and can cause digestive problems. Cut out the green skin with a knife. If there is too much green to cut, throw the potato away. The aboveground part of a potato plant is not edible. The flowers and berries are pretty, but do not eat them.

How to use and store: Potatoes add texture to



Curly Parsley



Italian Parsley

dishes, and they absorb flavors from the other ingredients. Mash them, bake them, or roast them with other root vegetables like onions and carrots. Boil potatoes and dice them into a warm salad, stir them into egg dishes, or blend them into a thick, creamy soup. Be sure to cook potatoes all the way through, because raw potatoes can cause digestive upset.

Potatoes that you harvest in fall will store well for six to eight months if you cure them first. Place the potatoes in a dark, well-ventilated area at room temperature (60° to 75°F) for seven to ten days. Then dust (but do not wash) dirt from the potatoes. Store the potatoes in a cool (around 45° to 50°F), dark place with good air circulation. Potatoes are about 80% water, so storing them at high humidity will prevent shriveling.

New potatoes should not be stored. You can keep them in a plastic bag in the refrigerator for up to one week.

Nutrition facts: One medium potato contains 160 calories and four grams of fiber. Potatoes are an excellent source of vitamin C and a good source of iron and niacin.

Curly parsley is mild, and Italian parsley is more flavorful.

Pumpkins

See *Squash, winter*

Radishes

How to harvest: Radishes are one of the fastest-growing crops. Some varieties are ready for harvest just one month after planting. Radishes come in a variety of colors including white, pink, and purple. They can be either round or long, like a small carrot. Begin harvesting as soon as the radishes are about one-half to one inch wide. They will pop up aboveground, so you can see how wide they are. Radishes left in the ground too long become woody and spicy.

Harvest radishes by holding the leaves at the base and gently wiggling until the root comes loose from the soil. A hand trowel can make the job easier.

How to use and store: Radishes are crispy and mild. Slice, shred, or chop them and add them raw to sandwiches, salads, tacos, and pasta dishes. Try radishes salted and roasted, pickled, or dipped in your favorite dressing.

To store radishes, remove the tops about a half inch from the radish. Wash radishes and store them in a plastic bag in the refrigerator. They will

keep for five or six days.

Nutrition facts: One half cup of sliced radishes contains 20 calories and no fiber. Radishes are an excellent source of vitamin C.

Spinach

How to harvest: Spinach leaves can be eaten when they are very small or when they are bigger. They will grow to the size of a hand or even larger. Spinach leaves should be deep green or silvery green. They may be smooth or bumpy,



Harvest snap peas when they are about as thick as your little finger.

depending on the variety.

Harvest spinach using the cut-and-come-again method. Snip a few larger leaves from the outside of a plants, close to the ground. The center leaves will continue to produce for a month or more. Spinach will “bolt” (send up a flower stalk) as the weather warms. This makes the leaves taste bitter. If you did not harvest the whole plant before it bolted, then pull it up as soon as possible and snip off any dark green leaves to use in meals.

How to use and store: Enjoy spinach raw or cooked. Steam it, drizzle it with olive oil, and season it with salt. Bake it into egg dishes and casseroles, blend it into dips and smoothies, stir it into pastas and bean dishes, and build green salads around it.

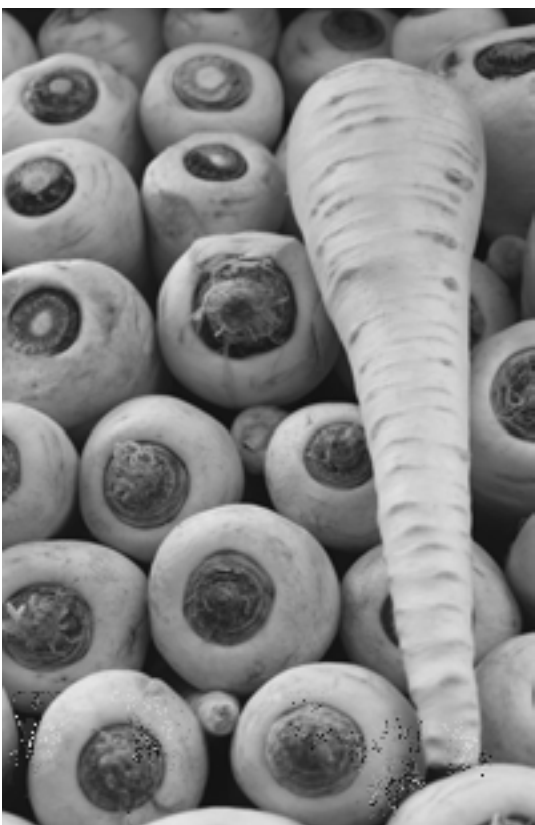
To store spinach, wash it and keep it in a plastic bag in the refrigerator for 10 to 14 days.

Nutrition facts: One cup of raw spinach contains 40 calories and five grams of fiber. Spinach is an excellent source of vitamins C and A, and iron.

Squash, summer (including zucchini)

How to harvest: Summer squash is the name for all tender-skinned squash, including zucchini, crookneck, and pattypan. Their shapes and colors vary, but all are best when harvested small, before they become seedy and fibrous. Harvest zucchini when it is no more than six to eight inches long. Harvest round types when they are no more than three to four inches wide. They will still be edible when they get bigger, but they will not taste as good.

Parsnips have a sweet, nutty flavor, and can be used like carrots.



Hold the squash while you snip the stem with scissors, clippers, or a knife. Cut the stem about an inch from the squash. Cutting instead of twisting will keep you from accidentally breaking the squash.

How to use and store: Like potatoes, summer squash has a mild flavor and picks up the flavors of the other ingredients in a dish. Slice it and barbecue it. Bake it into savory meals like egg dishes and lasagna. Or bake it into sweet treats like muffins and brownies. Mix it into stir-fries and pasta dishes. Steam it, stuff it, or use it raw in salads and tacos.

Store summer squash in a plastic bag in the refrigerator for five to fourteen days.

Nutrition facts: One half cup of cooked summer squash contains 18 calories and 1.3 grams of fiber. Summer squash contains small amounts of vitamins C and A, calcium, and iron.

Squash, winter (including pumpkins)

How to harvest: Winter squash is the name for all hard-skinned squash and pumpkins. This type of squash grows during summer and stores well into the winter. A ripe winter squash can weigh from a few pounds to a few hundred pounds, and it can be green, red, yellow, blue, white, or multi-colored. Winter squash and pumpkins need to ripen completely on the vine if they are to store well. When winter squash is ready, the skin is tough and hard to pierce with a thumbnail. Also, the stem will begin to turn from green and soft to tan and woody.

Use clippers to cut the stem two inches from the squash. The attached stem helps the squash keep longer in storage.

How to use and store: For varieties with very thick skins, use a large knife to split the squash into halves or quarters and remove the seeds with a spoon. Place the squash pieces in a shallow pan of water and cover with tinfoil. Bake at 450°F for about 45 minutes. Once the flesh is soft, scoop it out and use it in pies, soups, and sweet breads and



other baked goods. Some varieties, like butternut squash, have thinner skin. You can peel them and then slice, cube, or shred the flesh. Bake, roast, or fry the pieces and use them in sweet or savory dishes.

Winter squash stores well in a cool, dark place for two to six months, depending on the variety. Cure it first by leaving it in a warm location for 10 days. When you store several squashes, be sure to scatter them and not pile them in one spot.

Tip: Do not cure acorn squash, because curing can make the skin tough. Eat acorn squash soon after harvest because it will store for only up to two months.

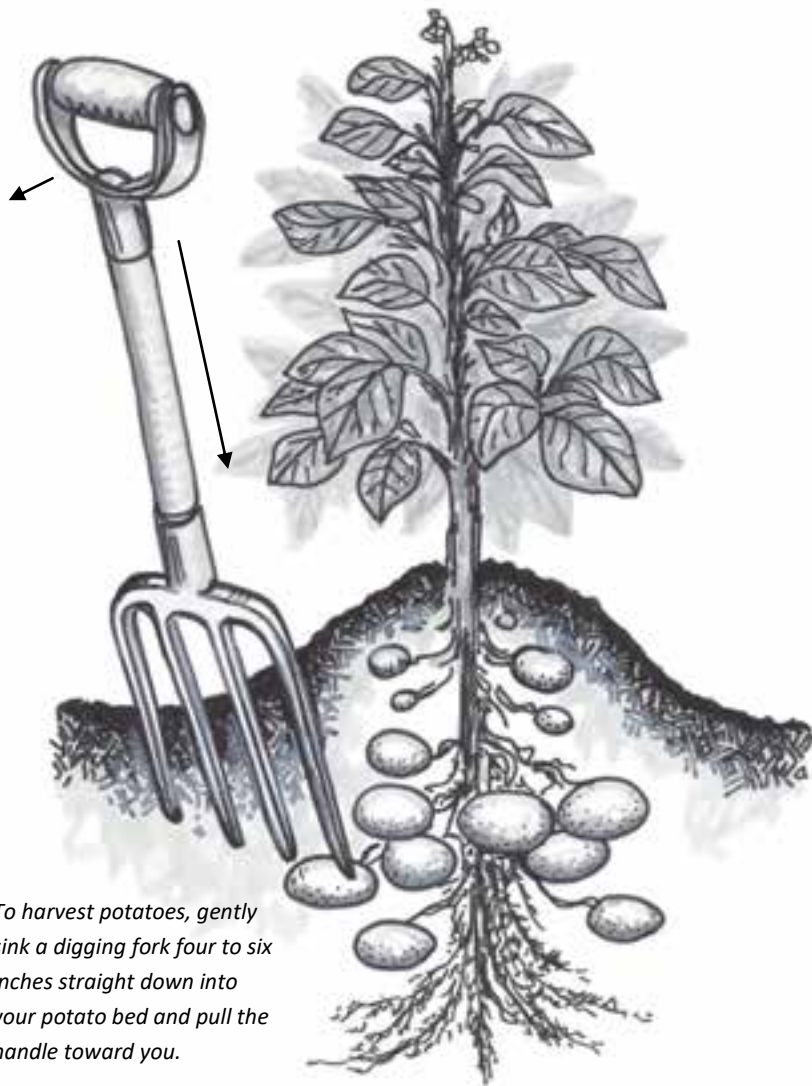
Nutrition facts: One half cup of cooked winter squash contains 40 calories and 2.9 grams of fiber. Winter squash is an excellent source of vitamin C and contains a small amount of folate.

Tomatoes

How to harvest: There are more than 4,000 tomato varieties in the world. Common garden varieties come in almost every color: white, pink, red, orange, yellow, green, purple, black, and even striped! Tomatoes may be large and round, tiny and pear-shaped, or long and pepper-like. The plant tags that come with your tomato transplants will tell you what your ripe tomato should look like

Hot peppers can irritate the skin and eyes. Do not rub your eyes after handling hot peppers, and consider wearing gloves to protect your skin.





To harvest potatoes, gently sink a digging fork four to six inches straight down into your potato bed and pull the handle toward you.

when they are ready to harvest. For all varieties, pick the fruit when it is just slightly under-ripe. The fruit should feel firm with just a little give. The color should be at or close to mature color, and the tomato should be easy to pull off the vine. Full-sized, under-ripe tomatoes will continue to ripen after harvest. If you expect a frost, pick all full-sized green tomatoes before they are damaged.

To harvest large tomato varieties, hold the fruit and twist it off the vine with your hand. To harvest smaller grape or cherry tomato varieties, hand pick each one or snip entire bunches off the plant with scissors or clippers.

How to use and store: Garden-fresh tomatoes are delicious summer treats. Use them as a base for sauces and salsas. Slice or chop them for pizzas, sandwiches, pasta dishes, and green salads. Blend

them with other vegetables into a cold summer soup. Stuff them with your favorite cheese and bake them. Skewer and grill them. Enjoy them fresh, sprinkled with a little salt and some herbs from your garden.

Store ripe tomatoes in a plastic bag in your refrigerator for four to ten days. Green tomatoes will store for one to six weeks in the refrigerator. Move them out of the refrigerator to ripen at room temperature when you want to use them.

Nutrition facts: One medium-sized raw tomato contains about 25 calories and 1.4 grams of fiber. Tomatoes are an excellent source of vitamin C and a good source of vitamin A.

Watermelon

How to harvest: Watermelon can be difficult to grow in the Pacific Northwest because it needs a long warm season to ripen. A watermelon will not ripen off the vine, so be sure to harvest only when it is fully ripe.

To know when a watermelon is ripe, look for these signs: 1) the green, curly tendrils near where the vine attaches to the fruit will turn brown and dry out; 2) the surface color of the fruit will turn from smooth and shiny to rough and dull; 3) the skin will



become

Courtesy of Ron McKenzie

tough and



will be hard to pierce with a thumbnail; and 4) the underside of the melon (where it lies on the soil) will turn from light green to yellowish.

A ripe watermelon should detach easily from the vine. Simply pick it up off the ground.

How to use and store: Eat watermelon by itself, or blend it into juices, smoothies, and cold summer soups. Pour watermelon juice into popsicle molds and freeze them. Slice watermelon into salads or serve it with fish, cheese, or salted meat.

Store a whole watermelon in the crisper drawer of the refrigerator for two to three weeks.

Nutrition facts: One cup of watermelon contains 50 calories and less than a gram of fiber. Watermelon is an excellent source of vitamin C and a good source of vitamin A. It contains small amounts of calcium.

Zucchini

See *Squash, summer*



Radishes are one of the fastest-growing crops in the garden.

Harvest spinach one leaf at a time using the cut-and-come-again method.



Courtesy of Janna Tangedahl at Twist.wordpress.com

Small summer squash taste best! Harvest when they are no longer than six to eight inches.



Courtesy of www.istockphoto.com



Courtesy of www.publicphoto.org

The blossoms of both summer and winter squash are also edible! Use them as pizza or quesadilla toppings, stuff them with cheese to make fritters, and even bake them into muffins.





You can peel off the skin of a winter squash before cooking. Or you can cut the squash into halves or quarters and bake with the skin still on.



Save winter squash and pumpkin seeds for roasting! Clean them, toss them with vegetable oil and salt, and bake at 300°F for 45 minutes. Stir in your favorite spice to add flavor.

There are more than 4,000 tomato varieties in the world.



Courtesy of Spencer Masterson





*When a watermelon is
ripe, the curly, green ten-
drils on the vine turn
brown
and dry out.*

Cooking from your garden

The following pages contain a few tried-and-true recipes to help you make the most of your harvest. These recipes were developed by the Oregon State University Extension Service Food Hero campaign and by chef volunteers from Oregon Food Bank's education programs. They are just a few of the low-cost, healthy, flavorful meals you can make with fresh garden produce.

For more recipes, visit **AZ Health Zone** at www.azhealthzone.org



About Food Hero

www.foodhero.org is an online resource for people who want to eat healthy meals and make healthy foods for their families. With resources in both English and Spanish, the website provides recipes, tips, and tools on how to prepare meals that are low cost, simple, and fast.

The Food Hero website is a project of the Oregon State University.



PASTA RATATOUILLE

12 (1-cup) servings

Ingredients:

6 cups water
1 pound pasta
3 tablespoons vegetable oil
1 large onion, chopped
5 cloves garlic, finely chopped
2 medium green bell peppers, chopped
3 small zucchini, cubed
1 small eggplant, cubed
3 medium tomatoes, cubed
1½ teaspoon salt
½ teaspoon black pepper
2 teaspoons basil, chopped
1 cup shredded Swiss cheese

Directions:

- Bring water to a boil in a large pot. Add the pasta and cook until tender, about 10 minutes. Drain and set aside.
- Heat the oil in a skillet over medium heat. Add the onion and garlic, and sauté about four minutes.
- Add the bell pepper, zucchini, and eggplant. Cook about 10 minutes.
- Stir in the tomatoes, salt, pepper, and basil.
- Continue to cook another three minutes or until the vegetables are crisp-tender.
- Serve over pasta.
- Top with Swiss cheese.
- Refrigerate leftovers within two to three hours.



CHINESE RAMEN

CABBAGE SALAD

12 (1/2-cup) servings

Ingredients:

5 cups shredded cabbage
2 cups chopped broccoli (or broccoli florets)
1 cup shredded carrot
½ cup chopped green onion
1 package chicken-flavored ramen noodles, crushed (reserve seasoning packet for dressing)
2 tablespoons apple cider vinegar
1 tablespoon sugar
2 tablespoons vegetable oil

Directions:

- In a large bowl, combine the cabbage, broccoli, carrot, green onion, and uncooked ramen noodles.
- For the dressing, combine the ramen seasoning packet, vinegar, sugar, and oil in a small bowl. Stir well.
- Pour the dressing over the salad. Toss to coat. Refrigerate until served.
- Refrigerate leftovers within two to three hours.

Notes:

- Add chicken, tuna, tofu, nuts, or other sources of protein.
- Use any kind of vinegar or substitute low-fat Italian dressing for the dressing ingredients.
- Reduce sodium by leaving out the seasoning packet.



Recipes and photos by: Food Hero, an online resource provided by the Oregon State University Extension Service.



Courtesy of Heather Arndt Anderson

Recipes by
Food Hero, an online
resource provided by
the Oregon State
University
Extension
Service.

VEGGIE SKILLET EGGS

Eight servings

Ingredients:

- 6 medium or large eggs
- ¼ teaspoon black pepper
- ½ teaspoon oregano or basil
- ½ cup shredded cheese (1½ ounces)
- 2 teaspoons vegetable oil
- 1 small onion, chopped (about 2/3 cup)
- 1 clove garlic, chopped or 1/8 teaspoon garlic powder
- 2 cups chopped mixed vegetables (green beans, zucchini, peas, corn, broccoli)
- 1 medium tomato, sliced

Directions:

- Beat the eggs with the pepper, oregano or basil, and cheese in a medium bowl.
- Heat the oil in a nine-inch frying pan. Add the onion, garlic, and mixed vegetables, and cook over medium heat until soft.
- Pour the egg mixture over the vegetables. With a knife or spatula, lift the outer edges of the egg mixture so it flows to the bottom of the pan.
- Cook until the eggs are set, about six minutes. Top with tomato slices.
- Cut into eight wedges and serve hot.
- Refrigerate leftovers within two to three hours.

KALE CHIPS

Six servings

Ingredients:

- 1 bunch fresh kale, chopped (eight cups)
- 1 tablespoon vegetable or olive oil
- 1/2 teaspoon seasoned salt

Directions:

- Wash the kale leaves.
- Slice off thick stems and discard or set aside for use in soups or stews. Thoroughly dry the leaves in a salad spinner or by blotting with paper towels.
- Tear or cut the leaves into bite-sized pieces. Place in a large bowl.
- Drizzle the oil over the kale and toss to lightly coat the leaves.
- Spread out the kale leaves on a cookie sheet.
- Sprinkle with the salt.
- Bake at 350°F until the edges brown, about 10 to 15 minutes.
- Serve hot.

Notes:

- If making the kale chips ahead of time, do not store them in an airtight container. They can get soggy if stored for too long.



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CURRIED CARROT-GINGER SOUP

Six servings

Ingredients:

2 tablespoons olive oil
1 medium onion, chopped (about $\frac{3}{4}$ cup)
2 cloves garlic, minced
3 large carrots, peeled and chopped
1 cup peeled and chopped sweet potatoes or yams
2 teaspoons grated fresh ginger
1½ teaspoons curry powder
1/2 teaspoon cumin (optional)
3 cups vegetable broth
½ cup milk or soy or coconut milk
Salt and black pepper to taste

Directions:

- Heat the oil in a stockpot.
- Add the onion and sauté until golden, about 10 minutes.
- Add the garlic, carrots, sweet potato, ginger, curry powder, and cumin. Sauté two to three minutes.
- Add the vegetable broth. Bring to a boil, then reduce to a simmer. Cook until the vegetables are tender, about 20 minutes.
- Puree using an immersion blender or food processor. Return to the stockpot.
- Add the milk and season to taste with salt and pepper.
- Bring the soup up to serving temperature. Serve and enjoy!



ROASTED CARROTS

Four servings

Ingredients:

6 medium carrots (2 cups)
1 tablespoon olive oil
2 teaspoons mustard
1 teaspoon honey
¼ teaspoon chopped fresh garlic or garlic powder
¼ teaspoon salt
Black pepper to taste (optional)

Directions:

- Preheat the oven to 400°F.
- Spray a baking sheet with cooking spray or line it with foil or parchment paper.
- Wash and peel the carrots. Cut into ½-inch diagonal slices.
- Toss with the olive oil mustard, honey, garlic, salt, and pepper.
- Arrange on the baking sheet so the carrots are not crowded or they will steam instead of roasting. Roast for 15 to 20 minutes, until crisp-tender and slightly browned. Every oven is a little different, so check the carrots to see when they are done.

Notes:

- For a variation on this recipe, you can leave out the mustard and honey. Instead, add one-half teaspoon of your favorite dried herb, such as thyme, oregano, or basil.
- This recipe can be used with different vegetables. For example, try broccoli or cauliflower instead of carrots.



Courtesy of Heather Arndt Anderson

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*Recipes by Kathy Block-Brown of
Portland, trained chef and Nutrition
Education Coordinator at Oregon Food
Bank.*

Recipes by
Lisa Bell (zucchini
muffins) and
Carol Kast (green
beans), Oregon Food
Bank
Education
Programs
volunteers.

Courtesy of Sarah Poe



GREEN BEANS WITH JALAPEÑO-LIME BUTTER

Four servings

Ingredients:

- 2 tablespoons softened butter
- 1 tablespoon minced fresh garlic
- Grated zest of 1 lime (or lemon)
- 1 teaspoon lime juice (or lemon juice)
- 1 teaspoon minced jalapeño pepper
- 3/4 pound green beans, trimmed and sliced diagonally into bite-sized pieces

Directions:

- For the flavored butter, stir together the butter, garlic, lime zest, lime juice, and jalapeño in a small bowl until well combined.
- Meanwhile, bring a large pot of salted water to a boil over high heat. Add the green beans and cook until just soft, three to four minutes.
- Drain the green beans in a colander and run



Courtesy of Sarah Poe

cold water over them to stop cooking.

- Return the green beans to the pot or place in a serving bowl. Toss with the flavored butter.
- Serve warm.

LEMON ZUCCHINI MUFFINS

12 muffins

Ingredients:

- 2 cups grated zucchini (about 2 medium zucchini)
- 1 cup low-fat yogurt
- 1/3 cup vegetable oil
- 1 cup sugar
- 2 large eggs
- 2 tablespoons lemon juice
- 2 cups all-purpose flour
- 2 teaspoons baking powder
- 1/2 teaspoon salt
- 1/2 teaspoon baking soda

Directions:

- Preheat the oven to 375°F. Spray muffin cups with nonstick cooking spray and dust with flour.
- Squeeze as much water out of the grated zucchini as possible. In a large bowl, whisk together the yogurt, oil, sugar, eggs, and lemon juice until well mixed.
- Stir in the zucchini.
- In another medium bowl, whisk together the flour, baking powder, salt, and baking soda until combined.
- Gently fold the dry ingredients into the wet ingredients until the batter just comes together.
- Divide the batter among the muffin cups and bake for 20 to 24 minutes, or until the tops are springy and a wooden skewer inserted in the top of a muffin comes out clean. Let cool in the pan two to three minutes. Cool completely on a wire rack.

Where to get information about storing & preserving:

University of Arizona Cooperative Extension website:

<https://extension.arizona.edu/food-preservation>

Connect with the University of Arizona Cooperative Extension's food preservation specialist:

Cindy Pearson | Program Coordinator, Senior | 928-428-2611 | cpearson@cals.arizona.edu

Storing and freezing suggestions			
Vegetables:	Keeps for:	Storage tips:	Preparation for freezing:
Basil	3-5 days	Store room temp, in dry bag or stand in water	
Beans	5-7 days	Store in cold, dry environment	Wash, remove ends. Blanch for 3 minutes, cool and drain. Package, seal and freeze.
Beets	Weeks	Store in cold, moist environment	Leave root, trim tops leaving ½ stem. Cook in boiling water until tender. Cool, peel (remove stem/root), cut into slices/cubes. Package, seal and freeze. Cook: Small beets: 25-30 minutes Medium beets: 45-50 minutes
Broccoli	3-7 days	Store in cold, moist environment	Wash and trim. Split lengthwise into 1 ½ in. across. Blanch for 3 minutes, cool and drain. Package, seal and freeze.
Cabbage	Weeks	Store in cold, moist environment, remove wilted leaves	Remove coarse outer leaves. Cut into medium shreds or think wedges. Blanch for 1 ½ minutes, cool and drain. Package, seal and freeze.
Carrots	Weeks	Store in cold, moist environment, remove leaves	Remove top, wash and peel. Cut large carrots in ¼ in cubes. Blanch for 2 minutes, cool and drain. Package, seal and freeze.
Cauliflower	3-7 days	Store in cold, moist environment	Break into 1 inch pieces and wash. Blanch for 3 minutes, cool and drain. Package, seal and freeze.
Cilantro	1 week	Store in cold, moist environment	
Corn	3-5 days	Store in cold, moist environment, keep husk on	Sort ears for size. Blanch, cool and drain. Package, seal and freeze. Small ears: 7 minutes Medium ears: 9 minutes Large ears: 11 minutes
Cucumbers	1 week	Store in cold, dry environment	
Eggplant	3-5 days	Store in cold, dry environment	Wash, peel and slice 1/3 inch thick. Blanch for 4 minutes, cool and drain. Package, seal and freeze. Add ½ cup lemon juice to water.
Garlic	Months	Store room temp, in the dark	
Kale, Lettuce, Spinach	3-7 days	Store in cold, moist environment	Wash. Blanch for 2 minutes, cool and drain. Package, seal and freeze.
Leeks	Weeks	Store in cold, dry environment	
Onions	Months	Store room temp, in the dark	
Parsley	1 week	Store in cold, moist environment	
Peas	3-5 days	Store in cold, dry environment	Remove blossoms/strings. Blanch, cool and drain. Package, seal and freeze. Small pods: 1 ½ minutes Medium pods: 2 minutes
Peppers	1 week	Store in cold, dry environment	Wash, cut in half and remove stems. Blanch for 3 minutes, cool and drain. Package, seal and freeze.
Potatoes	Months	Store room temp, in the dark	
Radishes	Weeks	Store in cold, moist environment, remove leaves	
Squash (summer), includes zucchini	5-7 days	Store in cold, dry environment	Wash and cut into ½ inch slices. Blanch for 3 minutes, cool and drain. Package, seal and freeze.
Squash (winter)	Months	Store room temp	
Tomatoes	3 days	Store room temp	Wash and boil for 30 seconds. Peel and core. Package, seal and freeze.
Turnips	Weeks	Store in cold, moist environment	Wash, peel and cut into ½ inch cubes. Blanch for 2 minutes, cool and drain. Package, seal and freeze.

Worksheet: Harvesting and storage

Define: Vocabulary words for the week

Spend time as a group defining these gardening terms:

MyPlate:

Blanching:

Reflection:

Do you have a favorite recipe? A favorite vegetable? A preserving technique that you can share with the class?



Activity: How to effectively harvest

Pick a few crops you will grow, and write down the harvesting method for each.

Crop	Harvest Method

Write down things you will do each month in the garden.

January	February
<p data-bbox="168 153 228 180"><u>Prep</u></p> <p data-bbox="168 772 245 800"><u>Plant</u></p> <p data-bbox="168 1398 269 1425"><u>Harvest</u></p>	<p data-bbox="808 153 868 180"><u>Prep</u></p> <p data-bbox="808 772 885 800"><u>Plant</u></p> <p data-bbox="808 1398 909 1425"><u>Harvest</u></p>



Write down things you will do each month in the garden.

March	April
<u>Prep</u>	<u>Prep</u>
<u>Plant</u>	<u>Plant</u>
<u>Harvest</u>	<u>Harvest</u>

Write down things you will do each month in the garden.

May	June
<u>Prep</u>	<u>Prep</u>
<u>Plant</u>	<u>Plant</u>
<u>Harvest</u>	<u>Harvest</u>



Write down things you will do each month in the garden.

September	October
<p data-bbox="167 170 228 201"><u>Prep</u></p> <p data-bbox="172 789 245 821"><u>Plant</u></p> <p data-bbox="167 1413 269 1444"><u>Harvest</u></p>	<p data-bbox="805 170 867 201"><u>Prep</u></p> <p data-bbox="812 789 885 821"><u>Plant</u></p> <p data-bbox="812 1413 914 1444"><u>Harvest</u></p>



Write down things you will do each month in the garden.

November	December
<p data-bbox="167 174 228 205"><u>Prep</u></p> <p data-bbox="167 793 245 825"><u>Plant</u></p> <p data-bbox="167 1413 269 1444"><u>Harvest</u></p>	<p data-bbox="803 174 865 205"><u>Prep</u></p> <p data-bbox="803 793 881 825"><u>Plant</u></p> <p data-bbox="803 1413 906 1444"><u>Harvest</u></p>

Activity: How to make your harvest last

Pick a few crops you will grow, and write down the storage method for each.

Crop	Storage Method



Glossary

Amendment:

1. A soil amendment is anything mixed into the soil to improve it, like compost or lime.
2. Amending is the act of mixing things into the soil.

Balanced fertilizer: A fertilizer that contains equal percentages of the three primary nutrients: nitrogen, potassium, and phosphorus.

Beneficial insect: An insect that helps in the garden by pollinating flowers or eating harmful insects.

Biennial: A plant that germinates and produces leaves and roots in its first growing season, then produces flowers and seeds before it dies in its second growing season.

Blanching:

1. Making plants or parts of plants whiter and more tender by protecting them from sunlight. Often done to cauliflower, endive, celery, and leeks.
2. Scalding vegetables in boiling water or steam for a short time to kill enzymes before freezing or drying.

Broadcast: To scatter fertilizer or seeds evenly over an area.

Bolting: When a plant produces seeds or flowers prematurely, usually due to heat or stress.

Broad-spectrum pesticide: A substance that kills most insects it comes into contact with, including beneficial insects.

Caterpillar: See Larva.

Compacted soil: Soil that has been flattened and is difficult for roots to grow in.

Compost: The product created by organic material that has been broken down by microorganisms and earthworms. Used to improve the texture and fertility of garden soil.

Cover crop: A crop that is planted in the garden during the off-season and removed or turned under before planting a crop that you will harvest. Prevents erosion and improves the soil.

Crop rotation: Changing the location of plant families from season to season to help prevent nutrient loss, disease, and pest problems.

Curing: A controlled drying process to reduce the chances of spoilage when storing crops like garlic and potatoes.

Cut-and-come-again: A method for harvesting leafy vegetables and herbs such as chard, cilantro, collard greens, kale, lettuce, parsley, and spinach. The older, outer leaves are harvested, and the younger, central leaves are left to grow for harvest later.

Days until harvest: Number of days from planting a seed or a transplant until that crop is ready for harvest.

Decompose: (With reference to organic materials like plant debris.) To break down or decay into compost with the help of organisms in the environment.

Determinate tomato: A tomato plant that is shorter and produces fruit over a four to six week period. Gardeners who want small plants or one large crop of tomatoes for preserving should look for determinate varieties. These work well supported by metal cages.

Erosion: When the soil is worn away by water or wind.

Ecosystem: Short for “ecological system.” A community of plants, animals, small organisms, and natural resources (like water and minerals) that interact in the same area or environment.

Fertility: The capacity of the soil to supply the nutrients needed for good plant growth.

Floating row cover: Lightweight fabrics placed directly over seedbeds and transplants to protect plants while they grow.

Footprint: A crop’s horizontal space requirements at maturity.

Fungicide: A type of pesticide that kills fungi. Sulfur and copper sulfate are two common fungicides.

Germination: The initial sprouting stage of a seed.

Green manure: See Cover crop.

Hardening off: The process of gradually exposing seedlings started indoors to the outdoors before transplanting.

Indeterminate tomato: tomatoes continue to grow, flower, and produce fruit throughout the season. Gardeners who want to pick a few eating tomatoes throughout the gardening season should choose indeterminate plants. Indeterminate tomato plants grow very tall and will need more support than most metal cages can provide. They also need to be pruned so that stay manageable in size.

Insecticidal soap: A special soap that kills insects but is not harmful to plants or people.

Insecticide: A type of pesticide that kills insects. There are both organic and chemical insecticides.

Integrated pest management (IPM): A holistic approach to garden maintenance that includes prevention and physical, biological, and chemical methods. With IPM, you use the least toxic methods to control pests.

Invasive weed: A plant that is competitive and persistent, and grows where you do not want it.

Larva: The immature form of an insect. Different from the adult in form. Caterpillars, grubs, and maggots are different types of larvae.

Leaching: Movement of water and nutrients down through the soil.

Length of harvest: The number of days a crop will continue to produce food that can be harvested.

Lime: A rock powder used to raise soil pH (decrease acidity).

Loamy soil: The ideal soil for vegetable gardening. It forms into a ball and holds its shape when moist, but crumbles easily when squeezed.

Micronutrients: Nutrients that plants use in small amounts.

Microorganisms: Very small living things, including beneficial bacteria and fungi, that help decompose raw organic material into compost.

Mulch: Any material placed on top of the soil to hold in soil moisture, moderate soil temperature, and control weeds. Includes wood chips, bark chips, shredded leaves, straw, cardboard, and newspaper.

N-P-K: Abbreviation for the three major plant nutrients in fertilizers. N stands for nitrogen, P for phosphorus, and K for potassium.

Nitrogen (N): A primary plant nutrient, especially important for leaf and stem growth.

Nutrient: A substance that nourishes plants.

Organic fertilizer: A natural fertilizer that has undergone little or no processing. Can be made from plants, animals, and/or minerals.

Organic material: Remains of organisms that once lived, such as leaves, plant trimmings, food scraps, dead plant roots, manure, and cover crop residue.

Overwinter: To live through the winter.

Perennial: A plant that lives more than two years and produces new foliage, flowers, and seeds each growing season.

Pesticide: Any synthetic or natural substance (or mixture of substances) used to prevent, destroy, repel or mitigate any pest.

pH: A scale of acidity or alkalinity from zero to 14. A pH of 6.0 (slightly acidic) to 7.0 (neutral) is good for vegetable crops.

Phosphorus (P): A primary plant nutrient, especially important for making flowers.

Plant family: A scientific grouping of plants that share similar characteristics or traits.

Planting window: The time period when the conditions are good for planting or seeding.

Pollination: The transfer of pollen from the male to the female part of the plant, necessary for fruits to grow.

Pore space: Empty space between soil particles that can hold air and water.

Potassium (K): A primary plant nutrient, especially important for developing strong roots and stems.

Pre-sprout: To cause seeds to germinate before planting them in the garden.

Primary nutrient: A nutrient required by plants in a large amount (nitrogen, phosphorus, and potassium).

Prune: To remove branches or leaves of plants.

Raised bed: Any garden bed raised above the ground.

Resistant: A plant having qualities that help it fight off a disease or insect.

Root ball: The mass of roots and the soil clinging to it when a plant is dug up or removed from a container.

Root-bound: When a plant's roots have completely filled its container. Typically, the roots begin to circle around the pot's outer edge.

Row cover: A sheet of synthetic material used to cover plants to protect them from cold and to keep out insect pests. Can also be used over bare soil to warm it before early planting.

Sheet mulching: A no-dig gardening method for improving the soil. It produces loamy soil good for planting.

Short-season crops: Crops that grow quickly from seed to harvest. Examples are lettuce, beets, and carrots.

Side-dress: To apply fertilizer to the soil around a growing plant.

Sow: To put seeds in the soil for the purpose of growing plants.

Succession planting:

1. Planting the same crop every two weeks so you can harvest over a long time.
2. Growing a short-season crop and replacing it with another crop after harvest in the same growing season. For example, growing and harvesting peas in spring, then planting kale in summer.

Taproot: The large, single, downward-growing root of plants such as carrots, beets, or dandelions.

Thin: To remove plants that are growing too close together so the remaining plants can continue to grow well.

Till: To turn over the soil using a shovel or a mechanical tiller to loosen the soil.

Tilth: The physical condition of the soil and how well a plant can grow in it. For example, loamy soils have good tilth.

Transplant: To move a plant from one place to another. Examples are taking plants out of pots to plant in the garden or digging up a plant from the garden and replanting it in another area.

True leaves: All the leaves that appear after the seed leaves (cotyledons).

Wilting: The drooping of leaves from lack of water.

Windbreak: A physical barrier that protects crops from the wind, such as a line of tall bushes, low trees or a fence.

Appendix

UA Cooperative Extension Master Gardener contacts

Apache County

Mike Hauser
928-337-2267
mhauser@cals.arizona.edu

Cochise County

520-458-8278 x2141
cochisemg@cals.arizona.edu
cals.arizona.edu/cochise/mg/ask-master-gardener

Coconino County

Hattie Braun
928-773-6118
hbraun@cals.arizona.edu

Gila County

Chris Jones
928-402-8586
ckjones@cals.arizona.edu

Graham County

Bill Brandau
928-428-2611
wbrandau@cals.arizona.edu

Greenlee County

Bill Cook
928- 359-2261 (Office)
928-254-8734 (Cell)
wrc@email.arizona.edu

La Paz County

Don Alamban
928-669-9843
apalamban@email.arizona.edu

Maricopa County

602-827-8201
MaricopaCountyPlantHotline@gmail.com

Mohave County

928-753-3788
mohavemg@gmail.com

Navajo County

928-337-2267

Pima County

520-626-5161
pcmgplantclinic@gmail.com

Pinal County

520-374-6263
macmastergardener@gmail.com

Santa Cruz County

Cassie Burruel
520-648-0808
cassieb@cals.arizona.edu

Yavapai County

Prescott Help Desk
928-445-6590 x222
prescottmg@gmail.com
Camp Verde Help Desk
928-554-8992
verdevalleymg@gmail.com

Yuma County

Janine Lane
928-726-3904
janinel@cals.arizona.edu

Arizona Master Gardeners are university-trained volunteers who serve as community educators. They work with the University of Arizona providing research based information on environmentally responsible gardening and landscaping to the public. After completing a semester long course, concentrating on gardening and the environment, Master Gardeners Associates volunteer to serve their communities.

For more information, hotline hours, and office locations, visit:

extension.arizona.edu/ua-cooperative-extension-master-gardener-county-contacts

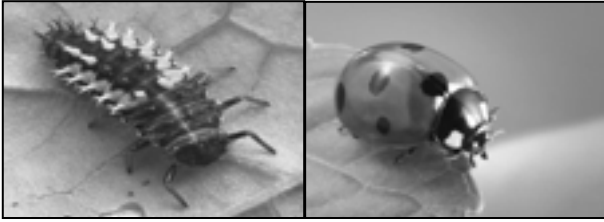
Contact Information

Ask your facilitator and fellow participants if they would like to keep in touch after the course is over and record their information here:

Good Bugs

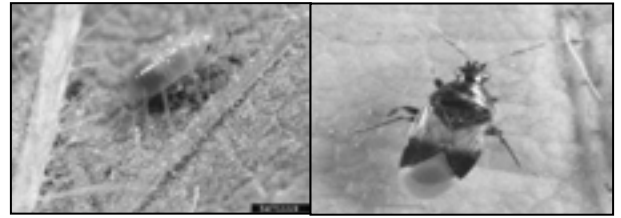
How to attract them

Ladybugs



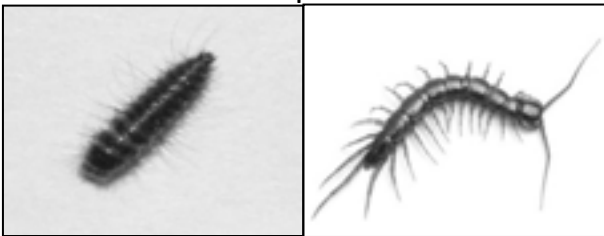
Plant flowers that produce pollen and nectar. Spray a combination of whey and yeast on plants.

Minute Pirate Bugs



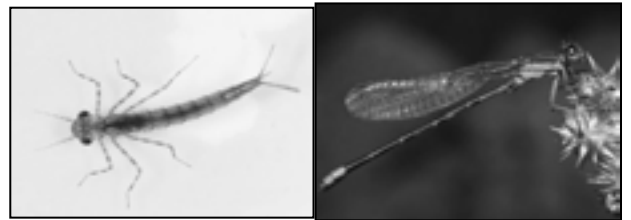
Plant flowers that produce pollen and nectar.

Centipedes



Keep a compost pile. They like organic matter. Practice low-till gardening.

Damselflies



Protect wetlands in your area or dig your own pond.

Green Lacewings



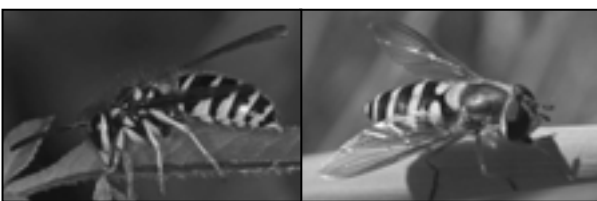
Plant flowers that produce pollen and nectar.

Honey Bees/Mason Bees



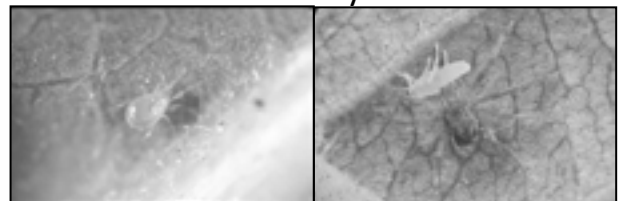
Grow flowering plants to promote pollination. Mason bees are native to the Pacific Northwest, and look similar to a house fly.

Yellow Jackets/Hover Flies



Leave nests alone unless they are interfering with the lives of people. Plant flowers to attract these pollinators.

Predatory Mites



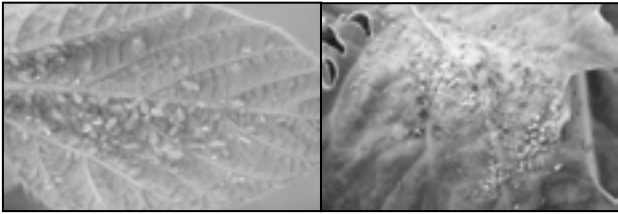
You probably already have some; don't discourage them with pesticides.

Photos above show larvae stage on the left and adult stage on the right.

Bad Bugs

How to get rid of them

Aphids



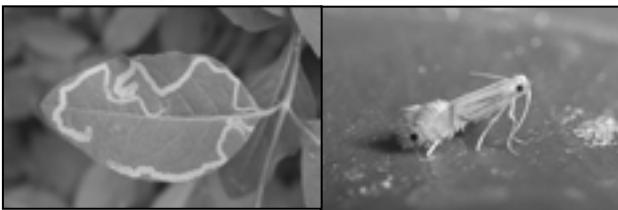
Grow healthy, strong plants. Encourage ladybugs and green lacewings. Spray with insecticidal soap.

Cab



Remove plant debris in the fall. Use row covers on young plants. Pick off by hand.

Leafminers



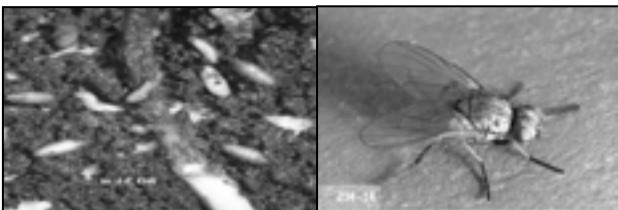
Use row cover on young beets, chard, and spinach. Cut off damaged leaves.

Cucumber Beetles



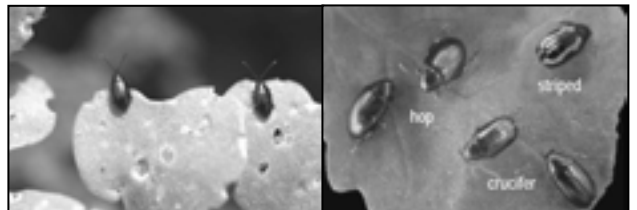
Use row cover on young squashes. Grow plants vertically. Hand pick and squish.

Cabbage Maggots



Remove plant debris in the fall. Use row cover on young cabbage family crops.

Flea Beetles



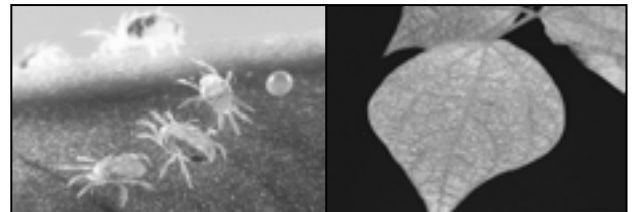
Plant healthy transplants. Use row cover on young plants.

Slugs



Use trap boards, beer traps, trap crops, and bait.

Spider Mites



Spray with a forceful jet of water or insecticidal soap. Predators include ladybugs.

Photos above show larvae stage on the left and adult stage on the right.

Resources for gardening on a budget

Ideas for creative, low-cost sourcing of garden materials

CONTAINERS/MISCELLANEOUS SUPPLIES

- **Home:** Repurpose plastic containers you might otherwise throw away, like yogurt containers, milk jugs, and tin cans.
- **Nurseries:** In the springtime, home growers and nurseries have an abundance of cheap plastic pots that shrubs and trees come in.
- **Restaurants/grocery stores:** Five-gallon buckets are plentiful at restaurants and grocery stores: ask around. This is a good-sized container for the larger veggies like tomatoes and broccoli.
- **Thrift stores:** Look for used containers, gardening supplies, and creative containers like bowls, kitchen supplies, and plastic totes.
- **Online:** Visit www.freecycle.org or the “free” listings on www.craigslist.org.
- **Stores:** Big box stores offer deals, especially late in the garden season. Look for sales in the garden section and check the clearance racks.

GARDEN SPACE

- **Community garden space:** City governments, churches, schools, and other programs offer garden space. Some community gardens have long waiting lists, but others are looking for new gardeners. Call the community garden operator in your area—and be sure to ask about scholarships!

MULCH

- **Fallen leaves:** Instead of raking your leaves to the curb in the fall, use them to mulch your paths and protect your garden beds in winter.
- **Wood chips from landscapers and tree companies:** Local tree companies, landscape companies, and municipal governments need to pay to get rid of the wood chips they grind up when they cut down trees. Look up companies in the Yellow Pages or online and ask if they will dump the wood chips in your garden instead of hauling them to the landfill.

ARIZONA RESOURCES AND GARDEN EDUCATION

- **Master Gardener™ Demonstration Gardens:** A great place to learn and get ideas. See page 146 to find the Master Gardener program in your area.
- **Native Seeds/SEARCH:** Operates a seed library for gardeners in Tucson, coordinates bulk seeds exchanges for farmers, provides seed grants to community gardens, and free seeds to Native American individuals. <https://www.nativeseeds.org/>
- **Community Food Bank of Southern Arizona:** Offers free gardening workshops as well as garden installation and materials to low-income individuals. See the class schedule at www.communityfoodbank.org/Our-Work/Programs/Garden-Workshops/Workshops and learn about garden installation and free or low-cost materials at www.communityfoodbank.org/Our-Work/Programs/Garden-Installation/Garden-Materials.
- **Community Gardens in Arizona:** Check out Good Food Finder AZ at goodfoodfinderaz.com/find-good-food/business-category/community-garden for a list of community gardens in Arizona.
- **Summer Winds Nursery (Phoenix metro area):** Free gardening classes for the public. For a schedule, go to summerwindsnursery.com/az/events.
- **Arizona Municipal Water Users Association/AMWUA (Phoenix metro area):** Free classes for the public on drip irrigation, rainwater harvesting, basic gardening, and landscaping. Find the calendar at www.amwua.org/what-you-can-do/workshops-and-events.
- **Phoenix Community Tool Bank:** A nonprofit tool lending program that provides organizations access to an inventory of tools for use in volunteer and community benefit projects. Learn more at www.phoenixtoolbank.org.

SEEDS & STARTS

- **SNAP program:** Use food stamp (SNAP) benefits to buy plant seeds and starts. For information, visit www.snapgardens.org.
- **Stores:** Look for seed sales at big box stores every winter (usually around February). Ask about coupons.
- **Online seed companies:** Many offer online specials or sales.
- **Urban Farmer:** Look for “cheap seeds” on www.ufseeds.com.
- **Nurseries:** Look for plant starts on sale at local nurseries in summer.
- **Your local food bank:** Ask about free seeds or starts.

Resources for gardening on a budget

Ideas for creative, low-cost sourcing of garden materials

SOIL & COMPOST

- **Big-box stores and nurseries:** Check the clearance rack for torn bags at nurseries and big box stores. Also ask about coupons.
- **Bulk soil suppliers:** Buying soil or compost in bulk is less expensive than buying it in bags. You can usually pick it up or arrange for delivery. Check with your local waste disposal company or a bulk soil supplier to learn about bulk soil delivery.
- **Craigslist:** Search the “free” listings at www.craigslist.org for compost, fill dirt, and other soil resources. (You may also find free plants.)
- **Google:** Type in “free dirt,” “free soil,” “dirt fill exchange,” or “free compost” and the name of your town. Follow the links to see what you can find!
- **Local landscaping companies:** Companies are sometimes willing to deliver extra soil left over from projects. Search for companies online or in the Yellow Pages. Be sure to ask where the soil came from, and whether it might be contaminated with lead or anything else harmful.
- **Tons of Dirt and Free Dirt:** www.tonsofdirt.com and www.freedirt.com are websites that help you find free or low-cost fill dirt, manure, mulch, and rock.

TOOLS

- **Neighborhood tool share programs:** Tool share programs allow neighbors to save space and money by lending each other tools for the garden or home. Some neighborhood associations, libraries, and community centers in your area may have existing tool share programs. If there is no tool share program in your area, you can start your own: search “start a tool share program” online for tips.
- **Garage sales, thrift stores, and Craigslist** often have inexpensive used tools.

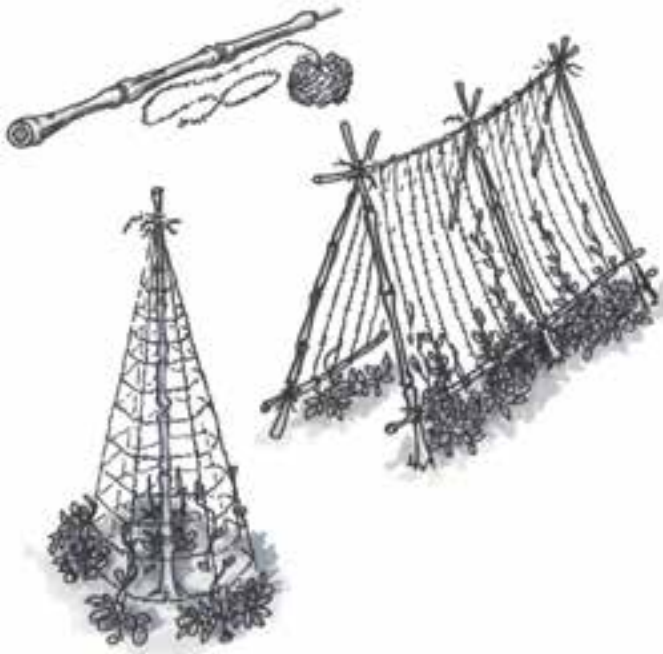
TRELLIS MATERIALS

- **See “Trellises and vertical gardening”** on pages 152-153 for examples of plant supports you can make from household items.
- **Use dry bamboo or old tree branches** from the backyard to build your own.
- **Grow vining plants along an existing fence** to avoid having to build a trellis.
- **Use old twine or grocery twist-ties** to tie up vines. Use old cloth or nylons to support heavy items like melons.
- **Re-use old pieces of PVC, wood, or chicken wire** to build your own trellises.
- **Check out the DIY network** for trellises that you can build yourself: <http://www.diynetwork.com/how-to/topics/trellises>

Trellises and vertical gardening

Do-it-yourself trellises using common household items

Basic teepee and A-frame trellises built with bamboo and twine



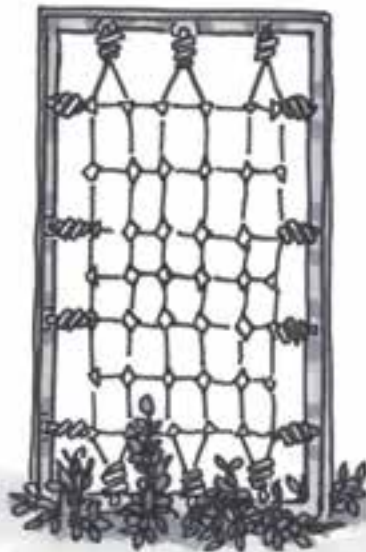
Old bicycle wheels and twine supported by rebar or wood 2x4s



Chicken wire or hardware cloth supported by rebar



Old cribs, bed springs, and headboards re-purposed as trellises



Trellises and vertical gardening

Do-it-yourself trellises using common household items

Supporting tomatoes

Rebar and chicken wire or hardware cloth

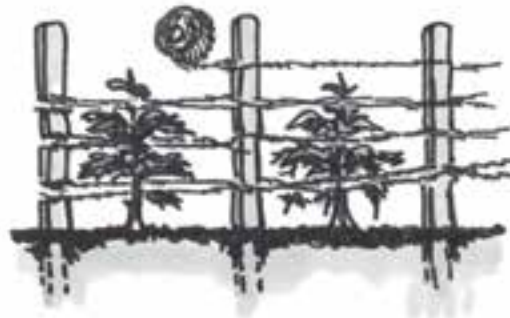


Cage made of bamboo or sticks held together with twine



Tomato tied to a single stake

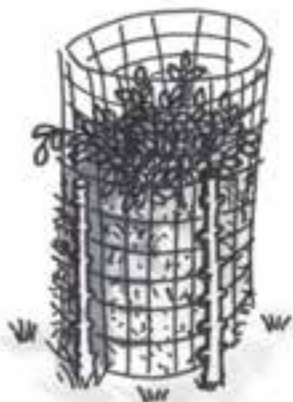
Chicken wire or hardware cloth in a circle around rebar



“Stake and twine”:
Continue adding levels of twine as tomatoes grow

Growing potatoes vertically

Leave bottom open and plant potatoes at soil level. As leaves grow, continue to cover with straw or soil. Potatoes will form as stem grow upward. Be careful to keep potatoes tubers out of direct sunlight as they grow.



“Potato tower” made of rebar and chicken wire

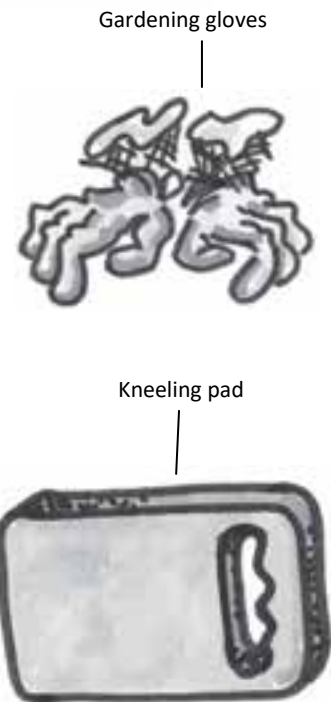
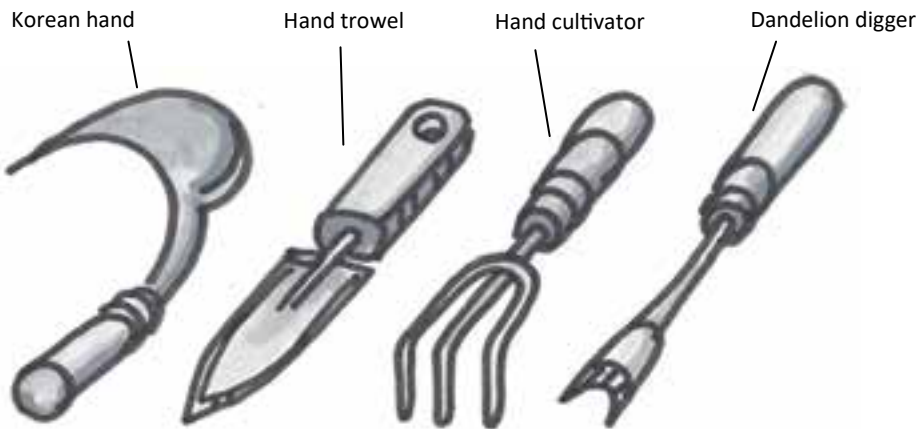
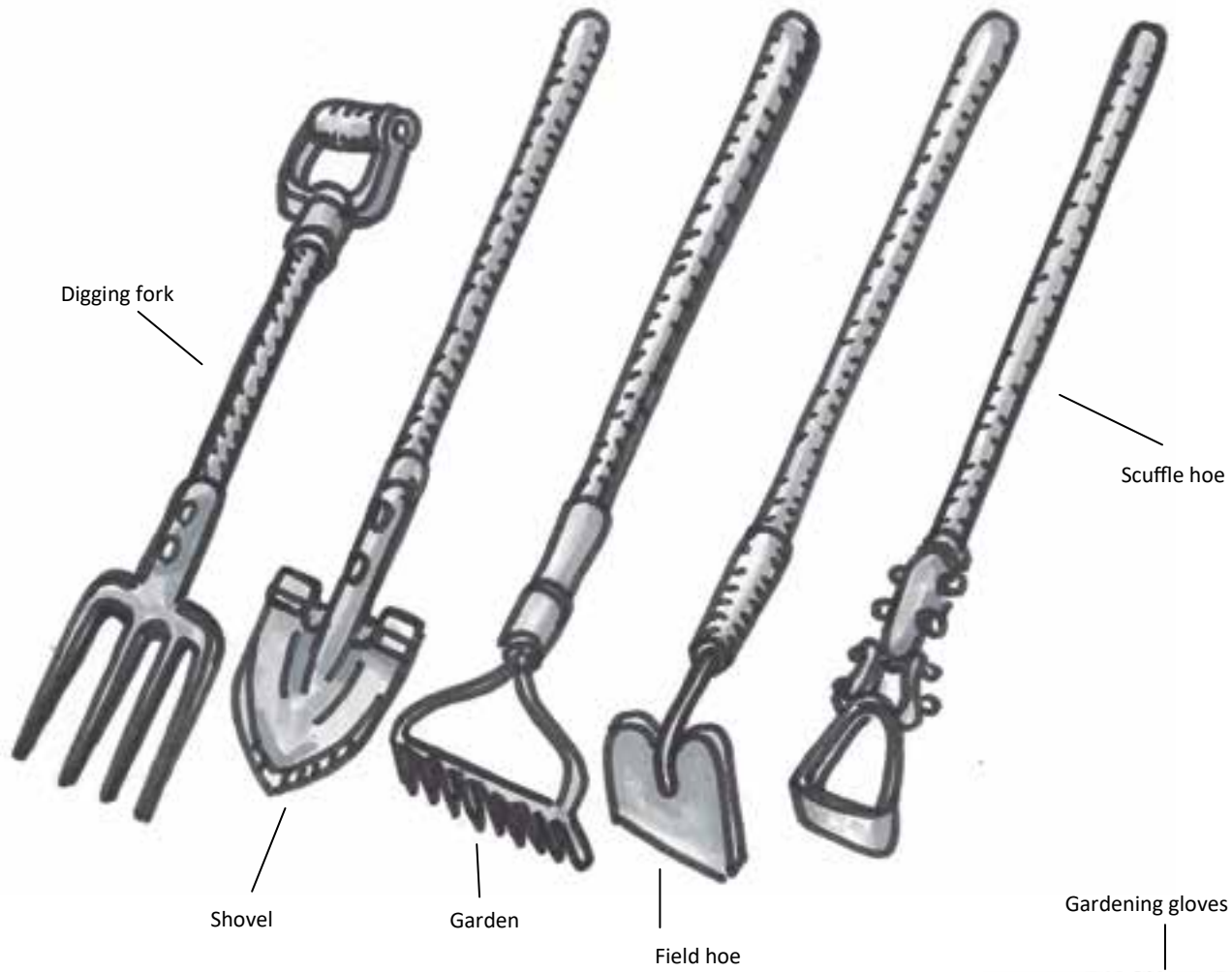


Potatoes grown in a burlap sack



Potatoes grown in a large cardboard box with open bottom

Common garden tools



Additional gardening information

Composting

Small Scale Composting in the Low Desert (AZ1632)

Available from University of Arizona Cooperative Extension:

<https://extension.arizona.edu/pubs/small-scale-composting-low-desert-arizona>

Composting with Worms (EM 9034)

Available from Oregon State University Extension Service:

<http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/23949/em9034.pdf>

Container gardening (look for the books at your local library)

Container Gardening in the Desert Southwest (AZ1713)

Available from University of Arizona Cooperative Extension:

<https://extension.arizona.edu/pubs/container-gardening-southwest-desert>

The Bountiful Container by McGee and Stuckey.

Great resource for edible container plants, extended info about each plant you can grow.

The Edible Container Garden by Michael Guerra.

An excellent resource, all geared toward growing vegetables as opposed to decorative floral displays. Good resources in the back for what to plant, and what size containers to use.

The Apartment Farmer by Duane Newcomb.

This one might be difficult to find. Includes good charts of how many plants will fit in a container and what plants give the most yield.

Cover crops

Summer Cover Crop Use in Arizona Vegetable Production Systems (AZ1519)

Available from University of Arizona Cooperative Extension:

<https://extension.arizona.edu/pubs/summer-cover-crop-use-arizona-vegetable-production-systems>

Cover Crops for Home Gardens (FS 304)

Available from Oregon State University Extension Service:

<http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/17462/fs304-e.pdf>

Food preservation and storage

Understanding the Canning of Food (FCS-702)

Available from University of Arizona Cooperative Extension:

<https://extension.arizona.edu/sites/extension.arizona.edu/files/attachment/understanding-canning-mca.pdf>

Canning Tomatoes and Tomato Products (PNW 300)

Available from Oregon State University Extension Service:

<http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/13728/pnw300.pdf?sequence=1>

Freezing Fruits and Vegetables (PNW 214)

Available from Oregon State University Extension Service:

<http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/20668/pnw214.pdf>

Options for Storing Potatoes at Home (CIS 1153)

Available from University of Idaho Extension:

<http://www.cals.uidaho.edu/edcomm/pdf/CIS/CIS1153.pdf>

Additional gardening information

Food preservation and storage (continued)

Pickling Vegetables (PNW 355)

Available from Oregon State University Extension Service:

<http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/20674/pnw355.pdf>

Storing Pumpkin and Winter Squash at Home (EC 1632)

Available from Oregon State University Extension Service:

<http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/12889/ec1632.pdf?sequence=1>

Fertilizing

Fertilizing Home Gardens in Arizona (AZ1020)

Available from University of Arizona Cooperative Extension:

<https://extension.arizona.edu/pubs/fertilizing-home-gardens-arizona>

Manure in the Home Garden (AZ1590)

Available from University of Arizona Cooperative Extension:

<https://extension.arizona.edu/pubs/manure-home-garden>

Fruits

Deciduous Fruit and Nuts for the Low Desert (AZ1269)

Available from University of Arizona Cooperative Extension:

<https://extension.arizona.edu/pubs/deciduous-fruit-nuts-low-desert>

Growing Grapes in the Home Garden (AZ1657)

Available from University of Arizona Cooperative Extension:

<https://extension.arizona.edu/pubs/growing-grapes-home-garden>

Growing Figs in the Low Desert (AZ1636)

Available from University of Arizona Cooperative Extension:

<https://extension.arizona.edu/pubs/growing-figs-low-desert>

Growing Strawberries in Home Gardens (AZ1667)

Available from University of Arizona Cooperative Extension:

<https://extension.arizona.edu/pubs/growing-strawberries-home-gardens>

Low Desert Citrus Varieties (AZ1001)

Available from University of Arizona Cooperative Extension:

<https://extension.arizona.edu/pubs/low-desert-citrus-varieties>

Herbs

Season For Health: A Guide For Using Herbs and Spices For Your Home Cooking (AZ1686)

Available from University of Arizona Cooperative Extension:

<https://extension.arizona.edu/sites/extension.arizona.edu/files/pubs/az1686-2015.pdf>

Herbs: Preserving and Using

Available from Colorado State Cooperative Extension:

<http://extension.colostate.edu/topic-areas/nutrition-food-safety-health/herbs-preserving-and-using-9-335/>

Harvesting and Drying Herbs

Available from Illinois Cooperative Extension:

http://web.extension.illinois.edu/hort_factsheets/dryingherbs.cfm

Additional gardening information

Herbs (continued)

How to Grow Flavor-Packed Herbs

Available from Oregon State University Extension Service:

<http://extension.oregonstate.edu/gardening/how-grow-flavor-packed-herbs>

Pest management

Integrated Pest Management for the Home Garden (AZ1521)

Available from University of Arizona Cooperative Extension:

<https://extension.arizona.edu/pubs/integrated-pest-management-home-garden>

Alternative Pesticide Options for the Home Gardener (AZ1765)

Available from University of Arizona Cooperative Extension:

<https://extension.arizona.edu/pubs/alternative-pesticide-options-home-gardener>

Bagrada Bug: A New Pest for Arizona Gardeners (AZ1588)

Available from University of Arizona Cooperative Extension:

<https://extension.arizona.edu/pubs/bagrada-bug-new-pest-arizona-gardeners>

Aphids (AZ1635)

Available from University of Arizona Cooperative Extension:

<https://extension.arizona.edu/pubs/aphids>

Planting and harvest calendars

Vegetable Planting Calendar for Maricopa County (AZ1005)

Available from University of Arizona Cooperative Extension:

<https://extension.arizona.edu/pubs/vegetable-planting-calendar-maricopa-county>

Planting and Harvesting Calendar for Gardeners in Yuma County (AZ1615)

Available from University of Arizona Cooperative Extension:

<https://extension.arizona.edu/pubs/planting-harvesting-calendar-gardeners-yuma-county>

Saving seeds

Collecting and Storing Seeds from Your Garden (FS 220)

Available from Oregon State University Extension Service:

http://extension.oregonstate.edu/lane/sites/default/files/collecting_and_storing_seeds.pdf

Soil

A Guide to Collecting Soil Samples for Farms and Gardens (EC 628-E)

Available from Oregon State University Extension Service:

<http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/42799/ec628.pdf>

Soil Testing Laboratories Serving Arizona

Call your local Cooperative Extension office for a current list (see p. 146).

Laboratories Conducting Soil, Plant, Feed, or Water Testing (AZ111)

Available from University of Arizona Cooperative Extension:

<https://extension.arizona.edu/pubs/laboratories-conducting-soil-plant-feed-or-water-testing>

Additional gardening information

Soil (continued)

Managing Caliche in the Home Yard (AZ1281)

Available from University of Arizona Cooperative Extension:
<https://extension.arizona.edu/pubs/managing-caliche-home-yard>

Using Gypsum and Other Calcium Amendments in Southwestern Soils (AZ1413)

Available from University of Arizona Cooperative Extension:
<https://extension.arizona.edu/pubs/using-gypsum-other-calcium-amendments-southwestern-soils>

Evaluating and Reducing Lead Hazard in Gardens and Landscapes (EC 1616-E)

Available from Oregon State University Extension Service:
<http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/19844/ec1616-e.pdf>

Vegetables

Ten Steps to a Successful Vegetable Garden (AZ1435)

Available from University of Arizona Cooperative Extension:
<https://extension.arizona.edu/pubs/ten-steps-successful-vegetable-garden>

Specialty Gardens for Arizona (AZ1271)

Available from University of Arizona Cooperative Extension:
<https://extension.arizona.edu/pubs/specialty-gardens-arizona>

Propagating Plants from Seed (PNW 0170)

Available from Oregon State University Extension Service:
<http://cru.cahe.wsu.edu/CEPublications/pnw0170/pnw0170.pdf>

Tomato Problem Solver

Available from Texas A&M Extension Service:
<http://aggie-horticulture.tamu.edu/vegetable/tomato-problem-solver/>

Growing Tomatoes Above 6000 foot Elevations in Arizona (AZ1282)

Available from University of Arizona Cooperative Extension:
<https://extension.arizona.edu/pubs/growing-tomatoes-above-6000-foot-elevations-arizona>

Season extension

Lengthen Growing Season by Building a Coldframe or Cloche

Available from Oregon State University Extension Service: <http://extension.oregonstate.edu/gardening/lengthen-growing-season-building-coldframe-or-cloche>

To search for more information from the
University of Arizona Cooperative Extension publications, visit:
<https://extension.arizona.edu/pubs>

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AZ HEALTH ZONE

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