Oregon State University Extension Service

Growing Your Own

A Practical Guide to Gardening in Oregon

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CONTENTS

Getting started
Building raised beds
Container gardening
Improving garden soil
Tilling advice
Cover crops
Recycling with compost
Where is your garden?
Dates for planting
Directions for best yields
Watering gardens
Fertilizing crops
Disease-free garden
Managing weeds
Protecting from slugs
Don't let the bugs beat you
Alternatives to chemicals
In cool-season areas
Fall and winter gardening

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Getting started

Choosing a garden site is as important as selecting the vegetables to grow in it. All vegetables need sunlight and fertile, well-drained soil, and they will contract fewer diseases if the site has good ventilation. Place the garden so it will be convenient to plant, care for, and harvest. Protect the garden site from invading insects or animals.

Few of us are lucky enough to have the ideal garden site. You might find that the perfect place for your sweet corn is along the back fence, where it becomes a backdrop for dahlias. Or the sunniest site for chard or beets may be along the sidewalk entry. Innovative gardeners will find spaces that fit their plants' needs.

First, select for sunlight. An open, south-facing, gradual slope is best, but at least look for a shade-free place. All vegetables need a minimum of six hours of sunshine. Less will cause the plants to be weak and spindly no matter how much care you give them.

Next, get to know your soil. Good gardening soil warms early in the spring, is loamy enough to provide oxygen to the roots of growing plants, holds water for several days, and is fertile enough to grow a good crop of weeds. Early warming is related to drainage. Poorly drained soil remains wet and cold late into the spring, making it difficult to grow early-season vegetables. If your soil is heavy and remains wet long after rain has stopped, consider using raised beds or installing drainage. Raised beds will not only be better drained, they also will warm earlier.

An indication of the general fertility of your garden soil is its natural vegetation. The healthier the weeds or grass growing on the site, the better the soil will be for vegetables.

Try to locate your garden away from trees and large shrubs. The roots from nearby woody plants will take nutrients and water away from your vegetables.

Avoid placing the garden where there is little air movement. A natural breeze helps prevent foliage diseases. Stagnant, humid, warm air creates ideal conditions for problems such as tomato blight, mildew on squash, or mold on green beans.

Place your garden where it will be easy to care for. If you have to drag a 50-foot hose to water, it becomes a chore. Because Oregon's vegetable-growing season coincides with the dry season, you may need to water frequently. If irrigation is time-consuming, your enthusiasm about gardening can fade quickly.

The most useful garden site is near the kitchen so the cook can move fresh vegetables quickly to the dinner table. Nothing beats the flavor of corn picked minutes before dinner.

For more information

Vegetable Gardening in Oregon (EC 871) (https://catalog.extension.oregonstate.edu/ec871)

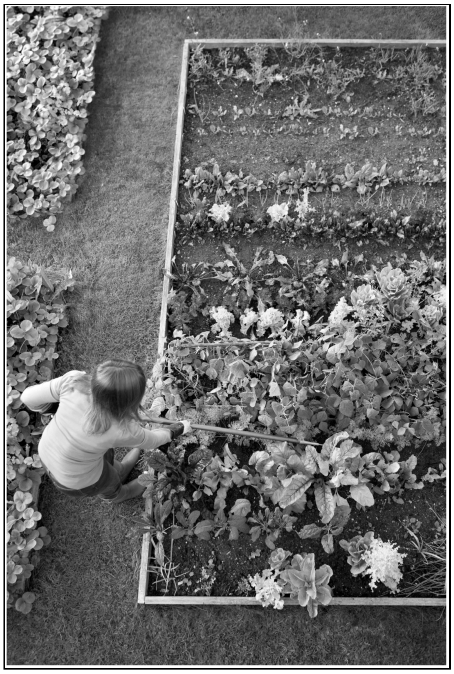
Building raised beds

Gardening is a challenge if your soil dries slowly in the spring or is hard totill. In the summer, you may face crusts, clods, and poor water absorption.

Fortunately, you can improve your soil by adding organic matter and creating raised beds. This lets you plant earlier in the spring because of improved drainage and faster soil warming. When fall rains begin, better drainage means healthier plants that yield longer.

You'll need a lot of organic matter, so choose a source that is readily available and inexpensive. Sawdust, ground bark, leaves, manure, or chipped pruning materials are good options. Other satisfactory materials, although more expensive, include planting mixes. If the materials are composted, so much the better.

The following method is easy and permits good garden production the first year:



Raised beds improve soil drainage and let you plant earlier in the spring. You'll also be able to grow more vegetables in less space.

Step 1

If the soil is compacted, till it first if possible, even if only to a depth of 2 or 3 inches. Do not rush this step; wait until the soil is dry enough to crumble and will not turn up in large chunks.

Step 2

Spread a 2- to 3-inch layer of organic material over the soil. You will need two-thirds of a cubic yard per 100 square feet (6 to 7 cubic yards per 1,000 square feet).

Step 3

Unless you used a composted product, manure, or fortified planting mix, add nitrogen fertilizer. Nitrogen is needed for breakdown of organic matter (e.g., sawdust, leaves, or grass clippings) and for plant growth. Broadcast one of the following evenly over the organic material:

- Ammonium sulfate: 20 pounds per 1,000 sq ft*
- Ammonium nitrate: 12 pounds per 1,000 sq ft*
- Urea: 9 pounds per 1,000 sq ft*
- Poultry droppings: 400–700 pounds per 1,000 sq ft*

*Assuming you added 2 inches of organic material.

Step 4

Till to about 6 inches. You can use a spade, but a tiller makes the job easier and the results more uniform.

Step 5

Create 48-inch-wide beds by shoveling a walkway between them. Make the walkway 14 to 16 inches wide and 6 inches deep. Add the excavated soil to the top of the beds. You now have a soil–organic matter mixture about 8 inches deep.

Step 6

Rake the beds level. The slope of the soil 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 or bark to the paths to reduce mud.

Retaining walls are unnecessary unless you want to create special shapes or use narrower walkways. They hold the soil in place but also create hiding places for slugs. Boards, blocks, or railroad ties make good retaining walls.

When you plant in your raised beds, you'll need to apply additional fertilizer because the nitrogen you added in step 3 took care of only the 2-inch organic layer.

Proper irrigation is important. The soil–organic matter mixture in raised beds dries faster than clay soil. On the other hand, it is loose so it absorbs water faster. Soaker or sprinkler hoses work well; with low pressure, they water only the raised bed. Keep walkways as dry as possible to control weeds. Place stakes at the corners of the beds to prevent hoses from damaging plants.

Organic matter decomposes and disappears, so add more each year. In the summer, use compost to provide nutrients. In the fall, cover the beds with 2 inches of leaves or other organic material.

After you've built your beds, tilling should be unnecessary. Conditions might not yet be ideal the following spring, but light spading or forking will create a suitable seedbed. As you continue to add organic material, the soil will improve each year.

For more information

- *How to Build Your Own Raised Bed Cloche* (EC 1627) (https://catalog.extension.oregonstate.edu/ec1627)
- *Raised Bed Gardening* (FS 270) (https://catalog.extension.oregonstate.edu/fs270)

Container gardening

If you lack space for a garden, consider raising vegetables in containers. You can grow any vegetable in a container with enough preparation and care.

Start by finding a container large enough to support fully grown plants and with adequate soil-holding capacity to accommodate the plants' root systems. The container must have drainage holes.

You can grow vegetables in almost anything, including barrels, flower pots, milk jugs, bleach bottles, window boxes, baskets, tile pipes, and cinder blocks. For most plants, containers should be at least 6 inches deep.

A fairly lightweight potting soil is the best growing medium for container plants. Garden soil is too heavy for container growing. Most commercially sold potting mixes are too lightweight for garden plants because they don't offer adequate support for plant roots.

If you buy a potting mix, add soil or compost to provide bulk and weight. Or mix your own with equal parts peat moss or well-rotted compost; loamy garden soil; and clean, coarse builder's sand. Add a slow-acting, balanced fertilizer (slow-release synthetic or organic fertilizers work best) according to container size. Add lime to bring the mixture's pH to around 6.5.

The ideal vegetables for containers are those that take little space—such as carrots, radishes, lettuce, and

parsley—or those that yield produce over a long period of time—such as tomatoes, peppers, herbs, and eggplants.

When planting, first carefully clean out the container, then fill it to within ½ inch of the top with slightly dampened soil mix. Sow the seeds or set transplants. Gently water the soil with warm water, taking care not to wash out the seeds. Label each container with the name and variety of plant and planting date. When seedlings have two or three leaves, thin them for proper spacing between plants.

Water container plants whenever the soil feels dry. Apply water until it begins to run out of the container's drain holes.

Container plants need more fertilizer than plants in regular gardens because the frequent watering constantly leaches fertilizer minerals out of the soil. For best results, start a feeding program for container plants 2 months after planting. Use a water-soluble fertilizer at its recommended rate of application every 2 to 3 weeks.

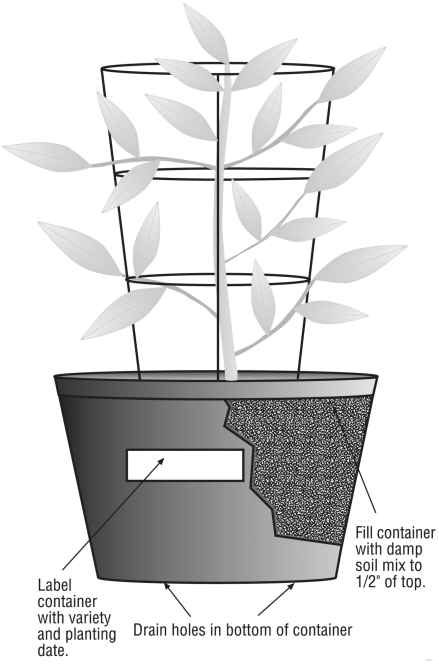
An occasional application of fish emulsion or compost will add trace elements to container soil. Do not add more than the recommended rate of any fertilizer. Too much can harm plant roots.

Watch for and control plant insect pests. Place containers where they will receive maximum sunlight and good ventilation. During periods of high temperatures and bright sunshine, move the containers into shade during the hottest part of the day. Shelter plants from severe rain, hail, and wind storms.

The versatility and mobility of a container garden allow you to grow a wider variety of vegetable plants over a longer time span than the usual spring/summer/fall growing period. By starting your garden indoors in the spring, moving it outdoors for the summer and then back indoors in the fall for frost protection, you can use nearly every growing day.



The ideal vegetables for containers are those that take little space — such as carrots, radishes and lettuce — or those that yield produce over a long period of time, such as tomatoes, peppers and herbs.



Improving garden soil

If your garden soil is poor, consider giving it some help. Adding organic materials to sandy soils improves their nutrient- and water-holding capacity. Adding organic materials to clay soil improves drainage and aeration, and helps the soil dry and warm up more quickly in the spring.

Good organic amendments (additions) for garden soils include wood byproducts such as sawdust and bark mulch, peat moss, cured manure, grass or wheat straw, and compost. Inorganic amendments include pumice, perlite, vermiculite, and sand.

Any composted material that has been reduced to humus is a good soil amendment. For example, cured manure is an excellent soil amendment if it has been properly composted to kill weed seeds.

Unfortunately, many manures contain a lot of uncomposted bedding materials such as sawdust, wood chips, or straw. These organic materials are high in carbon content and low in nitrogen and will inhibit plant growth unless you add extra nitrogen.

Microorganisms in carbon-rich amendments take free nitrate nitrogen out of the soil to build their own tissues. Therefore, less nitrogen is available for plants until the excess carbon-rich organic matter breaks down.

The breakdown of organic matter high in carbon content would take years with the nitrogen naturally present in cattle or horse manure. To speed up the process, mix additional nitrogen into your garden—at least 6 pounds of ammonium nitrate or 10 pounds of ammonium sulfate per inch of organic matter applied over a 1,000 square foot area.

Peat moss, with its high humus content, is the ideal amendment for raised beds or small gardens because it is nearly weed-free. However, it is expensive to use in large gardens.

Inorganic amendments such as perlite, sand, and vermiculite don't contain humus or contribute to its production. Inorganics function primarily as wedges that separate soil particles, increasing soil porosity and aeration.

Sand is low in both water- and nutrient-holding capacity and causes finer silt or clay soils to compact. Mix sand with an organic amendment such as peat moss or sawdust to improve the sand's amending properties.

Thoroughly till any amendment into garden soil to prevent layering. Tilling organic amendments into gardens in the fall gives soil microorganisms an early start on converting organic matter to humus. Another tilling in spring will thoroughly mix in the amendments.

Amending garden soil

To make a significant change in your garden soil, an amendment must equal at least one-third of the volume of the soil you are amending. For example, to amend a garden to a depth of 1 foot, you need to add one-third of a foot (4 inches) of material. Here is how to figure out the volume of material needed (using a 20-foot x 50-foot garden as an example):

1. Multiply width x length to get area:
   20 feet x 50 feet = 1,000 square feet
2. Multiply area x 0.333 (one-third of a foot) to get cubic feet:

1,000 square feet x 0.333 = 333 cubic feet
Divide cubic feet by 27 to get cubic yards:

3. 333 cubic feet ÷ 27 = 12.33 (121/3) cubic yards

For more information

- *Gardening with Composts, Mulches, and Row Covers* (EC 1247) (https://catalog.extension.oregonstate.edu/ec1247)
- *Improving Garden Soils with Organic Matter* (EC 1561) (https://catalog.extension.oregonstate.edu/ec1561)
- *Laboratories Serving Oregon* (EM 8677) (https://catalog.extension.oregonstate.edu/em8677)
- *Soil Sampling for Home Gardens and Small Acreages* (EC 628) (https://catalog.extension.oregonstate.edu/ec628)



Good organic amendments for garden soils include wood byproducts such as sawdust and bark mulch, peat moss, cured manure, grass or wheat straw, and compost.

Tilling advice

Tilling the garden performs a number of necessary functions. It mixes organic matter and fertilizer into garden soil and temporarily loosens the soil and helps control weeds that compete with crops for moisture and nutrients.

Frequent tilling, however, may do more harm than good. Too much tilling tends to destroy the structural qualities of soil and eventually may leave you with soil that is better suited to making bricks than garden produce.

Till garden soil only when it will accomplish some useful purpose, such as turning under organic matter, controlling weeds, breaking crusted soil for water penetration, or loosening a small amount of soil for planting seeds.



To preserve soil structure, till with a purpose and only when soil moisture is neither too wet or too dry.

Never till soil when it is wet. Doing so will leave you with cloddy, compacted soil. To test soil moisture, take a handful of soil and squeeze it. If it stays in a mud ball, it's too wet to till. If it is powdery and clumped, it is too dry. If it crumbles freely, it is just right.

Cover crops improve soil

One way to amend garden soils that requires minimum effort is to plant a green manure cover crop. An excellent winter cover crop for western Oregon is crimson clover. Plant ½ pound of seed per 1,000 square feet. Plant no later than October 1 and water the bed so the crop is established before cold weather sets in. When tilled under in late April, crimson clover will produce 3 to 4 pounds of nitrogen per 1,000 square feet.

Fava beans or Austrian winter peas make an excellent spring cover crop for tilling under in the summer. Plant in early April at a rate of ½ pound of seed per 1,000 square feet. Till the crop when it begins to bloom.

Till green manure crops at least 2 weeks before planting your garden. A final pass with the tiller just before you plant usually is sufficient to prepare garden soil for seeding vegetables.

Never till wet soil or you will cause heavy clodding in the soil and a compacted "tiller pan" beneath the tilled layer. A good seedbed contains loose, friable soil that is free of compacted lumps.



Fava beans make an excellent spring cover crop.

For more information

Cover Crops for Home Gardens (FS 304)
(https://catalog.extension.oregonstate.edu/fs304)

Recycling with compost pile

The compost pile is the home gardener's recycling factory. Instead of throwing away valuable organic materials, recycle them for use in your garden.

Compost is a good fertilizer and soil conditioner when worked into garden soil. Compost is also an excellent mulch.

You can compost many types of organic materials. Sod, grass clippings (avoid clippings from lawns recently treated with weed killers), healthy leaves, hay, straw, young weeds (avoid seed-laden weed material), manure, chopped corn stalks, shredded newspaper, and many kinds of vegetable and fruit refuse from the kitchen are good materials for composting. Shredding or otherwise converting the material into small particles speeds up the composting process.

Oak, walnut, and laurel leaves are slow to decay and do not make good composting materials. Do not put diseased plant materials, meat or dairy products, or dog, cat, or pig manure in a compost pile.

Two piles or bins are better than one for making compost. Make them 4 to 6 feet high, 3 to 5 feet wide, and any convenient length.

Add a variety of organic materials to the pile and mix them together. Add a cup of fertilizer high in nitrogen, such as ammonium sulfate, for each cubic foot of compost material. If compost contains animal manure, add less fertilizer.

Moisten the organic material thoroughly and continue adding material until the bin is full or the pile is the size you want. Pack the material tightly around the edges, but only lightly in the center. The center of the pile will settle more than the edges.

Although the compost pile needs watering periodically during the summer, steady rains will leach nutrients out of the compost during the winter. Prevent this loss by covering the pile with plastic sheeting during the winter.

Autumn leaves may not compost completely during the winter. Turn them over every month or so to promote decomposition. To turn, fork the material from one bin to another, putting the drier outside materials in the center of the pile.

When all of the ingredients have decomposed to a uniform, loamy-appearing material, the compost is ready to use.



A closed composting bin is a good way to recycle fruit and vegetable scraps while keeping out pests.

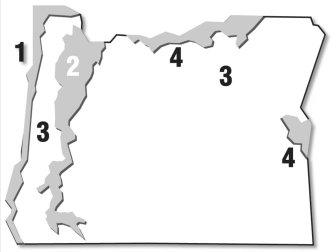
For more information

- *How to Use Compost in Gardens and Landscapes* (EM 9308) (https://catalog.extension.oregonstate.edu/em9308)
- *Gardening with Composts, Mulches, and Row Covers* (EC 1247) (https://catalog.extension.oregonstate.edu/ec1247)

Where is your garden?

Oregon has four growing regions. Choose vegetable varieties and planting dates suitable to the growing conditions in your area:

1. **Oregon coast**: cool, long season of 190-250 days.
2. **Western valleys**: 150-250 day season; warm days, cool nights; length of season varies year to year.
3. **High elevations**: short growing season of 90-120 days; frost can occur during any month.
4. **Columbia and Snake River valleys**: 120-200-day season; hot days, warm nights; length of season fairly well defined.



Dates for planting vegetables in Oregon

		Planting dates						
Vegetable	**Start plants indoors this long before planting date**	**Region 1. Coast, Astoria to Brookings**	**Region 2. Western valleys, Portland to Roseburg[a]**	**Region 3. High elevations, mountains, and plateus of central & eastern OR**	**Region 4. Columbia and Snake valleys, Hermiston, Pendleton, Ontario**	**Amount to plant for family of four[b]**	**Distance between rows[c]**	**Distance apart in the row**
Artichokes (globe)	crown pieces	Aug-Oct, May-June	Aug-Nov, April-June	not suitable	not suitable	3-4 plants	48-60"	48-60"
Asparagus	1 year	March-April	Feb-March	Feb-March	Feb-March	30-40 plants	60"	12"
Beans (lima)	not suitable	not suitable	May-June	May-June	April 15-June	15-25' of row	12-24"	2-6" bush, 12-24" pole
Beans (snap)	not suitable	May-June	May-July	April-June	April 15-June	15-25' of row	12-24"	2-6" bush, 12-24" pole
Beets	not suitable	March-June	March-June	April-June	March-July	10-15' of row	12"	1-2"
Broccoli	6 weeks	May-June	May-July	April-June	April-July	15-20' of row	12-24"	12-24"
Brussels sprouts	6 weeks	May-June	May-July	April-June	April-July	15-20' of row	24"	24"
Cabbage	6 weeks	Jan-April, July-Sept	April-June	April-June	April-July	10-15 plants	24"	24"
Cantaloupes	4 weeks	not suitable	May	not suitable	May	5-10 hills	48"	48"
Carrots	not suitable	Jan-June	March-July 15	April-June	March-July	20-30' of row	12"	2"
Cauliflower	6 weeks	Jan & June	April-July 15	April-May	April & July	10-15 plants	24"	24"
Celery	9 weeks	March-June	March-July 15	May-June	June-Aug	20-30' of row	24"	5"

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Chard	not suitable	Feb-May	April-July 15	March-June	Feb-May	3-4 plants	24"	12"
Chinese cabbage	4 weeks	July-Aug	Aug	April-June	Aug	10-15' of row	30"	6"
Chives	6 weeks	April-May	March-May	April-July	Feb-March	1 clump	Needs 4 sq ft	Scatter
Corn (sweet)	not suitable	April-May	April-June	May-June	April 15-June	4 rows, 20-30' long	36"	15"
Cucumbers (slicing)	4 weeks	April-June	May-June	May-June	April 15-June	6 plants	48"	24"
Cucumbers (pickling)	4 weeks	May-June	May-June	May-June	April 15-June	25' of row	48"	6-12"
Dill	not suitable	May-June	May	May-June	May	25' of row	24"	6-9"
Eggplants	9 weeks	not suitable	May	not suitable	May	4-6 plants	24"	24"
Endive	6 weeks	March-July	April-Aug 15	April-July	Aug	10-15' of row	12"	10"
Garlic	not suitable	Sept-Oct	Sept-Feb	Aug-Sept	Nov-Feb	10-20' of row	18"	3"
Kale	not suitable	May-July	May-July	May-July	May-July	20-30' of row	24"	24"
Kohlrabi	not suitable	July-Aug	April-Aug 15	May	April-Aug	10-15' of row	24"	3"
Leeks	not suitable	Feb-April	March-May	April-June	Jan-April	10' of row	24"	2"
Lettuce (head)	5 weeks	Feb-July	April-July 15	April-Aug	Feb-April	10-15' of row	12"	12"

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Lettuce (leaf)	5 weeks	Feb-Aug	April-Aug 15	April-Aug	Feb-April	10-15'of row	12"	6"
Okra	8 weeks	not suitable	not suitable	not suitable	May	10-20' of row	24"	18"
Onions	10 weeks	Jan-May	March-May	May-June	Feb-April	20-40' of row	12"	3"
Parsley	10 weeks	Dec-May	March-June	May-July	Feb-May	1-2 plants	12"	8"
Parsnips	not suitable	May-June	April-May	May	March-June	10-15' of row	24"	3"
Peas	not suitable	Jan-Aug	Feb-May	April-June	March-April	30-40' of row	36" bush, 48" vine	2"
Peppers	10 weeks	May	May-June	May-June	May	5-10 plants	24"	12-18"
Potatoes (sweet)	6 weeks	not suitable	not suitable	not suitable	May	50-100' of row	48"	12"
Potatoes (white)	not suitable	Feb-May	April-June	May-June	March-June	50-100' of row	30"	12"
Pumpkins	4 weeks	May	May	June	April 15-June	1-3 plants	72"	48"
Radish	not suitable	All year	March-Sept	April-July	March-Sept	4' of row	12"	1"
Rhubarb	crown pieces	Dec-Jan	March-April	April	Feb-March	2-3 plants	48"	36"
Rutabagas	not suitable	June-July	June-July	April-May	March-July	10-15' of row	24"	3"
Spinach	not suitable	Aug-Feb	April & Sept	April & July	Sept-Jan	10-20' of row	12"	3"

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Squash (summer)	4 weeks	May	May-June	May-June	April 15-June	2-4 plants	48"	24"
Squash (winter)	4 weeks	May	May	May	April 15-May	2-4 plants	72"	48"
Tomatoes	8 weeks	May-June	May	May	May	10-15 plants	36-48", closer if supported	24-36"
Turnips	not suitable	Jan & Aug	April-Sept	April-May	Feb & Aug	10-15' of row	24"	2"
Watermelons	4 weeks	not suitable	May	not suitable	May	6 plants	72"	60"

[a] Medford area planting dates may be 7–10 days earlier and extend 7–10 days later than dates indicated for western valleys.

[b] For many of the crops, the amount to plant should be divided into several plantings, 1 or 2 weeks apart.

[c] Use narrower spacings for small gardens

Follow planting directions for best yields

Planting a vegetable garden isn't a complicated or mysterious process. The planting directions printed on the back of seed packets include three basic principles that will improve your chances of success:

Plant vegetables at the right time

Planting seeds at the recommended time will reduce the risk of damage from frost or hot weather.

Plant vegetables at the right depth

Seeds planted too deeply take longer to come up, if they come up at all. Also, weeds may grow up first and crowd out vegetable plants. Conversely, shallow seeds may wash away or dry out before they sprout. Plant vegetables with small seeds (such as cabbage, carrots, radishes, and lettuce) 1⁄2 inch deep. Plant vegetables with medium-sized seeds (such as beets and chard) 3⁄4 inch deep. Plant large-seeded vegetables (such as beans, corn, and squash) 1 to 1 1⁄2 inches deep.

Plant vegetables the right distance apart

Correct spacing allows each plant to get its share of sunshine, water, and soil nutrients. If you plant seedlings too close to each other, the vegetables will not grow as large as they normally would. Excessive tops on radishes and other root crops result from crowding.

Watering vegetable gardens

Plants that receive the proper amount of water are likely to be healthy and productive. In Oregon, summer vegetable gardens require regular watering because of the extremely low rainfall during that season. When planning your garden, consider how you will meet the plants' water needs.

Soil type is important in watering. Water soaks into and drains through sandy soil about twice as fast as it does clay soil. Loam soil lies between these two extremes. Thus, it takes longer to water to a specified depth in clay soil.

How often to water

Regardless of the system you choose, the goal is the same: to deliver water to the roots of the plants at about the same rate that it is removed from soil by plants and evaporation. Consider your soil, your plants, and recent weather when determining how much and how often to water your garden. Sandy soil holds much less water than clay soils. Larger plants consume more water than seedlings. Hot, windy weather dries out soil.

Instead of developing a watering schedule based on calculations and charts, monitor your garden to determine your watering needs throughout the growing season. Different plants in your garden may have different needs:

- Germinating seeds and seedlings need to be kept uniformly moist without being washed away, so water them with a gentle spray every day or two.
- Developing plants need to be watered deeply, but less often, to encourage deep root growth. Water at least 6 inches deep and then let the surface inch or two completely dry out before watering again.
- Crops such as lettuce, beets, green beans, and chard draw water from the top foot or less of soil. Thoroughly soak the rooting zone and then don't water until the plants show signs of needing additional water such as turning a dark bluish green or wilting during the hottest part of the day.
- Corn, tomatoes, asparagus, and rhubarb have deep root systems that allow them to draw water from the top 2

feet of soil. Deep-rooted plants need water less frequently, but need more water to reach the rooting depth.

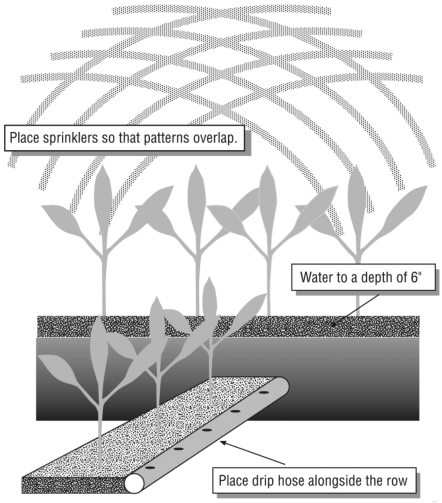
- As a general guideline, garden plants that have been watered properly, and therefore have developed deep roots, need a thorough watering every 5 to 7 days in hot weather.



Drip irrigation system.



Corn, tomatoes, asparagus, and rhubarb have deep root systems that draw water from the top 2 feet of soil. Water them deeply but less frequently. Lettuce, beets, and green beans draw water from the top foot or less of soil. Water them often.



Place sprinklers so that patterns overlap. Water to a depth of 6". Place drip hose alongside the row.

Methods of watering

There are three basic watering methods: (1) hand watering with a hose or a watering can, (2) soaker hoses and drip irrigation systems, and (3) portable sprinklers. The method you choose will depend on the size of your garden, your budget, and your lifestyle.

Hand watering delivers water directly to the plants, thus eliminating waste. If you are hand watering, be sure to water deeply. Remember, this takes time. Do some spot checks to make sure you are delivering enough water, and be careful to give all areas of the garden adequate coverage.

Drip irrigation systems require an initial investment of time and money but, once installed, are more convenient and conserve water. You can set up a drip system to meet the needs of individual plants precisely and then alter it throughout the growing season as watering needs change.

As with any watering method, infrequent, deep watering is the goal. A typical drip system is run 1 or 2 hours once or twice a week. Avoid the tendency to overwater with drip systems; the surface may look dry while the rooting zone is wet. If in doubt, check the soil.

The pattern of soil wetting with drip irrigation is different for sandy and clay soils. In sandy soil, the water soaks straight in, wetting a narrow vertical band of soil. In clay soil, the water spreads more horizontally. Thus, drip emitters can be placed farther apart for clay soil than for sandy soil.

Sprinklers have the disadvantage of wasting water by watering paths and other bare spots in the garden. They also lose water to evaporation and wind drift. When using sprinklers, always water when there is little wind.

Because they wet the foliage, sprinklers also might promote the development of leaf diseases.

If using sprinklers, elevate them above the tallest plants so the water streams are not blocked. To make sure all of your plants are watered, place sprinklers so their patterns overlap. Runoff indicates you need to water at a slower rate.

Common problems

Avoid these three common watering problems:

- Frequent, shallow watering promotes root development in the surface layers of the soil. Plants with shallow roots are very susceptible to drought stress and mechanical damage when weeding.
- Overwatering can drown plants by filling up soil pores with water, leaving little or no oxygen for plant roots. Also, excessive watering leaches away nutrients and can contribute to groundwater contamination.
- Postponing irrigation after plants show signs of needing water can damage plants very quickly in hot weather. Observe your plants every day or two and respond to their needs promptly.

For more information

Conserving Water in the Garden: Growing a Vegetable Garden (EM 8375)
(https://catalog.extension.oregonstate.edu/em8375)

Fertilizing crops for high yields

Ensuring that your plants have the right amount of nutrients is critical to growing a successful garden. Plants require 16 elements. Of these, nitrogen (N), phosphorus (P), and potassium (K) are key nutrients that are contained in most commercial fertilizer mixes. In western Oregon, many soils don't contain enough boron, and several crops (e.g., cabbage, broccoli, cauliflower, raspberries, strawberries, beets, and carrots) benefit from an application of boron.

Vegetable gardens are most productive with a soil pH of 6.0–7.0. Nutrients are most available for plant uptake at this pH. Many soils in eastern Oregon have a high pH (7.5–8.5) and benefit from an application of elemental sulfur to lower the pH.

Fertilizers often are classified as "organic" (e.g., manure, grass clippings, wood ashes, and blood meal) or "chemical." Bountiful gardens can be grown using either type, but there are some differences. Plants can use chemical fertilizers as soon as they are applied, but organic fertilizers must be broken down by soil bacteria and fungi before the nutrients can be absorbed by plants. The compound the plant absorbs is the same regardless of the type of fertilizer.

Before adding fertilizer to your garden it is important to do a soil test. The soil test will tell you what nutrients are lacking, and then you can make an educated decision about which product to apply.

Chemical and organic fertilizers are available as packaged mixes containing N, P, and K. When selecting a product, read the package label carefully; it will tell you how much of each nutrient the fertilizer contains. The nutrients

always are listed in this order: nitrogen-phosphorus-potassium. Thus, a fertilizer labeled 5-10-5 contains 5 percent nitrogen, 10 percent phosphorus (in the form of phosphate), and 5 percent potassium (in the form of potash). In other words, every 10 pounds of this product contains 0.5 pounds nitrogen, 1 pound phosphorus, and 0.5 pounds potassium (10 lb product x 0.05 N = 0.5 lb N).

It is important to note that N, P, and K behave differently in the soil. Take these differences into account when deciding how and when to apply fertilizer.

Phosphate and potassium move slowly in the soil. To ensure that your plants receive adequate amounts of these nutrients, mix them into the soil. A common method is "banding." Dig a trench about 3 inches deep and 2 inches to the side of where the seeds or plants will be planted. Place fertilizer in the trench. As the plants' roots grow, they'll reach the fertilizer and quickly absorb the nutrients.

Nitrogen in organic fertilizers must be released by soil organisms. Mix these fertilizers into the top 2–3 inches of soil so the organisms can go to work. Nitrogen in chemical fertilizers is available immediately and is highly water-soluble. It will be carried to the roots by irrigation and rain, so it doesn't need to be mixed into the soil. If it doesn't rain within a couple of days after you apply a chemical nitrogen fertilizer, water your garden to dissolve the nitrogen and move it into the root zone.

Determining which nutrients are lacking in your garden, the type of fertilizer to use, and when and how much to apply varies among gardens. It even can vary from year to year in the same garden. Spending a little time determining how best to meet your plants' nutritional needs will result in a more bountiful harvest.



Fertilizers containing potassium, phosphorus, and organic nitrogen will be more available to plants if you work them into the top 2-3 inches of soil.



A soil test can help you determine how much fertilizer to add. Fertilizing too little or too much can make plants more susceptible to disease.

For more information

- *Fertilizing Your Garden* (EC 1503) (https://catalog.extension.oregonstate.edu/ec1503)
- *Improving Garden Soils with Organic Matter* (EC 1561) (https://catalog.extension.oregonstate.edu/ec1561)
- *Laboratories Serving Oregon* (EM 8677) (https://catalog.extension.oregonstate.edu/em8677)
- *Soil Sampling for Home Gardens and Small Acreages* (EC 628) (https://catalog.extension.oregonstate.edu/ec628)

Vigor a key to disease-free garden

Growing healthy, vigorous plants is the key to producing quality fruits and vegetables. Plant diseases can kill garden plants, reduce yields, or cause unsightly blemishes on produce. By practicing a few basic gardening principles, you not only will improve the quality of your produce, but also will reduce the need for chemical sprays.

Thinking about the needs of your plants is the first and most important factor to consider before planting your garden. Extension publications often will help you determine those needs. Plants vary in their requirements for sunlight, soil conditions, and irrigation. To keep plants healthy and productive, it is important that you understand and meet these needs.

Choosing the right location for your garden is critical. Most vegetables prefer sunny locations with little or no shade. Consider moving your garden if it is located in partial shade, or prune overhanging tree branches to provide the needed sunshine. Generally speaking, the more sun, the better. Since plants convert sunshine to starches and sugars, plants grown in full sun will produce larger vegetables and sweeter fruit than those grown in partial shade. In addition, sunshine helps dry out wet foliage, thus reducing the potential for disease problems.

Proper soil conditions are equally important to the health and vigor of plants. Most plants prefer a loam soil with good water drainage. Avoid low-lying areas where water collects, since damp conditions promote root rot. You can improve any soil by adding organic matter such as compost or peat moss. This is especially true of sandy and clay soils. Organic matter helps sandy soils hold water and nutrients. It provides clay soils with more air spaces so that roots can breathe more easily.

Some plants, such as blueberries, prefer an acidic soil, but generally a pH of 6 to 7 is ideal for most plants. A soil test kit purchased from a garden center will help determine soil acidity.

More detailed soil analyses to determine fertilizer requirements also are helpful. A list of soil testing laboratories is available at your local Extension office. It is important that plants be adequately, yet not excessively, fertilized. Improper fertilization will make plants too weak or too vigorous and more subject to disease.

There are several other factors to consider as you plan your garden. To prevent the buildup of disease organisms, rotate your crops from year to year on a four-year rotation. This also will prevent soils from becoming depleted of nutrients by plants. Consider the following rotation: root crop, followed by leaf or seed crop, then cabbage family crop, and finally legume. Legume crops, such as peas, help to restore the nitrogen supply in the soil.

Select seeds and plants carefully. In recent years, plant breeders have bred resistance to many diseases into seeds. Check seed catalogs and packages for resistance information. Also plant only disease-free transplants. Bargain plants that are unhealthy are no bargain since they may bring diseases to your garden and infect healthy plants.

Once your garden is growing, thin plants to provide good air circulation. High humidity and wet leaves favor disease organisms such as mildew and Botrytis blight. In addition, overcrowded plants will be weak and starved for light, nutrients, and water, and will not yield an abundant harvest.

Proper watering is critical to maintaining the health and vigor of plants. Scratch below the soil surface on a regular basis to check moisture content. Irrigate before the subsurface soil dries. To reduce the chance of leaf disease, water in the morning so that foliage has a chance to dry before nightfall.

Control insect pests in and around your garden. Insects such as aphids and leafhoppers weaken plants and also can carry viruses from infected to non-infected plants.

Destroy diseased plants or plant parts as soon as you see them so the disease will not spread. Avoid composting diseased plants; some diseases can live in compost.

Weeds not only compete with desired plants for nutrients and water but serve as a reservoir for insects and diseases. It is best to destroy young weeds before they become established. Avoid using herbicides in and around vegetable gardens. Remove weeds with a hoe or by hand-pulling and prevent reestablishment by using a mulch.

For more information

- *Fertilizing Your Garden* (EC 1503) (https://catalog.extension.oregonstate.edu/ec1503)
- *Laboratories Serving Oregon* (EM 8677) (https://catalog.extension.oregonstate.edu/em8677)
- *Preventing Plant Disease in Your Garden and Landscape* (FS 242) (https://catalog.extension.oregonstate.edu/fs242)
- *Soil Sampling for Home Gardens and Small Acreages* (EC 628) (https://catalog.extension.oregonstate.edu/ec628)

Managing weeds

Weeds compete with vegetables for water, light, and nutrients. Some also harbor pests or diseases that can harm garden crops. By controlling weeds, you'll give your plants a better chance to grow and produce to their potential. Several methods of controlling weeds in vegetable gardens are described below.

Mulching

Organic mulches help control weeds and also improve the soil as they break down. If applied in a 4-inch layer or more, however, they sometimes produce acids that can hurt plants. A few types of leaves, such as walnut, can inhibit growth of crop plants and seeds.

Plastic mulch also works well. Black plastic reduces light to the soil, thus preventing weed growth. Clear plastic warms the soil faster than black plastic but does not control weeds. Put drip irrigation hoses in place before laying down the plastic. Make slits in the plastic, add fertilizer, and place transplants next to the water source.

Landscape fabric is another option. Because it allows moisture to pass through, it doesn't require a drip system. However, it is thicker than plastic and tends to cool the soil instead of warming it.

Water management

Weeds need water to germinate and grow. Sprinklers water a large area, all of which must be weeded. Drip irrigation delivers water only where you want it; the rest of the garden stays dry, and weed problems are reduced.

Cultivation

Germinating weeds are very vulnerable to hoeing, hand pulling, or tilling. Mature weeds are more difficult to

remove. Weed early and often.

Tillers are practical only in large, open areas. They can damage roots or stems if used close to crop plants. Thus, hand weeding and hoeing are the best choices for close weeding. Hand pulling works well in small gardens and raised beds. A scuffle hoe is preferred for larger areas.

Pull or hoe weeds when the soil is damp, but not wet. Working wet soil damages soil structure. Conversely, when soil is too dry, weeds are hard to remove.

Several hoe styles are available. The lightweight Warren type of hoe has a heart-shaped blade and is useful for cultivating between plants. The hula or action hoe is a lightweight scuffle hoe. Pushing and pulling it just under the soil surface eliminates newly emerging weeds. It is less effective against well-established weeds.

Hand cultivators are good for weeding small areas and between closely spaced plants. Another useful tool is the dandelion digger (also known as a weeder, cultivator, or asparagus knife). It consists of a 10- to 14-inch metal rod with a two-pronged blade at one end and a handle at the other.

Rotation

Crop rotation can reduce weed problems. Plant aggressive vegetables (such as winter squash or corn) where noncompetitive crops (such as carrots and onions) grew the year before. Keeping part of the garden clean-tilled or in a summer cover crop can help reduce weed problems for the next season.

Using transplants

Many vegetables can be started indoors or purchased as young plants and then set out into the garden. The transplant has a head start against germinating weed seeds.

Close spacing

Closely spaced vegetables shade the soil and suppress weeds. Remember, however, that weeding must be done by hand when plants are close together.

Cover crops

Cover crops grown on annual beds in the winter can smother much winter weed growth. The cover crop can be a winter-hardy grain, a legume, or a combination of the two.



Landscape fabrics are another option for weed control. They deprive weeds of the light theyneed to grow.



Transplants have a head start against germinating weed seeds.

Protecting your plants from dreaded slugs

Slugs thrive west of the Cascades. Damaged plants are marked by slime trails and irregularly shaped holes with smooth edges.

The amount of slug damage depends mainly on rainfall and nighttime temperatures. Slugs must have soil moisture, and they feed when temperatures are greater than 50°F. They love mild winters, wet springs, moist summers, and irrigation. Cold, windy winters and hot, dry summers reduce their numbers and cause some slugs to become dormant.

Grass cover, mulches, soil cracks, and worm tunnels provide places for slugs to hide and lay eggs. Remove dark, moist habitats and till to a depth of 6 inches to eliminate these hiding places.

Slugs lay eggs in the fall after rains start, typically in late September and early October. If you reduce the population before they lay eggs, you have won half the battle.



Slugs are attracted to the odor of beer and will drown in a beer-filled trap.

Hand picking

Hand pick slugs about two hours after sunset. Slice them in half, pierce them, sprinkle them with salt, or scrape them into a bucket of soapy water.

Barriers and traps

Copper strips. When a slug touches copper, it is charged with current, an unpleasant experience that makes it reverse course. Place a band of copper (preferably 3 inches wide) around beds or individual plants. Or form copper wire into a tight, conical spiral around each plant, with the small end at the bottom, and push the wire into the soil. Make sure slugs are not trapped inside barriers.

Trap boards. Slugs seek shelter during daylight. Place small, flat boards under plants and between garden rows. Remove slugs each morning and scrape them into a bucket of soapy water.

Beer traps. Slugs are attracted to yeasty odors. To make a beer trap, cut a 2-inch hole about two-thirds up the side of an empty margarine tub or yogurt container. Bury the container so the hole is just above ground. Add 2–3 inches of beer (or a mixture of 1 tablespoon yeast, 1 tablespoon flour, 1 tablespoon sugar, and 1 cup water) and cover with a lid. Remove dead slugs daily.

Trap crops. Slugs love to eat marigolds. Plant marigolds along your garden's border and hand pick slugs and dispose of them in late evening.

Nontoxic control products

Iron phosphate granules (e.g., Sluggo, WorryFree, and Escar-Go). The wheat aroma of these granules attracts slugs. After eating them, slugs stop feeding, dry out, and die within 3 to 6 days. Bait remains active for about 1 week or longer depending on the environment.

Diatomaceous earth. Made of ground mineral fossils, this powder punctures slugs' soft covering. Sprinkle it in a 1-inch-deep, 3-inch-wide band around a plant's base. Wear proper personal protective equipment, including a facemask or respirator, to prevent inhalation. Rain can destroy the effectiveness of the diatomaceous earth, so you may have to reapply after a rain event.

Chemical control products

Ammonia-water spray. When sprayed directly with a solution of equal parts household ammonia and water, slugs dehydrate. Test a plant's sensitivity to ammonia by spraying a small section and watching for a reaction in the next day or two.

Metaldehyde. Metaldehyde is the most common active ingredient in synthetic chemical baits. Use these baits in the fall. By late winter and early spring, conditions are too wet and slugs can recover.

These baits are toxic to earthworms and may affect nontarget insects. These baits may be attractive to pets, and can harmful to children and fatal to dogs and other domestic animals if ingested in large quantities. However, it's possible to use them safely. To reduce harm to earthworms and nontarget insects, place a few pellets under a board and remove dead slugs each morning. Read the entire label before using for precautions you can take to protect your pets, such as how long you should keep your pets away from pesticide application sites.

Don’t let the bugs beat you to it

Preventive medicine is a good thing, but not when it comes to insect control in the home garden. Don’t apply pesticides as a matter of course. Use chemicals only when you know that insects are present and causing damage, and there are no other means of control.

You can beat the bugs by regularly checking your plants carefully for both beneficial and pest insects. Catching pest infestations early will make control easier.

Some fruits and vegetables need more watching than others. Various types of insects love to feast on broccoli, cabbage, cauliflower, peas and—late in the season—green beans and turnips. Young tomato plants are susceptible to flea beetles and cutworms, but once past the early growth stage, tomatoes are not as vulnerable to insect damage. Melons, corn, cucumbers, and squash are relatively safe from pests (except for earworms on corn).

Some of the most common insect pests and control measures for each are described below. Consult with your local Extension Master Gardener Program for options that will work best for you.

Cabbage maggot

These underground larvae inflict damage on cabbage family varieties and radishes. Flies lay eggs on plant stems or near the ground level. The eggs hatch into maggots.

Destroying crop refuse and trash in the fall will help eliminate overwintering sites for these pests. Controlling wild mustard around the garden will help reduce cabbage maggot fly populations. Covering plants with floating row covers helps keep flies from laying eggs on or near plants. Surrounding stems with paper collars might help deter downward movement of maggots that do hatch on the stems.

The adult fly is susceptible to dusts or sprays of methoxychlor or malathion. Several applications at 10- to 14-day intervals should eliminate the problem.

Garden symphylan

Garden symphylans are small, 12-legged insects, about ¼ inch long, that live in the soil. They often arrive in gardens in manure taken from an old manure pile.

These pests feed on the roots of many garden plants, causing stunting or death. They are hard to find, but evidence of their presence is short, stubby roots and stunted plants. Because symphylans do not make their own tunnels through the soil, you can partially control them through frequent tilling.

Natural enemies feed on symphylans, but the populations of these enemies are not sufficient to reduce heavy infestations.

Flea beetle

This tiny, blue-black beetle eats holes in the leaves of many garden vegetables. The larvae also bore tiny tunnels just under the skin of potato tubers.

Floating row covers can protect plants from flea beetles. Mature plants often can sustain a lot of flea beetle damage without suffering reduced yields, so control may be unnecessary. If damage is heavy, pesticides can be used to control the insect on cole crops.

Cutworm

Several species of cutworms damage crops by cutting off seedlings at the soil line, eating holes in edible roots, and feeding on foliage. Treating soil with insecticides at planting time does little good.

For cutworm control in small areas, hand-pick climbing cutworms from plants during the evening or scratch the soil to uncover them during the day.

For additional control, place a 3-inch-high cardboard collar around the stems of young plants and push it 1 inch into the soil.

Pesticides can help control cutworms. If cutworms are cutting plants below ground level, apply the pesticide to the soil. If they are climbing up and damaging foliage, spray or dust the leaves.

Aphids

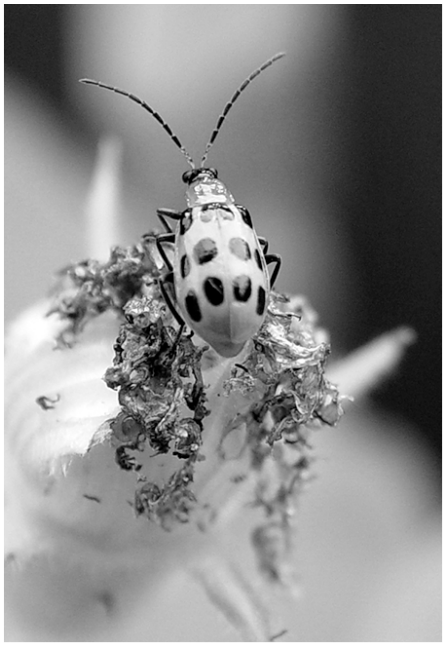
Aphids come in a variety of colors. Black aphids infest green beans late in the summer. Green aphids infest cabbage family plants and are especially annoying on broccoli and cabbage, where they hide within the head. Aphids weaken plants by sucking juices from their tissues and can spread disease.

Resident ladybugs and other predators can substantially reduce aphid populations. Take care to protect and encourage these predators. Also limit damage by removing aphids with a stream of water from a garden hose or by smashing them. Insecticidal soap can be used to control aphids. Other pesticide options are also available.

Cucumber beetle

This is a green ladybug with black spots. It damages vegetables by chewing holes in leaves and can spread disease.

Use floating row covers to protect plants, but remove the covers from cucumbers, melons, and squash when they start to bloom so bees can pollinate them. Hand-picking is another effective control method. Pesticides also can be used to manage this pest.



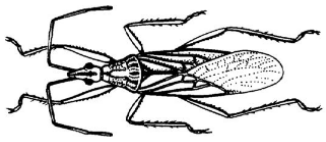
The cucumber beetle is a green ladybug with black spots. It damages vegetables by chewing holes in leaves and can spread disease.

Cabbage worm

These larvae attack cabbage family varieties. Cover plants with floating row covers to prevent the butterfly (adult stage of the cabbage worm) from laying its eggs on plants. Larvae often can be removed by hand-picking. Pesticides are another option for controlling larvae.

Beneficial garden insects

The following are beneficial insects, not pests. Beneficial insects feed on pest insects and help gardeners with pest insect control. Try to avoid killing beneficial insects.



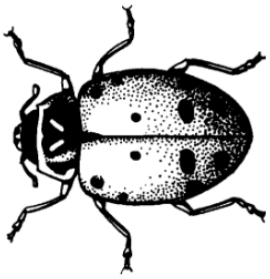
Western Damsel Bug
***Nabis alternatus* Parshley**

Photo: Insects and Mites of Economic Importance in the Northwest, reproduced with permission



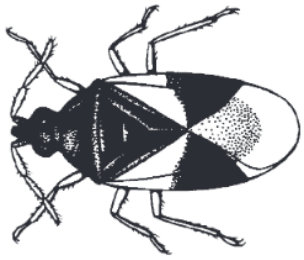
Green Lacewing
***Chrysoperla* spp.**

Photo: Insects and Mites of Economic Importance in the Northwest, reproduced with permission.



Lady Beetle *Hippodamia* spp., *Coccinella* spp.

Photo: Insects and Mites of Economic Importance in the Northwest, reproduced with permission.



Minute Pirate Bug
***Orius tristicolor* (White)**

Photo: Insects and Mites of Economic Importance in the Northwest, reproduced with permission.

For more information

- *How to Identify, Scout, and Control Insect Pests in Vegetable Crops* (EC 1626) (https://catalog.extension.oregonstate.edu/ec1626)
- *A Pocket Guide to Common Natural Enemies and Crop and Garden Pests in the Pacific Northwest* (EC 1613) (https://catalog.extension.oregonstate.edu/ec1613)

Alternatives to chemical control of insect pests

Although gardeners sometimes assume that organic pesticides are not toxic, it is important to remember that they are still pesticides and are formulated to deter or kill a pest. The primary advantage of choosing an organic pesticide over a synthetic pesticide is that the organic product breaks down faster, and will not persist as long in the environment.

Many alternatives to organic and synthetic pesticides are available for gardeners who want to avoid chemical control of insect pests. Simply knowing which insects are detrimental to garden plants and which are beneficial can go a long way in helping you protect your plants from hungry bugs.

Start by deciding how much insect damage is acceptable. Plant extra vegetables to compensate for some loss. Monitor your plants carefully and often in order to catch an infestation early. Identify insects that you suspect to be pests.

Try these methods to minimize insect damage:

- Select insect- and disease-resistant vegetable varieties. Avoid those plants that attract insects or are susceptible to diseases. Tuber and root crops (e.g., potatoes and carrots) and cole crops (e.g., radishes, cauliflower, cabbage, broccoli, turnips, and rutabagas) are susceptible to wireworms, symphylans, cabbage maggots, onion maggots, and other soil insects. Beans, beets, chard, peas, cucumbers, spinach, and squash are more insect-resistant.
- Keep plants healthy by watering adequately. Fertilize and thin plants to reduce competition for moisture and

nutrients.

- Remove weeds to conserve soil moisture and eliminate hiding places for pest insects.
- Encourage natural enemies of insect pests such as insect predators, parasites, nematodes, bats, geese, ducks, chickens and other birds.
- Attract beneficial insects to your garden by planting small-flowered plants such as daisies, alyssum, yarrow, dill, angelica, clover, and coneflower. Make sure something is in flower throughout the season.
- Avoid growing the same types of vegetables in the same spot year after year. A four-year rotation is best. Avoid large plantings of any crop.
- Exclude insects from plants by using fiber materials, row covers, or other barriers such as plastic bottles, plant collars, and hot caps.
- Remove any plants that become infested. When a crop is finished producing, remove all plant residue. Pick up and destroy fallen fruit and nuts.
- Use traps. Pheromone traps disrupt insects' mating cycles, while yellow sticky boards catch winged aphids, whiteflies, leafhoppers, and fungus gnats.
- Hand-pick pests or knock them off plants with a stream of water from a garden hose. Kill the insects by putting them in a cup of soapy water.
- If all else fails, the least toxic insecticides include botanicals such as neem and pyrethrin; microbials such as *Bacillus thuringiensis* (Bt) and beneficial nematodes; and products such as insecticidal soap, horticultural oil, and diatomaceous earth. Always identify the pest before choosing a pesticide, and use pesticides according to label directions. Spot spray infestations only, and avoid spraying plants when they are in bloom. Garden-wide sprays and spraying plants in bloom can harm bees and other beneficial insects.



You can plant a variety of small-flowered plants such as daisies to attract beneficial insects to your garden.



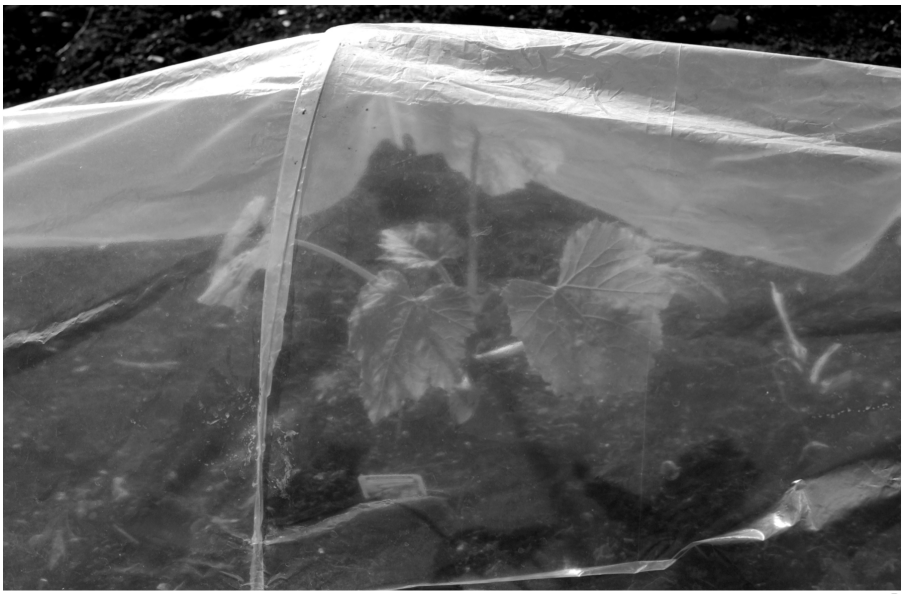
Beans, beets, chard, peas, cucumbers, spinach, and squash are less susceptible to insect damage than tuber and root crops and cole crops.

Growing warm-season crops in cool-season areas

Oregon's climate affords gardeners the joy of growing many types of plants. However, in many areas there are limitations to growing warm-season vegetables (e.g., melons, tomatoes, eggplants, and corn). Even if the growing season is long, air and soil temperatures may be too low for maximum plant growth. Luckily, there are ways to enhance your chances of harvesting large, luscious melons; vine-ripened, juicy tomatoes; and beautiful, purple eggplants.



You'll have better luck with tomatoes, peppers, and cucumbers if you select varieties suited to Oregon's environment.



Covering soil with plastic or fabric can increase the soil temperature

Site selection

Choose a garden location that receives full sun and is protected from wind. A site with a slight south- or southeast-facing slope will warm early in the spring and allow colder air to drain to a lower location.

It takes only a small increase in temperature to speed up plant growth and development. Covering plants with cold frames, cloches (clear plastic and hoops), plastic-wrapped tomato cages, or floating row covers (spun polyester) will significantly modify the growing environment (temperature, wind, and humidity). These covers increase air and soil temperatures and conserve heat that otherwise would be lost during the night.

Some of these methods can be used with several plants, while others cover only an individual plant. Some are most suitable for modifying the environment at the beginning or end of the season, while others are suitable for use during the entire growing season.

Soil preparation and fertility

A light, well-drained soil (either sandy in texture or amended with organic matter) will warm faster in the spring and stay warmer in the fall. Also, soil in raised beds warms faster and allows for earlier planting. To further speed soil warming, cover the soil with clear polyethylene plastic film. This can increase the soil temperature by 10–15°F over a period of a few days, thus allowing you to plant earlier in the spring.

Proper fertilization is critical when growing long-season vegetables under less-than-optimum temperatures. Plants need to get off to a quick start and have adequate nutrition in order to mature quickly. Phosphorus is especially important for early growth in cool soil.

Soluble chemical fertilizers are a good choice for plants growing in cold soil since the nutrients are immediately available to plants. Apply organic fertilizers later in the growing season when soil temperatures have risen; the microbes that break down these fertilizers and make them available to plants are most active in warm soils.

Choice of crop varieties

Select the vegetable varieties best suited to your growing environment. If you don't, all of your other work will be for naught. For tips on what varieties to plant, talk to long-time local gardeners and nursery or garden center personnel, or read seed catalogs.

Planting at the right time

Warm-season vegetables require warm temperatures to germinate (50°F) and warmer day and night temperatures to reach maturity. For germination and early growth, soil temperature is as important as air temperature. Don't rush. Vegetables planted too early may fail to establish well and may take longer to begin producing and have smaller total yields than those planted after soil and air temperatures have warmed.

For more information

- *Constructing Coldframes and Hotbeds* (FS 246) (https://catalog.extension.oregonstate.edu/fs246)
- *Fertilizing Your Garden* (EC 1503) (https://catalog.extension.oregonstate.edu/ec1503)
- *Producing Transplants at Home* (FS 225) (https://catalog.extension.oregonstate.edu/fs225)
- *Raised Bed Gardening* (FS 270) (https://catalog.extension.oregonstate.edu/fs270)
- *Short-season Vegetable Gardening* (PNW 497) (https://catalog.extension.oregonstate.edu/pnw497)

Gardening on the Oregon coast

Gardening on the Oregon coast isn't impossible. On the other hand, it isn't easy. Wind, fog, and cool temperatures are obstacles to gardening success. However, if you match your plant needs and garden design to the coastal climate, gardening by the beach can be a rewarding experience.

Site selection

Make the most of available heat by planting on the south side of a wall or building. Plastic hotcaps, cloches, row covers, or small greenhouses can modify the planting environment to increase heat. Be sure to provide ventilation when using plastic covering or plants will dry out.

Soil preparation and fertility

Many coastal soils are sandy and don't hold water well. Gardens on these soils need additional organic matter and frequent watering during the drier summer months.

A lack of nutrients limits plant growth in any gardening environment. Be sure to apply adequate fertilizer to coastal gardens during the growing season.

Choice of crop varieties

A key detail in coastal gardening success is the selection of appropriate varieties. Cole crops, root crops, lettuce, peas, spinach, zucchini, leeks, and onions do well here. Tomatoes and corn will do well if you use short-season varieties and some type of row covering to speed germination and early growth.



Lettuce and other cool-weather crops grow well in coastal Oregon's climate.

Climate and seasonal issues

Lack of sunlight and warmth often are limiting factors on the coast. Sometimes, removing trees will make a big difference. Orienting garden rows in a north-south direction helps maximize sunlight to all parts of the garden.

Heavy rainfall in the spring is a problem where soils drain slowly. Add organic matter and use raised beds to improve soil drainage and speed up soil warming.

Wind protection is essential on the coast. Wind causes moisture to evaporate from plant leaves more quickly than roots can take in new moisture. This causes drought stress, which in windy areas can occur even when the ground is saturated with moisture. Place small fences, tires, shade cloth, snow fencing, or other objects around plants to break the wind.

Gardening in the Rogue Valley

Gardeners in the Rogue Valley enjoy an excellent climate for gardening and a wide variety of fertile valley soils. Warm, sunny weather in late spring, summer, and early fall provides good growing conditions with a minimum of garden plant diseases. Year-round gardening is possible, with mild winters where temperatures seldom drop below 20°F.

Site selection

Due to variations in the topography of the valley floor, foothills, and mountainous areas, and in tree density on forested sites, the Rogue Valley offers varied microclimates of sunlight exposure, temperature, humidity, and air drainage.

Select your garden site with care and take advantage of the climatic variation within your yard. It may determine your success as a gardener. For example, the south side of a house or slope is warmer than the north side. A southern exposure receives maximum sunlight.

Plant crops that like more warmth in an area with southern exposure. Plant shade-tolerant leafy vegetables on the

north side of a building or on a north slope.

Locate your garden where it will receive at least 6 hours of sunlight each day (8 to 10 hours is preferred). Avoid planting vegetables near buildings or trees that shade your garden. In addition, the roots of nearby trees and shrubs will rob vegetables of nutrients and water.

Avoid frost pockets or areas that warm slowly in the spring. Frost will build up in areas lacking air drainage, such as low spots at the base of a hill or at the foot of a slope bordered by a solid fence.

Wherever you locate your garden, be sure a readily available supply of water is nearby. Garden soil on hot and windy sites in the Rogue Valley can lose up to a ½ inch of water per day. Since there is very little rainfall during the summer, watering is necessary at planting time and throughout the summer. If watering your garden is difficult and time-consuming, it will become more work than you want to do during the hot days of July and August.



Wherever you locate your garden, be sure a readily available supply of water is nearby.



Locate your garden where it will receive at least 6 hours of sunlight each day

Soil preparation and fertility

Rogue Valley soils range from sandy loam to heavy clay. Most of the clay soils originate from rocks of ancient volcanic activity in the Cascade Mountains. Granite soils are from older, more durable and slowly weathered rocks of the Siskiyou Mountains. The granite rock materials formed sandy loam soils that drain well but are not as rich in nutrients as clay soils. Gardeners usually prefer loam or sandy soils.

Clay soils drain and dry slowly. When wet, they are sticky and difficult to garden. “Heavy” clay soils live up to their name when gardeners try working them too early in the spring. If you work clay soil when it’s too wet, it will make a poor seedbed of hard clods. Prepare garden soil when it’s no longer sticky and when a handful squeezed together doesn’t form a hard lump.

Soils that drain well will warm faster in the spring, but may become too warm for some crops during midsummer. Experienced gardeners rotate from cool- to warm-season crops in early summer to gain the advantage of increased

soil temperature.

Improve clay soils by adding organic matter, an excellent soil amendment regardless of soil type. In well-drained granite soils, it improves water retention, while in heavy clay soils it improves soil drainage.

Climate and seasonal issues

The Rogue Valley climate is influenced by the nearby Pacific Ocean, with its marine warmth in winter and cool but dry air in summer. The moderating air mass is carried onshore by prevailing westerly winds.

The frost-free period is 165 to 170 days, beginning about the first of May and ending in mid- to late October. This varies slightly from one location to another. These dates are critical for tomatoes, corn, potatoes, squash, cucumbers, and other warm-season crops susceptible to frost injury. Try to select vegetable varieties that will mature within the frost-free period.

Plant corn and potatoes around mid-April even though near- or below-freezing temperatures still might occur. The first plants may be nipped back, but damage will be minimal and plants will continue to grow and emerge from the ground as the weather warms.

Other warm-season crops do best with mid-May to early June plantings, when there is less chance of frost and soil is warmer.

During early summer, these cool nights may prevent fruit set for crops such as tomatoes. Sufficiently warm nights eventually will prevail, however, and tomato fruit will be set by midsummer.

In spite of some warm midsummer days, the growing season's average daily temperature is 70°F. Warm days are offset by cool nights, as cold air drains down from surrounding mountain slopes.

Rogue Valley fall weather is ideal for cool-season crops. Try a midsummer planting for fall harvest. Midsummer planting of cool-season spring crops also is recommended where soggy soils prevent early gardening.

It's possible to grow winter garden crops successfully in the Rogue Valley during most years, and such crops can be grown in the valley consistently if they are given some protection, particularly on days of extreme low temperatures. Although annual extreme lows range between 10 and 20°F, the average daily low dips only slightly below freezing during December and January.

Since 75 percent of the average annual rainfall comes between November and March, take advantage of breaks in the weather to prepare your garden for a mid-February planting of peas and onions. Avoid early planting in areas that remain soggy after a rain.



Corn can be planted in mid-April even though nighttime temperatures still are cool.



Cool nights in early summer can delay fruit set on tomatoes, but tomatoes will set on by midsummer, giving them time to ripen during the warm, sunny days of early fall.

Gardening in central and eastern Oregon

Although it may not be a gardening paradise, central and eastern Oregon is more than a wide expanse of high desert. Successful vegetable and fruit gardening is possible east of the Cascades if you take into account the area's special and widely varying climate and soil characteristics.

Soil preparation and fertility

Soils in central and eastern Oregon vary widely. Light-textured soils, low in organic matter, nutrient content, and water-holding capacity, are found in parts of central Oregon and the eastern Columbia Basin. These soils may require frequent applications of fertilizer and water. At the other extreme are heavy soils high in soluble salts (which can create an alkalinity problem).

Added organic matter such as manure or compost generally is beneficial for most central and eastern Oregon soils. Specific information for each area is available from county offices of the OSU Extension Service or from local garden centers.

Choice of crop varieties

Concentrate on vegetables adapted to your area. Avoid planting vegetables that require special, intense, or improved growing conditions. Root crops (e.g., potatoes, carrots, and beets) and cold-tolerant crops (e.g., cabbage, chard, leaf lettuce, and kohlrabi) do well in high-elevation gardens.

Short-season vegetable varieties offer the best chance of success. For example, cool nights during the growing season may cause a 65-day tomato to require 75 to 80 days or more to mature.

Planting at the right time

Planting dates for high-elevation, short-season areas generally lag behind those in other parts of the state. In high areas, gardens usually are planted from mid-May, for cold-tolerant plants, to mid-June. Later plantings often fail to

mature before fall frosts.

Use plant protection devices, such as row covers, hotcaps, and Walls-o-Water, to extend the growing season for vegetables requiring longer periods to mature.

In areas along the Columbia River, where the growing season approaches or exceeds 120 days, planting dates can be moved up to early May.

Climate and seasonal issues

The growing season may be as short as 80 to 90 days in central Oregon at elevations above 3,500 feet. In some of the lower elevations and river valleys, growing seasons may exceed 130 days.

Also, large fluctuations in daytime and nighttime temperatures, often as much as 40–45°F, affect vegetable and fruit production. Cool nights reduce the chances of successfully growing vegetables that like warm nights, such as lima beans and eggplants.



Cold-tolerant crops such as cabbage, chard, leaf lettuce, and kohlrabi do well in high-elevation gardens.



Root crops such as potatoes, carrots, and beets do well in areas with short growing seasons and cool nights.

Gardening along the Columbia

For gardens in lower elevation areas along the Columbia River, frost and cold are not the main enemy. In the river gorge, beginning in mid-spring and extending through summer, heat and steady winds create problems for gardeners trying to establish fruit and vegetable plantings.

Starting a garden in a steady 20-mile-per-hour breeze with temperatures approaching the mid-80s can be a challenge. Frequent, light watering is the only way to keep seedlings from drying out. Place a rock or secure a roofing shingle on the windward side of seedlings to break the wind and help plants become established.

As the season progresses and temperatures rise above 100°F, protection from heat becomes critical. Plants can wilt and die quickly if not properly cared for. Give established plants plenty of water. Watering 60 to 90 minutes at a time, three times a week, will keep plants growing vigorously.

For season-long protection from the wind, plant a hedge that will grow 4 to 5 feet high on the west side of the garden. It will provide some wind protection yet allow plenty of light to reach garden plants.

Fall and winter gardening

If you live west of the Cascades, there's a good chance you can garden almost year-round with a little extra effort. Many cool-season crops produce well in the fall and hold through the winter if protected. Good crops for fall and winter gardens include salad greens, cabbage, broccoli, kale, Brussels sprouts, carrots, leeks, beets, turnips, scallions, parsley, cilantro, spinach, and parsnips. You can plant these vegetables in mid- to late summer after you harvest spring crops and space is available.

The first key to a successful fall and winter garden is location. Good drainage is essential, and raised beds are best. If your soil doesn't drain well, amend it with organic matter such as compost.

Don't plant in a spot that is prone to early frost (for example, at the bottom of a hill) or exposed to the wind. Look for an area that gets maximum sun during winter. A south-facing slope is ideal.

Make sure your winter garden is easily accessible. It's no fun to slog through mud and cold rain to harvest your crops.

Choose varieties that are suited to fall and winter harvest. Some varieties are designated specifically for fall planting, while others perform well only in the spring. Consult seed catalogs to find the best varieties.

It can be tricky to know when to plant a fall garden. The crops need to have time to mature before cold weather and short days curtail growth, but if you plant too early the young plants might wilt in the heat or be too mature to hold well into the winter.

To determine when to plant a particular vegetable in your area, you need to know the average date of the first killing frost and the number of days to maturity for the variety. The formula below will help you determine when to plant:

Number of days from seeding or transplanting outdoors to harvest

+ Number of days from seed to transplant (if you grow your own transplants)

+ Fall factor (about 2 weeks to account for the fact that plants grow more slowly in the cool, short days of autumn)

= Number of days to count back from first frost date

Before planting, rework the soil by tilling or spading to a depth of 6 to 8 inches. Then apply ½ cup of 5-10-10 fertilizer for each 100 square feet of row space. Add organic matter if needed to improve drainage.

To prevent disease problems, don't plant crops where a related vegetable was growing. For example, put broccoli in a spot vacated by peas, not by cabbage.

When thinning, leave extra space between plants that will stay in the garden over the winter. Closely spaced plants are more susceptible to rots and slug damage in cool, wet weather than are those with adequate ventilation.

Control slugs as soon as fall rains start. By reducing the population in early fall before the breeding season, you'll have less trouble during the winter.

Fall also is the time to protect your plants from the weather. Cold frames, cloches, Walls-o-Water, and other protective devices keep the environment inside slightly warmer than the surrounding air. They also protect plants from frost and, just as important, cold rain.



Extend the growing season by using a row cover or other device to protect plants from harsh weather.

For more information

- *Constructing Coldframes and Hotbeds* (FS 246) (https://catalog.extension.oregonstate.edu/fs246)
- *How to Build Your Own Raised Bed Cloche* (EC 1627) (https://catalog.extension.oregonstate.edu/ec1627)

Trade-name products are mentioned as illustrations only. This does not mean that the Oregon State University Extension Service either endorses these products and services or intends to discriminate against products and services not mentioned

Use pesticides safely!

- *Wear protective clothing and safety devices as recommended on the label. Bathe or shower after each use.*
- *Read the pesticide label—even if you've used the pesticide before. Follow closely the instructions on the label (and any other directions you have).*

- *Be cautious when you apply pesticides. Know your legal responsibility as a pesticide applicator. You may be liable for injury or damage resulting from pesticide use.*

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Master Gardener online training

The OSU Extension Service, in cooperation with Professional and Continuing Education, offers an online version of the Master Gardener basic training course. The course covers topics such as basic botany; basic entomology; integrated pest management; soils, fertilizers, and composting; pesticide safety; herbaceous and woody ornamental plants; vegetable gardening; indoor and container gardening; home landscaping; and plant pathology. A combination of readings, lectures, discussions, quizzes, exams, and self- and peer-review of completed assignments fosters and supports students' mastery of gardening knowledge and techniques. For more information, visit Professional and Continuing Education (https://pace.oregonstate.edu/catalog/master-gardener-online).

OSU Extension gardening program

The aim of the Oregon State University Extension Service gardening program is to help beginning and experienced gardeners alike effectively and sustainably use their soil and water resources for productive harvests, aesthetically pleasing landscapes, and personal satisfaction. Oregon's gardening education program is assisted by Master Gardener volunteers who help deliver information and gardening encouragement in their local counties and communities. Master Gardener volunteers are active in more than 30 of Oregon's 36 counties. To learn how you can get involved in the Master Gardener program, contact your local OSU Extension office. For more information, see the *Master Gardener Program Brochure* (EM 8723) (https://catalog.extension.oregonstate.edu/em8723).

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