

A GUIDE FOR PERSONAL VEGETABLE & FRUITS GARDENING IN WYOMING

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Wyoming Gardening Manual
A guide for personal vegetable and fruits gardening in Wyoming

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Published by ARI Books

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online copies of the manual are available for downloading free of charge at www.feedinglaramievalley.org and www.actionresources.ngo

Project Notes

Growing Resilience was a community-based, action research project conducted from 2015 – 2021 designed to bring home gardens to households on the Wind River Reservation and to members of the Northern Arapaho and Eastern Shoshone nations of Wyoming, and to measure the impact of those gardens on participants' health. The Growing Resilience project leveraged tribal assets of land, family, culture and community health organizations to develop and evaluate home food gardens as a family-based health promotion intervention to reduce disparities suffered by Native Americans in nearly every measure of health. University of Wyoming led the health data collection element of Growing Resilience. The project director and principal investigator was Christine M. Porter, and the project manager was Alyssa Wechsler. Etheleen Potter, an enrolled member of the Northern Arapaho tribe, led the garden intervention aspect of the project, including garden installation and support. Melvin Arthur, an enrolled member of the Northern Arapaho tribe, led the qualitative assessment of the project. Gayle M. Woodsum served as community liaison. The project was overseen by a Community Advisory Board: Rhonda Bowers (Northern Arapaho); Clarisse Harris (Northern Paiute); Pat Harris (Northern Arapaho); Kathryn Lone Fight (Eastern Shoshone); Rubena Tillman (Eastern Shoshone); Ina Weed (Eastern Shoshone); Nelson "Pat" White (Northern Arapaho).

The Growing Resilience Community Advisory Board extended their community-based and led work beyond the research project, in order to support sustainable food justice, food security, and

community gardening work in the Wind River Reservation under the name ***Wind River Nations Growing Gardens & Food Justice***.

Gardens for Health and Healing (GHH) was a community-based action research project designed to bring home gardens to households in Albany County, Wyoming, and to design and test the best ways to measure any impacts of those gardens on the health of individuals living with multiple chronic health conditions. GHH began as a partnership between the University of Wyoming and Feeding Laramie Valley (FLV). Christine M. Porter at University of Wyoming served as Principal Investigator. Gayle M. Woodsum at FLV served as Co-Investigator. Program Coordinators were Lina Dunning from FLV and Rachel Budowle from University of Wyoming. Gardens for Health and Healing continues as an FLV community-based and led program in support of food equality, security, sovereignty and justice for everyone in Albany County, Wyoming.

Acknowledgements

This gardening manual is a project of the Growing Resilience community-based action research project conducted in Wyoming's Wind River Indian Reservation. **Growing Resilience was funded by NHLBI and NIGMS National Institutes of Health, grant no. R01 HL126666-01, Christine M. Porter, PI.** Additional support comes from the following Wyoming-based organizations:

Action Resources International
Blue Mountain Associates
Feeding Laramie Valley
Prevention Management Organization of Wyoming

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ESSENTIAL GARDENING TOOLS

Before heading out into the garden we suggest having the following items to help you:



Garden Fork - Also known as a hand rake. These are used for turning the soil, cultivating, and removing debris.



Gardening Gloves - Used to protect your hands from thorns and splinters. You want your gloves to fit properly to avoid blisters. Use gloves that are lightweight, with water resistant and breathable fabrics to keep your hands dry and cool.



Hand Pruners - Also called Pruning Shears, these are used to prune and harvest your plants. Ideally, use the Bypass pruners for your garden. For pruning large or thick plants, use loppers or long-handled pruners.



Hand Trowel or Garden Spade - Used for transplanting, digging small holes, and removing weeds. Narrow blades are best for weeding or cultivating. Broad blades are more useful for moving larger amounts of soil.



Hoe - Used for preparing your garden, turning the soil in rows, and cultivating. For vegetable gardens, use flat, wide types. These are best used for larger garden spaces.



Hose with Adjustable Nozzle - Use a hose long enough to reach and spray all areas of your garden. Use an adjustable nozzle to better control the water pressure and spray radius. Keep in mind that the longer your hose is, the lower your water pressure will be. Rubber hoses will last longer and kink less than vinyl, but they will be heavier and more expensive.



Depending on the size of your garden, you may want to use a large **watering can** instead. Make sure you choose a design that is ergonomically sound when full of water.



Spade or Round-Headed Shovel - Used for digging large holes, lifting sod, and moving mounds of soil. These are ideal for larger gardening spaces. For a small garden, a garden spade might be more useful.

Sunscreen and Hat - Protect yourself from sun damage. Always apply sunscreen before going out into your garden. Wear a hat for additional protection for your head, face, and neck.



Wheelbarrow - Used for moving large amounts of soil, mulch, and compost to your garden. Ideally, use a single-handle two-wheel model, they are easier to balance and do better on uneven terrain.

Wheelbarrows are ideal for larger gardening spaces. For smaller plots, consider using a **large bucket** to transport your compost or mulch.

Optional:

- **Knee Pads** - Gardening will require being on your knees for extended periods of time. Knee pads are an easy, and cost-effective way to save your knees.
- **Tape Measure** - This is an easy tool to help gauge distances between rows, individual plants, and hole depth.
- **Water Wand** - Extends the reach of your hose and focuses your water. This will save your back and reduce wasting water.



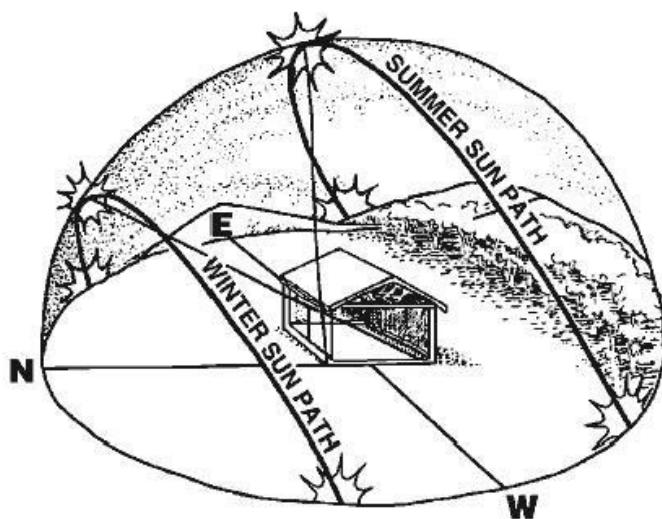
Shovels are particularly useful tools for digging large holes and moving large amounts of soil.

Photo courtesy of Sydney Edwards, Feeding Laramie Valley, 2019

SELECTING A GARDEN SITE

If you have not had a vegetable garden before, now is the time to start thinking about site selection. Think about the types of vegetables and fruit you want to grow and the amount of space each plant will need. I would suggest beginning with a smaller garden and enlarging as you gain more skill and confidence.

Probably the most important factor to consider in selecting a site is full sunlight. Most vegetables need at least 6 full hours of direct sunlight (8-10 hours is ideal). Take note of where your home is located, the nearby trees and shrubs, and pathway of the sun as the day progresses to determine the approximate amount of sunlight available to a plot. If your only spot to house your garden has limited sun, there are still some vegetables that you can grow that do not require as much sun such as lettuce, spinach, and broccoli.



Source: Solar Choice

Each side of your house will offer different amounts of sunlight, heat, shade, and wind protection. Take advantage of fences and walls that can provide wind protection, some shade or even additional heat for some plants. A little research will help you select which plants to grow in each location. If you choose to intermingle vegetables with your flowers be sure to know what you are harvesting as some plants are poisonous.

Elevation is something to consider when selecting a garden site. The higher the elevation, the shorter the growing season. You want a spot where there is some air circulation. Selecting a site at the bottom of a slope should be avoided because it takes longer for those areas to warm up in the spring and often cool down quickly or frost in the fall thus limiting the length of the growing season. Select a piece of ground higher up.

Some tips to remember are:

- If the garden space slopes to the east, you will get mostly morning sun. This area will warm up quickly but will cool down earlier in the evening.

- If the garden space slopes to the west, it will be slow to warm up, but you will have warm afternoon temperatures that will hold longer into the evening.
- A south facing slope will have extended periods of sunlight.
- North facing spaces usually have shade all day long and can be difficult growing spaces for most vegetables.

Wyoming wind can be extremely damaging to plants and can also cause soils to dry out more quickly. If possible, select a site that is somewhat sheltered or provide some type of windbreak for your garden or individual plants. Remember, additional water will be needed to compensate for the wind.

If possible, start your garden close to your home. Generally, gardens conveniently located close to your home will entice you to spend more time watering, weeding, controlling pests and harvesting. These gardens generally are healthier and more productive.

If you are unsure where your power lines run on your property, call “Before You Dig” (811) or visit the website www.onecallofwyoming.com/homeowners to be sure your garden plot will be located in a safe space.



If possible, plant your garden close to home.

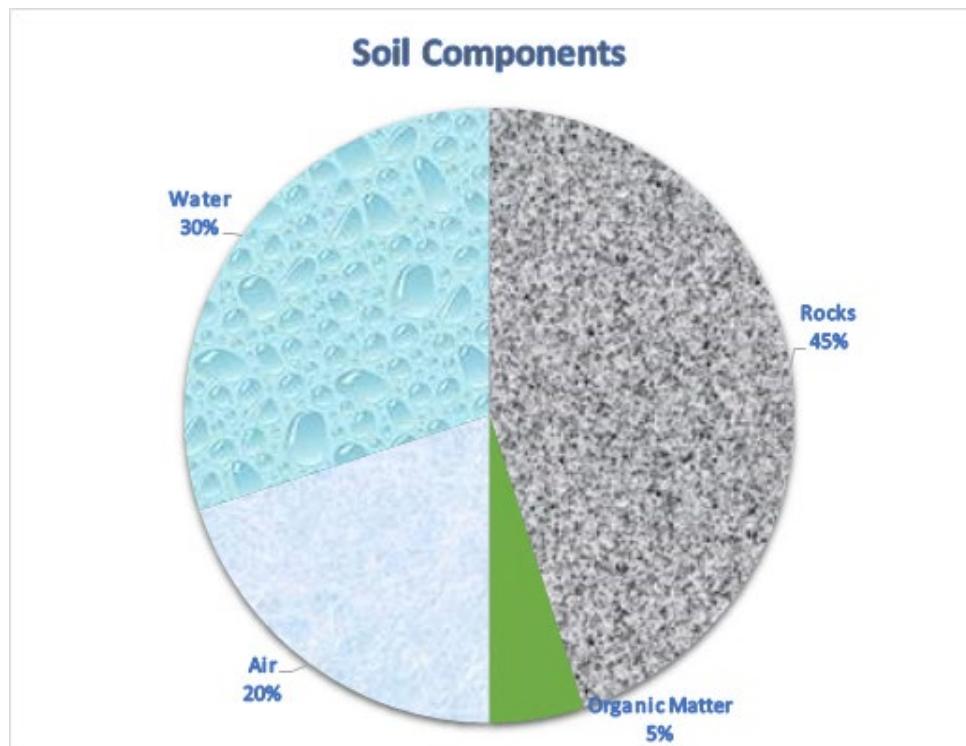
Photo courtesy of the Tillman Family, Growing Resilience, 2016

Soil quality is somewhat important, but it does not have to be perfect. There are amendments you can add to improve the quality of the soil. More information is provided on page 14, [Building Fertile Soil](#). Look for sites where there is good drainage. An optimum scenario would be to have soil that is fertile, full of organic matter and easy to dig and till.

Easy access to water is important. At a minimum, gardens need at least one inch of water per week and more if your soils are sandy or located in a windy site. Without adequate water your plants will do poorly and not provide the quantity and quality product you are hoping for.

UNDERSTANDING YOUR SOIL

Soil is a combination of materials, both living and nonliving. One part of soil is broken down rock. Another is organic matter, sometimes referred to as humus, made up of decaying plants and animals. Soil is roughly 50 percent pore space. Water and air are also a part of soil. These components make up the soil's structure, or the arrangement of solids and pore space.



Basic soil components - Graph created by Feeding Laramie Valley, 2020

All the careful sowing, weeding, and tending could be in vain if the quality of your soil is not up to par. Soil provides plants with the nutrients, water, and air needed for healthy plant growth and development. Each plot of land will have different characteristics (minerals, organic and inorganic matter) and will determine what kinds of plants you can grow successfully. Knowing your soil type will also decide what kinds of amendments your soil is lacking.

You will have more control of your growing medium if you are gardening in containers or raised beds, but for larger gardens it helps to understand the characteristics of the soil you have to work with.

The Rock Particles of Soil or Soil Texture:

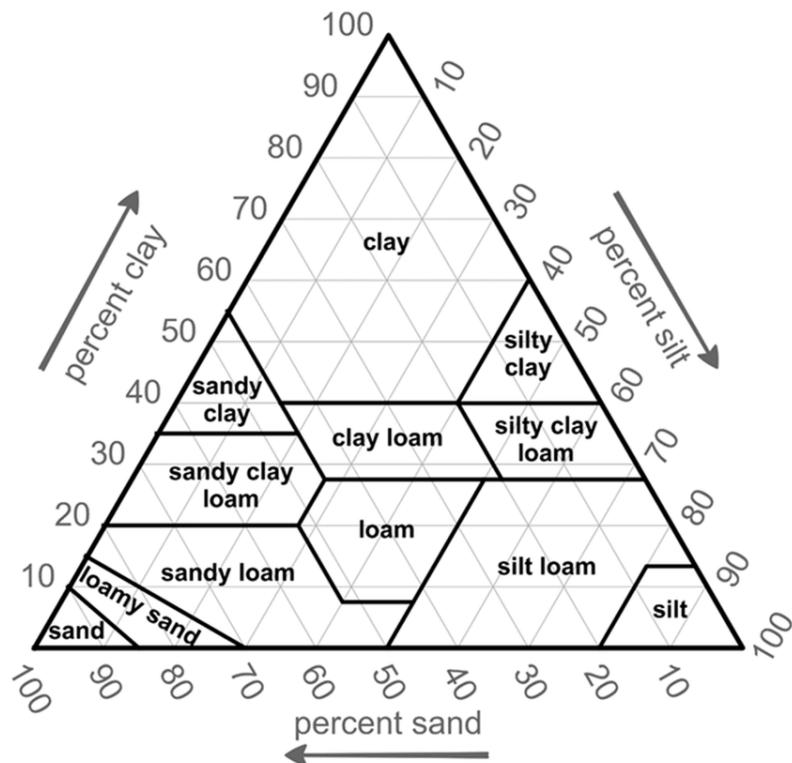
Sand is the largest particle found in soil. When you rub it, it feels rough and gritty. Sand does not contain many nutrients but is good for providing drainage.

Clay is the smallest particle found in soil. Clay is smooth when it is dry but is sticky when wet. While clay can hold many nutrients, it does not allow much air or water to pass through. Therefore, too much clay in the soil can make it heavy and unsuitable for growing most plants.

Silt falls between sand and clay. Silt feels smooth and powdery when it's dry. Silt also feels smooth when it's wet but not sticky.

Loam is a good mix of the three, making this type of soil the best for growing plants. Loam breaks up easily.

Soil Textural Triangle

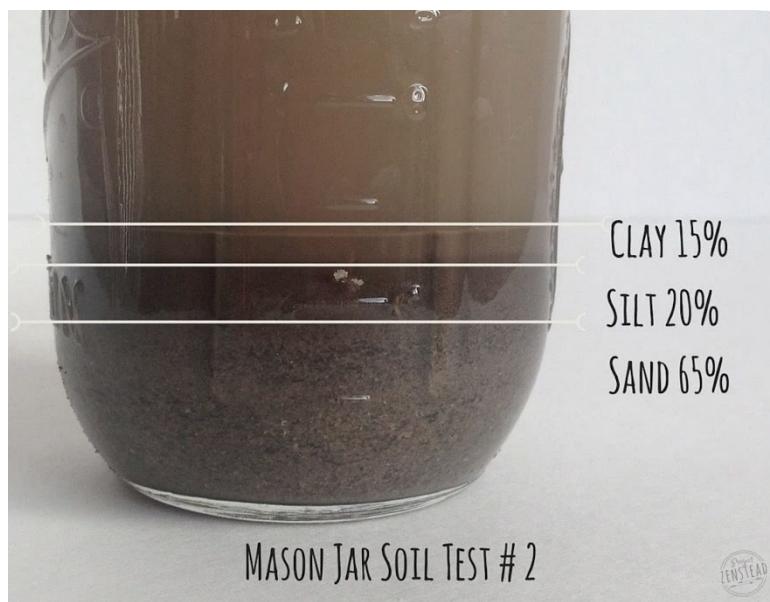


Hydrologic-Process-Based Soil Texture Classifications for Improved Visualization of Landscape Function - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/USDA-Soil-Texture-Triangle_fig2_279631053 [accessed 3 Jun 2020]

How to Determine the Texture of Your Soil

Here is a simple way to gauge the texture of garden soil:

1. Dig multiple samples from the top 8 inches of your soil from several spots in your garden. Mix them in a bucket. Remove stones, roots, mulch, and other chunks of organic matter. Break up any clods or clumps.
2. Put about 2 inches of soil in a flat-bottomed quart jar. Add 1 teaspoon of powdered dishwasher detergent to help disperse the soil particles. Add water to within 2 inches of the top. Screw on the lid tightly and shake the jar for 5 minutes or until the soil is thoroughly liquefied.
3. Place the jar in a spot where it can remain undisturbed for several days. After 1 minute, use a marker to mark the level of sediment in the jar; this represents the sand in the soil sample.
4. Make a second mark after 1 hour; the sediment between the two lines is silt.
5. Clay particles will settle to the bottom last, taking up to a week. Some organic material may remain floating after all the mineral particles have settled.
6. Use a ruler to measure the depth of sand, silt, and clay, as well as the total soil depth in the jar. If the silt layer has become more compressed as the clay settles, measure by observing the slight variations in color instead of the marks on the jar. Use the measurements to calculate the percentage of each soil component.



Example of a simple soil test - Photo courtesy of Woodland High School

The soil particles seem to touch each other, but in reality, they have spaces in between. These spaces are called pores. When the soil is "dry", the pores are mainly filled with air. After irrigation or rainfall, the pores are mainly filled with water.

Soil Testing

Having your soil tested by a professional laboratory is highly recommended. Soil tests can be somewhat costly, but the results will provide you with excellent baseline information and save you time in soil preparation and unnecessary expense in amendments. Be sure to use a lab that can provide test results, a report that explains their findings and recommendations for gardening.

Soil tests should provide soil nutrient content and physical properties. They will also assess the suitability of a site for growing certain plant species. There are several tests available depending on what information you already know about your soils and what your intent for the soil is. The soil labs will provide a list of testing options and instructions for taking soil samples.

After the official soil test from a lab, there are some over the counter tests that you can do on your own to keep tabs on the condition of your soil. Periodically an official test should be completed just to be sure you are on track or if you suspect a problem.

Suggested soil lab:

Colorado State University
Natural and Environmental Sciences Building
Room A-319, Fort Collins, CO.
(970) 491-5061
<http://www.soiltestinglab.colostate.edu/>
\$35 per sample



You may search on the internet for other soil labs.

Preparing Your Garden Space



Soil is easy to take for granted but an understanding of our soil type and its proper preparation is essential for a thriving garden. It can take several years to get your garden soil at optimum growing condition. But every year spent working with your soil along with adequate light and moisture will minimize pests, weeding and improve the quality, quantity, and taste of your vegetables.



Family garden in raised beds - Photo courtesy of the Hurley Family, Growing Resilience, 2016

The following are general guidelines to preparing your garden space:

- If possible, begin prepping your garden in the fall.
- Select a reasonably level space with maximum sunlight and good drainage.
- Mark your garden boundaries with stakes and string.
- Begin soil preparation by digging out the area of your vegetable garden. Create the perimeter first by digging the edge of the garden area before breaking the ground in-between. Remove the top layer of sod with a shovel. If the area is not a grassy spot, then just remove weeds, rocks, and debris.
 - **Note:** Grass can be added to a compost pile. Do not add weeds or any other plant material that has already seeded or has been sprayed with herbicide or insecticide.
- Look at your soil and determine what the combination or texture is (sand, silt, and clay). If possible, send a representative sample of garden soil to a soil-testing lab for nutrient and pH analysis.

- Cultivate the soil by turning it with a shovel or rototiller. Tilling the soil breaks it up and prepares it for planting. Till the soil 12-inches down. Deeper if you are planting root crops like potatoes. Using a rototiller will make this process faster than if you do it by hand. Continue to remove rocks and debris as you work. I use a rototiller for the initial preparation of the garden. Then I tend to use the [**“double dig” method**](#) (page 12) in the years to follow since too much machine tilling can destroy the structure of the soil. Work the soil only when it is dry enough to crumble easily after squeezing, never when it is saturated with water.



Tilling the soil prior to planting. Using a rototiller is a faster way to till your garden, but should not be done several years in a row - Photo courtesy of Reece Owens, Feeding Laramie Valley, 2016

- Adjust the soil pH (measure of acidity or alkalinity) by adding ground limestone or sulfur as recommended by the soil test results.
- Spread a minimum of 2 inches of compost (humus or well-aged manure) over the garden area with a rake. Work the compost 6 inches into the ground using a shovel or spade, turning the soil to break it up. Preferably, compost should be added in the fall - especially if the manure is not well composted. Organic matter will need to be replenished at the start of every growing season. If the soil resists improvement, consider growing in raised beds.
- In some cases, soil factors can be deemed too costly or daunting of a task to amend. In these cases, a raised bed could be considered. Raised beds are typically square or rectangular boxes made of wood or metal. Raised bed soil mixes are commercially available, or a mix of topsoil, compost, and other ingredients like peat moss and vermiculite could be used to meet the intended vegetable or fruit's nutrient needs.

About a week before you plan on planting:

- Add some topsoil using the same method as spreading the fertilizer.
- Allow your cultivated soil to rest for a couple of days. Work the soil again if there are clumps that still need breaking down.
- Rake and begin planting your garden.



Raised beds, soil prepped and ready for planting.
Photo courtesy of the Bergie Family, Growing Resilience, 2016

Double Digging

Double-digging involves loosening up the layers of soil and adding organic matter. This method adds air deep into the soil and enables roots to grow and the microbes to create good soil structure. Aerated soil holds water better than compacted soil, requiring less watering and increased nutrient uptake by plants.

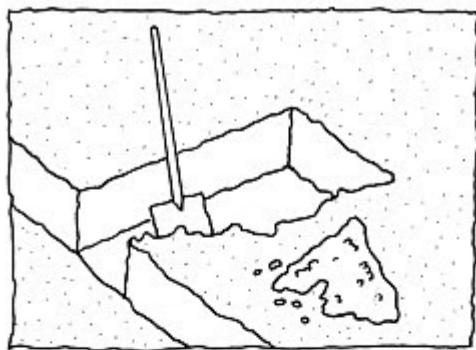
Be sure before digging that the soil has enough moisture (like a wrung-out sponge). This will make digging easier. If the soil is too dry or too wet, it is more difficult to dig and the soil structure can be damaged in the process.

If you are unsure where your power lines run on your property, call “Before You Dig” (811) or visit the website www.onecallofwyoming.com/homeowners to be sure your garden plot will be located in a safe space.

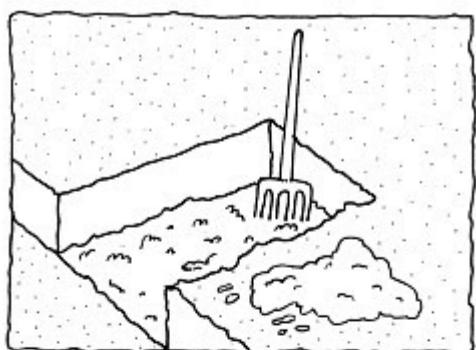
Below is a step-by step guide to the double-digging method:

1. Begin at one end of the bed and dig a 1-foot-wide by 1-foot-deep trench across the bed's width, placing the excavated soil in a wheelbarrow.
2. Next, work a garden fork into the floor of the trench and slowly rock it back and forth to loosen the soil. Continue until the soil in the excavated area is loosened.
3. Add organic material, such as compost, and any necessary soil amendments. Using your gardening fork, thoroughly mix them into the subsoil.
4. Dig a second, similar-size trench next to the first, this time placing the excavated soil in the first trench with additional added compost mixed in.
5. Loosen the soil at the bottom of the second trench with the garden fork, mix in compost.
6. Dig a third trench and repeat steps until you reach the end of your garden. Fill the last trench with the topsoil you placed in the wheelbarrow when you dug the first trench enriching it with organic matter as you did before.

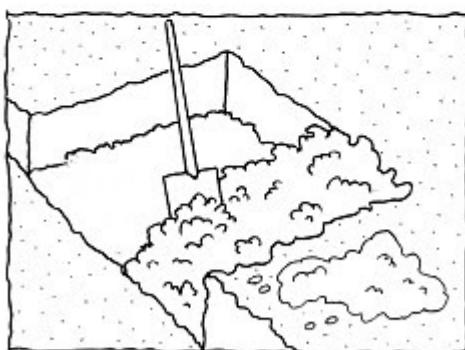
Hint: When digging or planting, put a strong, wide digging board on the bed to distribute your weight and avoid compacting the soil.



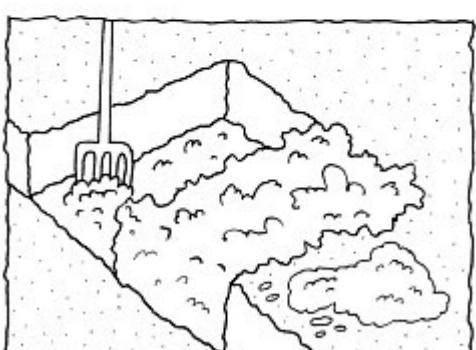
A. DIG FIRST TRENCH; PILE
SOIL ALONGSIDE TRENCH
OR INTO WHEELBARROW



B. BREAK UP BOTTOM OF TRENCH
WITH FORK AND WORK IN
SOME COMPOST



C. DIG SECOND TRENCH;
PLACING SOIL INTO FIRST
TRENCH



D. CONTINUE IN THIS MANNER;
FILL LAST TRENCH WITH
SOIL FROM FIRST TRENCH

Diagram of double digging - Photo courtesy of Jennifer Kaczmarski, University of Minnesota Extension, 2018

Building Fertile Soil

Healthy soil should equal healthy plants. Building and maintaining fertile soil rich in organic matter is the groundwork for thriving plants, resisting pests and diseases, and providing a bountiful crop.

One approach is using synthetic chemical fertilizers that are easy to use but these don't always provide the long-term effects that plants and soil need. Your plants can only absorb a limited amount of fertilizers and since most of them are water soluble, the remainder ends up as runoff during a rainstorm or watering that contributes to water pollution.



Transplanting at the FLV Farm - Photo courtesy of Sydney Edwards, Feeding Laramie Valley, 2019

Organic soil amendments such as compost, manure, cover crops, and fertilizers derived from non-synthetic sources can improve quality of soil and assist your plants during the growing season.

Think of your garden space as an ecosystem, much like a forest. In a forest, there is a continuous cycle of plants, grasses and animals living, dying, and decomposing. This process adds organic matter to the soil and is similar to what you are trying to recreate in your garden.

Imagine your garden as a bank, every time you harvest a crop or pull weeds you are making a “withdrawal” from the nutrients and organic matter within the soil. If you don’t make a deposit of decomposed plant and animal matter, eventually you will have depleted the soil of all its nutrients and your crops will suffer.

Below are some suggestions for making a deposit, or building your own fertile soil:

- Properly heated **compost** is made up of recycled yard and garden waste, vegetable and fruit scraps, leaves, and manure. Avoid using plants that have gone to seed. Commercial compost can also be purchased at garden stores and landscape suppliers. Start with approximately 2 inches of fine-textured compost spread evenly over the beds and work into the soil before planting. To learn how to make [compost at home](#), see page 17.
- **Manure** from cows, poultry and other livestock is another source of organic matter. Be sure that it has been aged at least 6 months to a year or process it through your compost pile before using it in your garden. Fresh manure can be “hot” and will damage plants if not aged. Composting the manure and getting it to the right temperature also helps to kill bacteria. Llama “beans” are slow release manure reducing the risk of burning to garden plants. These are high in nitrogen, potassium, phosphorus and trace elements and minerals. Be aware that animal manure is a byproduct of what they have been eating. If their feed is high in salts your manure could have an increased salt content.

Note: Use caution when using horse manure as it may have unwanted weed seeds.

Apply a two-inch composted layer of cattle manure and work it into the soil before planting. Poultry, sheep, rabbit, and goat manure generate too much heat and have a higher nutrient count. They should be applied at a lesser amount. My preference is to apply manures in the fall and let it rest over winter.



Cover crops such as clover will limit erosion, suppress weeds, and add organic matter to your soil.
"Clover cover crop in vineyard, VanBuren County, Michigan." - Photo courtesy of Lynn Betts, NRCS

- **Cover crops** grown in your garden beds will add organic matter to the soil, limit erosion during the rainy season and high winds, and help to suppress weeds. Some cover crops include vetch, rye grass, peas, clover, and fava beans. These crops would be planted in

the fall and tilled in the spring. The leguminous cover crops such as fava beans and vetch, host a type of bacteria on their roots that fixes nitrogen from the air. As these crops break down, they supply the soil with nitrogen. These crops are called green manures. Seeds for these crops are available through seed catalogues.

- **Mulches** such as sawdust, tree bark, straw and leaf mold can boost the soil's organic matter levels. Using it as a surface mulch will help to suppress weeds and retain moisture. They will also tie up nitrogen temporarily as they decompose. Consider composting these materials prior to applying them to your garden.

Organic matter provides many of the nutrients plants need but there will be times when there are some deficiencies. A [soil test](#) (see page 8) will help determine what your soil is lacking.



Add mulch in your garden to suppress weeds and retain soil moisture.
Photo courtesy of Sydney Edwards, Feeding Laramie Valley, 2019

Make Your Own Home Compost

Composting is a technique used to accelerate the natural decay process. The technique converts organic wastes to a mulch which is used to fertilize and condition soil. There are two methods for home composting aerobic (with air) and anaerobic (without air).

When you first start out the organisms in the pile will be aerobic and will continue to live until the oxygen is gone. Turning the pile helps to keep these organisms alive. As the pile settles and has too much moisture if it is not turned regularly the aerobic organisms will die and the anaerobic organisms will grow.

The anaerobic method is an awfully slow process and can produce very foul-smelling odors. The advantage to this method is that it requires minimum maintenance. To control some of the odors you can use airtight containers, cover the pile with plastic or layers of soil.

Note: The anaerobic method may attract unwanted insects, rodents, and animals.

My preference is the aerobic method which is what I will describe. Home composting requires a careful mix of ingredients to achieve the right consistency and balance. There are numerous books with a variety of techniques already written about “how to compost.” What I will describe is my preference. Your location, temperatures, location of the compost piles, what ingredients you use, and the amount of time you spend turning your pile, will determine how you compost. You may need to adjust what I suggest.



Compost heaps are a pile of organic matter (up to 3 feet in height) that are easy to turn.
Photo courtesy of Alex Shannon, Feeding Laramie Valley, 2018.

Basic Ingredients:

Some examples of shredded/chopped organic materials (Carbon to Nitrogen C:N, 30:1 Ratio) and the organisms that feed on the material are listed below.

Carbon (Brown) Items:

- Coffee Grounds
- Dried Leaves
- Straw
- Woody Stems

Nitrogen (Green) Items:

- Grass Clippings
- Vegetable Scraps
- Green Plant Materials

Micro-organisms:

- Worms
- Fungi
- Insects
- Bacteria

Shredded Organic Wastes: Shredding, chopping or even bruising organic materials hastens decay. One way to shred leaves is to mow the lawn before raking, collecting the shredded leaves in the mower bag. It takes at least 34 cubic feet of shredded material to form a compost pile. Use garden debris free of disease or seeds. ***Do not use potato, tomato, or weed plant debris.***

Good Location: The compost pile should be in a warm area and protected from overexposure to wind and too much direct sunlight. While heat and air facilitate composting, overexposure dries the materials. The location should not offend neighbors.

Nitrogen: Nitrogen accelerates composting. Good sources include fresh grass clippings, manure, blood meal and nitrogenous fertilizer. Lime should be used sparingly if at all. It enhances decomposition, but too much causes nitrogen loss, and it usually is not necessary unless the pile contains large amounts of pine and spruce needles or fruit wastes.

Air: The compost pile and its enclosure should be well ventilated. Some decay will occur without oxygen, but the process is slow and causes odors. Be sure to regularly turn your compost pile to boost airflow.

Water: Materials in the compost pile should be kept as moist as a squeezed sponge. Too little or too much water retards decomposition. Overwatering causes odors and loss of nutrients.

$$\text{Air} + \text{Water} + \text{Carbon} + \text{Nitrogen} = \text{Compost}$$

Temperature: Heat released from the compost pile is directly related to the microbial activity. Temperatures should be monitored and recorded at different locations throughout the pile and process. **Desirable range for composting is 140°F to 160°F for 10 to 15 days.**

- 105°F destroys some pathogens, weed seeds and insect larvae
- 131°F should destroy human pathogens
- 145°F should kill most weed seeds
- Above 150°F and the micro and macro organisms begin to die
- Above 180°F and the compost pile can spontaneously combust

The temperature should begin gradually dropping as the compost process completes. A sudden drop in temperature could indicate a problem.

- If there is a lack of oxygen—turn your pile
- If there is a lack of moisture—add water
- If there is an incorrect ratio of carbon to nitrogen material—adjust amounts

Items to Avoid or Limit in a Home Composting Setting



Bones	Slow to decompose; can attract pests.
Cat litter	May contain pathogens harmful to humans; may also contain chemicals to perfume litter.
Charcoal and briquettes	Contain sulfur oxides and other chemicals that are toxic to soil and plants.
Cooked food waste	May contain fats which attract animals; slow to decompose.
Dairy products	Avoid butter, cheese, mayonnaise, salad dressings, yogurt, and sour cream. These will smell and take a long time to decompose.
Diseased plants	Diseases can be transferred to the compost pile. <i>Avoid even healthy potato or tomato plants.</i>
Dishwater	May contain grease, perfume, and sodium.
Fatty, oily, greasy foods	Slow to decompose.
Fish scraps	Severe odors during decomposition. Can attract pests.
Herbicides and pesticides	Avoid any item that has been treated. The residue from these ingredients can last from one month to several years.
Glossy colored paper	May contain inks that could contribute toxins.
Meat	Can attract pests; smells bad during decomposition.
Non-recyclable cardboard	Slow to decompose. Cut into small pieces and dampen before using to assist in decomposition.
Peanut butter	Can attract pests; slow to decompose.
Peat moss	Absorbs moisture. Wet thoroughly and add in small quantities.
Pet wastes, human feces	May contain pathogenic bacteria, viruses, and parasites that require prolonged high temperatures to be destroyed.
Seeds	Avoid any vegetation that has seeded.

Rhubarb leaves	Contains oxalic acid which lowers pH and inhibits microbial activity. Add in very small quantities and mix thoroughly with other materials or omit from the pile.
Sawdust	<i>Be sure it has not been chemically treated.</i> Sawdust is made of tiny pieces and can easily obstruct the air flow. Turn regularly. Use as a brown material on a 4 to 1 ratio with green material.
Sludge (bio-solids)	Requires special handling and high temperatures to kill disease organisms and get rid of toxic metals.
Wood ashes	Changes the pile's chemistry and can cause nutrient imbalance. Use very sparingly in very thin layers.
Wood chips	Slow to decompose. Shred or chop into small pieces to aid decomposition.

Types of Composting Structures



The type of structure you choose to use is your personal preference and should be based on the amount of compost you wish to make. Some units may work better in Wyoming's cooler temperature environments. The optimum size of structure is a 3ft X 3ft X 3ft. Be sure it is well ventilated for good air circulation to encourage rapid composting.

Basic types of units for composting:

Holding Units—Used to hold yard and kitchen scraps. These units are the easiest to use but also take the longest to turn your material into compost. Typically, the organic material inside is not turned and can be difficult to increase oxygen level. These units are normally made of wood or galvanized chicken-wire.

Turning Units—These units are designed to allow mixing of organic material periodically. With a three-compartment unit you can turn organic matter from one section to the next depending on the stage of decomposition. The first unit would be for incoming organic matter, the second bin would hold half composted organic matter and the third bin would be the finished product. This increases the rate in which your food and green waste is converted to usable compost for the garden.

Barrel Composter—The benefit of this type of unit is that it can be turned easily. This allows for increased aeration and speeds up the time it takes to convert your food and yard waste into usable compost. These types of units can be purchased commercially. You may want to consider having 2 or 3 of these containers.

Heaps—Basically, you are just piling your organic matter in a large heap. Keep your pile height up to 3 feet, but it can be as long as you want it. Consider starting a second

heap when the first heap is large enough to allow it to decompose. Heaps are easy to turn. Consider your location (animals, rodents, and wind) before deciding on a heap structure.

Pit Composting—Dig a shallow pit in the ground (2ft X 3ft). Pit composting does not provide good aeration and can become an anaerobic type composting system. This type of composting can take longer unless you design it so that the material can be turned.

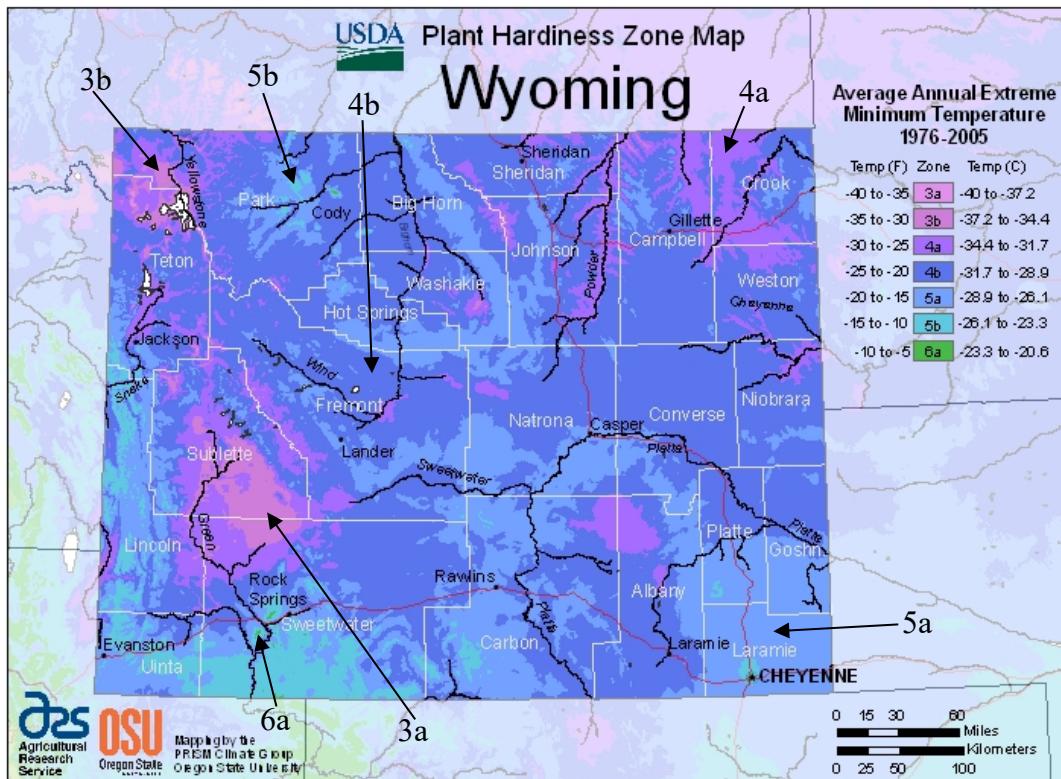


Turning units speed up the time it takes for your waste to convert to usable compost.

Photo courtesy of Feeding Laramie Valley, 2016

WYOMING PLANT HARDINESS ZONES

USDA Plant Hardiness Zone Map is the standard by which gardeners can determine which plants are most likely to thrive at a location. The zones are based on information gathered over a 30-year time-period. The zones are broken down by the average lowest temperature, divided into 10° sections.



As you can see, a lot of Wyoming (Fremont, Converse, Campbell, Big Horn County, etc.) is a dark grey, which falls under Zone 4b (-25 to -20 °F). Several areas around Sublette county are zones 3a (-40 to -35 °F), and parts of Uinta and Sweetwater counties are in zone 5b (-15 to -10 °F) and in some small cases 6a (-10 to -5 °F). Because this map is mostly based upon temperature, it does not account for Wyoming's extreme winds and lack of winter snow cover. Caution should be used when selecting plants and choose items that have an established success history.

Visit <https://planthardiness.ars.usda.gov/PHZMWeb/> and type in your zip code to find your specific zone.

Remember there are microclimates on your property that may allow plants that are not expected to survive in certain areas thrive. These microclimates allow increased flexibility on plant varieties. These maps should only be used as a guide.

SUGGESTED FRUITS AND VEGETABLES

A majority of Wyoming is in the higher elevation, so it is not unusual to have a late frost in July and one as early as August. The main concern is the length of the growing season. Trying to raise a plant that requires a long 90-100 days to maturity when you only have 70-80, or less, of frost-free days will cause you disappointment. **You will have the best success with varieties suited for Zones 3 and 4.** When selecting seeds look for those varieties that can be harvested in the shortest amount of time. Starting seeds indoors, protecting plants at the beginning and the end of your growing season will provide increased success.

Fruit Varieties for Wyoming:

Apples:

- Dolgo Crab
- Gala
- Honeycrisp



Elderberries:

- Adams
- BlackLace
- Lemony Lace



Blueberries:

- Blueray
- Patriot
- Saskatoon



Plums:

- Alderman
- Native
- Superior



Cherries:

- Hansen's Bush
- Nanking Bush
- North Star Pie



Raspberries:

- Killarney
- Latham
- Plainsman



Currants:

- Amos Black
- Cascade
- Red Lake



Strawberries:

- Earliglow
- Ft. Laramie
- Honeoye



Strawberries are an excellent fruit for beginners. They are easy to grow and are incredibly flavorful.

Photo courtesy of Sydney Edwards,
Feeding Laramie Valley, 2019



Vegetable Varieties for Wyoming:

Beans (Bush)*

Blue Lake
Gold Mine



Onions*

Walla Walla
Red Candy



Beans (Pole)*

Fortex
Kentucky Blue



Peas (Snap)*

Sugar Ann
Super Sugar



Beets*

Detroit Dark Red
Golden Detroit



Peas (Snow)*

Oregon Giant
Dwarf Grey Sugar



Bell Peppers*

Early Crisp
King of the North



Potatoes*

Kennebec
Dark Red Norland



Broccoli*

Green Goliath
Bonanza



Pumpkins

Cheyenne Pie
Small Sugar



Brussel Sprouts*

Long Island Improved
Jade Cross



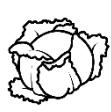
Radishes*

Cherry Belle
French Breakfast



Cabbages*

Red Acre
Golden Acre



Spinach*

Avon
Teton



Carrots*

Autumn King
Danvers Half Long



Squash

Patty Pan
Yellow CrookNeck



Cucumbers

Northern Pickling
Straight Eight



Sweet Corn*

Latte
Early Sunglow



Eggplants*

Hansel Hybrid
Diamond



Swiss Chard*

Bright Lights
Lucullus



Jalapeños*

Big Chile
Biker Billy



Tomatoes*

Nikolayev Yellow Cherry
Sasha's Altai



Kale

Dwarf Siberian
Lacinato (Dinosaur)



Turnips*

Purple Top White Globe
Tokyo Cross



*Lettuce**

Butter Crunch
Ithaca
Black Seeded Simpson
Crispy Frills



*Zucchini**

Black Beauty
Jackpot Hybrid



Cauliflower head from Linford Elementary Garden.
Photo courtesy of Reece Owens, Feeding Laramie Valley, 2011

*Flip to the back of the Garden Manual for the [step by step reference guide](#) on page 64 for this vegetable.

SEEDS

How to Read a Seed Packet

There are many transplants available for your garden, but there will be some that you will need to start by seed. There is an enormous amount of information that can fit on a 3in X 4in seed packet. All this information is particularly important to ensure that you are purchasing the correct vegetable and variety of that species for the area you want it to grow. Be aware that not all seed packets will provide the same information. This is my attempt in providing you with basic information.



Organic Blue Lake Bush, bush beans seed packet (front and back).
Photos courtesy of Celeste Hefti, Feeding Laramie Valley, 2020

The Front of the Seed Packet:

Company Name: Typically found in large print at the top of the packet.

Type of Plant: Fairly large print, usually found near the top along with a photo.

Variety: Generally found below or next to the type of plant.

Net Weight: Weight of the seeds.

Additional Info: Typically the [type of seeds](#) (i.e. Heirloom, Open Pollinated). See page 31 for each type of seeds.

Certified Organic: (USDA Organic Certification Seal)

These seeds were grown under the standards required to be certified organic by the USDA. Some seed companies utilize standards used by other certification associations and bear similar seals.



Contact Information: Address, phone number or email information of the company packaging/selling the seed. Can be located on the front or back side of a seed packet.

The Back of the Seed Packet: The back of the seed package has all the really important information that you need. It will provide planting and growing instructions and when you might expect to harvest.

Lot Number: Every container of seed is identified by a unique code that is assigned to a specific amount of seed (lot) that is mixed and shipped by the seed company. This code or lot number helps seed control officials trace the seed in the package back to the fields where they were grown.

Tested: The date the seed was tested for germination quality.

Sell By: The date is the end of the year in which the seeds were packed. This is the date that if the seed is sold by, it should meet germination standards set by the United States. Germination tests guarantee the germination rate for a particular year and every year after the sell by date there will be a decrease rate of about 50%. Meaning that a year after the sell by date, your seeds will only have a 50% chance of germinating. Additionally, the seed's level of performance or seed vigor is lost even more rapidly in comparison to other seeds.

Description: Specific characteristics of the vegetable (color, growing and storage characteristics, taste, and suggested use) will be listed.

Determinate / Indeterminate:

- Determinants will only grow so tall and stop. Most of this plant's product will mature at the same time. Great types of produce for preserving.
- Indeterminates are more of a “vining” plant (ex: certain tomatoes and pole beans) and will need support. If you want your produce to continually yield all summer until the frost this is the type you want.

Vine (Pole) / Bush:

- Vine or pole plants usually refer to squash, peas, beans, or cucumbers. These plants grow from a central point and will need some type of support. If a squash

plant is allowed to stay on the ground, another set of roots can develop at the point it touches the ground. The produce will mature during a longer time frame.

- Bush plants are more compact and generally the produce will mature in a short time frame.

Annual / Perennial:

- Annuals mean the plant will live for one year only.
- A perennial will continue to come back every year if the plant is in the correct zone and cared for properly. Some flowers, rhubarb, and herbs are perennials.

Hybrid: Plant derived from the crossing of two parent plants. A hybrid can also be organic if both parents were organic.

Note: Saving seeds from a hybrid will not breed true, i.e. it will not provide you with the same plant.

Propagation: This is the information on how and when to start the plant. Some plants are direct seed and others can be started indoors and transplanted.

- “As soon as the ground can be worked” - soil is thawed and not too wet.
- “After last frost or number of weeks after last frost” - plant after the average of the last frost in your area.
- “Directly in the garden” - plant the seed directly into your garden. Do not grow transplants.
- “When the ground has warmed to” - some seeds germinate best at specific temperatures. The seed packet will provide the ideal temperature.
- “Harden Off” - Preparing transplants for handling the temperature changes in the garden. Transplants spend a few hours outside each day for a few days until they are acclimated.

Seasonal Benchmarks:

- *Early Spring:* Soil temperature is cool, but past the last hard freeze or heavy frost. May still have light frost.
- *Late Spring:* Soil has begun to warm, and the danger of frost is past.
- *Early Summer:* Soil temperature and night temperatures have warmed.
- *Late Summer:* Soil and night temperatures have begun to cool, but still before the first frost.

- *Fall:* Soil temperatures have cooled, and light frosts occur, but before the first hard freeze or heavy frost. The ground is not frozen.
- *Winter:* Soil temperature is very cold, or the soil is frozen. Hard freezes and heavy frosts; the soil may freeze.

Zone Map: [USDA Plant Hardiness Zone Map](#) is the standard by which gardeners and growers can determine which plants are most likely to thrive at a location. Keep in mind that local variations such as moisture, soil, winds, and other conditions might affect the viability of individual plants. Most of Wyoming lies between Zone 3 and 5. Refer to page 22 to view your area's specific zone.

Planting Time: Suggested months seeds can be planted. This varies depending on current weather conditions.

Soil: The recommended soil type preferred by the plant. Some plants do best in certain types of soil and pH levels. For example, potatoes like sandy soil with a pH level of 5.3 to 6.0.

Planting Depth: Indicates how deep the seed should be planted. Seeds planted too deep may not germinate or will take longer to emerge from the soil.

Germination: The length of time a seed should emerge under good conditions. A rule of thumb is if the package indicates a seed should emerge in 10 days and 30 days have passed, scratch the surface of the ground to see if the seed has germinated. If not, replant. Check the expiration date of the seed packet, depth of planting, and temperature of soil.

Soil Temperature: Ideal germination temperature.

Plant Spacing: Approximate space between similar plants after thinning.

Days to Maturity: Approximate number of days for vegetable/fruit to mature after germination. *Caution:* Make sure you select varieties that will grow to maturity within your growing season.



Sun: Usually indicated by a picture depicting partial or full sun. This is the amount of optimum sunlight the plant needs. Most plants require a minimum of 8 hours of full sun without shade. *Note:* Leafy vegetables can grow in partial shade.

Water: Gauges how much water the plants need to provide a mature product. Texture of soil, air temperatures and wind play important roles in determining the amount of water needed. Usually, a minimum of 1 inch of water is needed each week. The amount of time you need to spend watering depends on your water pressure and the type of soil.

Harvest: Provides approximate information on when the product is mature and ready for picking. See page 55 for a [harvesting guidelines](#).

Seed Storage: Information to help you store excess seed for the next growing season. Some seeds will need dry, cool, dark areas and others may need refrigeration. See page 58 and 62 for [how to store your vegetables over winter](#) and several [storage space ideas](#).



Properly space out your plants so that each one can get sufficient nutrients, sunlight, and have room to grow. Look on the back of your seed packet for recommended spacing.

Photo courtesy of the Hurley Family, Growing Resilience, 2016

Not All Seeds are the Same

Genetically Modified Organism (GMO):

According to the USDA, genetic modification is “the production of heritable improvements in plants or animals for specific uses, via either genetic engineering or other more traditional methods.” In some countries, GMO is strictly used in the context of genetically engineered organisms. GMO varieties will maintain their characteristics if saved and replanted. However, since these seeds are patented, ***it is illegal to save GMO seeds for next season’s use.***

Genetically Engineered (GE):

Genetically engineered organisms are generally what is referred to when the public uses the term GMO. These varieties have genetic components that were not generated through traditional breeding practices, i.e. not sexually inherited. They are created by using molecular genetic techniques like gene cloning and protein engineering to directly alter an organism in a way that would not occur naturally by nature.

Examples: Corn modified with a naturally occurring soil bacterium for protection from corn borer damage (Bt-corn), and herbicide-resistant (“Roundup Ready”) soybeans, corn, cotton, canola, and alfalfa. All of these are agronomic, commercial crops.

Hybrid:

To create hybrid vegetables, breeders select desirable characteristics from two or more unique parent plants (of the same genus, species, or variety) and cross-pollinate them in a controlled environment to create a plant with the best features of the parent plants. Hybrid vegetables have benefits such as disease resistance, higher yields, and better uniformity. Seeds saved from hybrids tend to revert to the qualities of the individual parents. Produce grown from a saved hybrid plant seed will not be the same as the year before.

Open Pollinated (OP):

Seeds that are produced by pollination from wind, insects, or self-pollination. Seed saved from open-pollinated varieties will produce plants that are essentially the same as the plants from which the seed was originally harvested.

It is important when growing different varieties of the same vegetable to maintain the recommended distances and keep them separated so that an unintentional “cross” or hybrid cultivar isn’t produced.

Heirloom:

Generally produced through open pollination, heirloom varieties of fruits and vegetables have been passed down several generations through the process of seed saving; there are exceptions such as heirloom apples that have been propagated through grafting and cuttings of older trees. These varieties typically have cultural significance to a geographical area and desirable characteristics like taste and/or appearance.

Variety:

Differentiation within a species that breed true-to-seed or will produce the same plant with harvested seed. Typically, these characteristics are distinguishable by geographic area, qualitative, and/or quantitative traits.

Cultivar:

Similar to a variety except in that its seed will not breed true or will not produce a plant with the same representative characteristics of the parent.

Organic or Certified Organic:

These seeds have been grown in compliance of the USDA's National Organic Program and inspected by a USDA certifier. The land that the seed was grown on cannot have had any prohibited substances applied for three years prior. Synthetic fertilizers, pesticides, sewage sludge, irradiation, genetic engineering, and treating seed with fungicides are also prohibited. Companies selling organic or certified seed will usually identify it by the USDA Organic Seal or state it somewhere on the packaging.



Seeds collected from last year's gardens stored in jars.

Photo courtesy of Sydney Edwards, Feeding Laramie Valley, 2019

Coated Seeds

Pelleted:

Seeds that are enclosed in an inert material to form a pellet. This process is used with small seeds like lettuce, carrots, and onions. Pelleted seeds are normally used in larger farming projects when using commercial seed planting equipment for exact seed spacing. Recently seed companies are beginning to offer some smaller packages of pelleted seed for the home gardener.

Sometimes seeds are coated with a polymer to control germination. Seed coatings produced with an inert powder such as pumice can be of two types:

- Split coats – the pelleted seed can absorb water, transfer this water to the seed and split exposing the germinating seed.
- Melt coats – the coating dissolves when wet and gradually washes away from the seed.

Treated:

Treated seeds are usually coated with a fungicide, bactericides, and insecticides to protect seed from pathogens when germinating.

Film Coated:

A thinner colored coat is applied to the seed that does not change the shape but does increase the weight of the seed. This is sometimes used to seal any insecticide or fungicide that has been applied to the seed and protect the handler from toxic chemicals. Film coating is also used to help seed flow through a planter box when planting. The color also makes the seed easier to pick out of the soil when checking for spacing during planting.



Non-coated or treated seeds - Photo courtesy of Feeding Laramie Valley, 2017

IRRIGATION

With proper watering, your soil generally should stick to your hands and be able to form into a loose ball. If your soil is very sandy, it may not hold together as well but should still feel moist (not runny). Over-watering affects the availability of nutrients to the plant. It results in lack of oxygen and a poor root system. The efficiency of nutrient uptake is reduced and nutrient deficiencies, such as iron deficiency, might develop. In addition, over-watering leaches nutrients from the root zone.

Under-watering may also affect nutrient availability to the plant. When the soil is dry, the movement of water through the soil is reduced. Since nutrients move in soil together with water, their availability to the plant is reduced as well.



Watering recently planted seeds - Photo courtesy of Sydney Edwards, Feeding Laramie Valley 2019

When watering your plants try and remember the following:

Do:

- Water deeply - You want to make sure the water goes down to the roots, not just the soil surface. If you are unsure, dig a small hole about 6 inches deep. If the soil is dry, water for a little bit longer.
- Water 2-3 times per week (depending on the plant, water more or less).
- Ideally, water early in the morning - Less water will be lost to evaporation later in the day. This will also allow the foliage to dry during the day and prevent rot and disease.
- Use a slow stream of water - This allows the soil to soak up the water. It makes it easier to stop watering before the water starts pooling up or running off.
- Water at ground level - This will reduce risk of rot or disease from wet foliage.

Do not:

- Let water pool up - This will lead to your plants being overwatered, can lead to disease, and can cause your nutrients to leach out.
- Mist your plants - Consistently wet foliage is more susceptible to disease.

- Water in the late afternoon - It can cause water-stress in your plants. A lot of water will be lost to evaporation and will not make it down to the roots. Additionally, your foliage will likely still be wet at night and can lead to rot and disease.
- Use a fast stream - If you are using a hose, keep the direct fast-stream directed away from your plant, otherwise your water will be more likely to run off and not absorb into the soil. Ideally, use a slow-stream or trickle system.

Types of Irrigation

An adequate supply of water during the growing season is directly related to the quality and yield of produce. Some vegetables will become strong-flavored or stringy when under water stress. About an inch of water every four days is an average application. If it is hot and windy, your plants will need additional water. When plants are in bloom or producing, they will need an even larger amount of water. A soil probe can be used to check the moisture in the soil. Unfortunately, they are not always accurate. A spade can be used to dig a small hole to check for moisture. If the top two inches of soil are dry, go ahead and water.

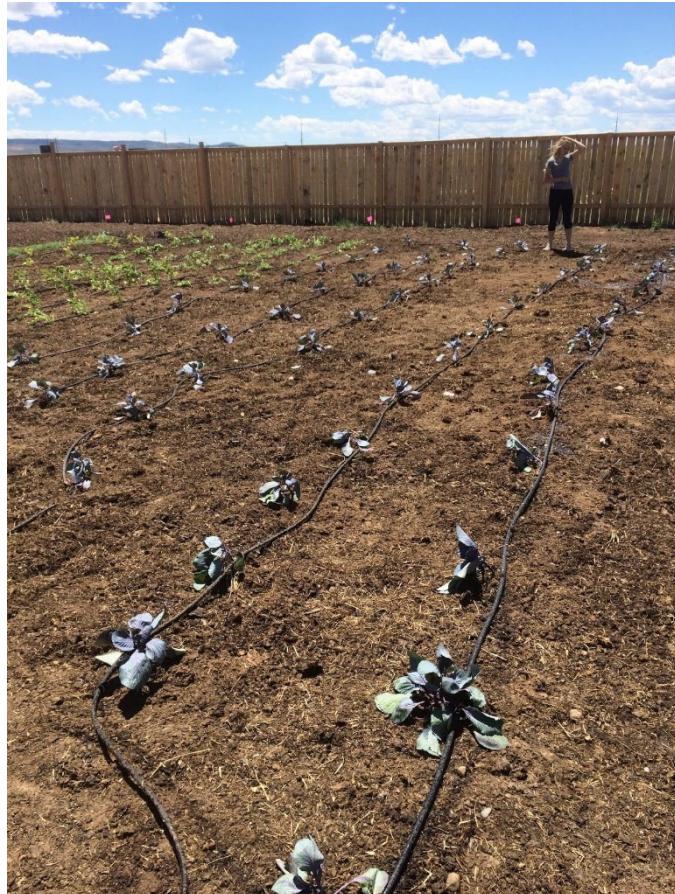
Furrow Irrigation: This method is used if your water comes from an irrigation ditch and your garden is planted row-style. Carefully adjust the flow of water so that it reaches the end of the row in a third of the time you plan to irrigate. If you are running your water for 30 minutes, you adjust your flow so that it reaches the end of the row in 10 minutes.



Furrow irrigation using siphon tubes from a lateral waterway, Colorado, NRCS

Sprinkler Irrigation: If your garden is in a high wind area, using a sprinkler system can be difficult. Place empty tuna cans in and around your garden. Run the sprinkler approximately every four days until the water in the cans measures 1 inch. Taller crops will interfere with water distribution on shorter crops. *If you have plants susceptible to foliar disease overhead sprinklers are not recommended.*

Drip Irrigation: This method involves using drip tubes with emitters and bubblers. Drip tubes can be placed on the ground or under mulch and emitters are spaced between (6-12-24 inches) wherever you want the water to come out. Because these systems plug easily, it is recommended that they be used with a clean water source (such as city water). Check moisture level regularly with a water probe or dig a small hole. A filter system is recommended for a drip irrigation system.



Basic drip irrigation system in the cabbage rows.
Photo courtesy of Reece Owens, Feeding Laramie Valley, 2016

Soaker Hoses: This system has water oozing out the entire length of the hose. Pressure regulators may be needed to keep the hose from rupturing. Run a normal garden hose to the spot you want irrigated and then attach the soaker hose. Check moisture level with a water probe or dig a small hole. Hard water will eventually destroy the hose.

Timers: Can be used on sprinkler, drip, and soaker hose systems to come on and off for your convenience.

My least favorite type of irrigation is the sprinkler system because water is being applied to the entire garden, not just where your vegetable plants are growing. In addition to using excess water, this type of irrigation can encourage weeds to grow. It is not an effective use of water in high wind conditions.

COMPANION VS. POOR COMPANION PLANTINGS

Many plants have natural substances in their flowers, roots and leaves that can repel or attract insects depending on the needs of your garden. Some of these substances have also been known to increase growth rate and flavor of certain plants. Tall plants can provide shade for those varieties that are sensitive to full sun or protection from the wind. With careful selection of companion planting you let nature do its job.

On the other hand, some plants will restrict the growth of other plants or compete for nutrition in the same way. The chart below is a guide of companion and poor companion plant suggestions. Plant the poor companions a minimum of four feet away from each other or on the other side of your garden.

CROP:

Asparagus

COMPANIONS:

Tomato, Basil, Jalapeños



POOR COMPANIONS:



Beans, Bush

Potato, Cucumber, Strawberry,
Celery, Zucchini, Chard

Onion, Bell Pepper

Beans, Pole

Corn, Radish, Zucchini, Chard

Onion, Beets, Kohlrabi, Sunflower,
Bell Pepper, Brussels Sprout

Beets

Cabbage & Onion Families,
Lettuce, Brussels Sprout

Pole Beans

Bell Pepper

Carrots, Cucumber, Spinach

Beans, Broccoli, Peas

Broccoli

Celery, Onion Family, Potatoes

Bell Pepper, Jalapeños, Lettuce

Brussels Sprout

Beets, Celery, Turnip

Strawberries, Pole Beans, Lettuce

Cabbage Family

Aromatic herbs, Celery, Beets,
Onion Family, Spinach, Chard

Dill, Strawberries, Pole Beans,
Tomato, Jalapeños

<i>Carrots</i>	English Pea, Lettuce, Tomato Bell Pepper, Onion Family, Sage, Brussels Sprout	Dill
<i>Celery</i>	Onion & Cabbage Families, Tomato, Bush Beans, Broccoli	-
<i>Chard,</i> <i>Swiss</i>	Onion Family, Beans	Potato, Corn
<i>Corn</i>	Potato, Beans, English Pea, Pumpkin, Cucumber, Zucchini	Tomato, Chard
<i>Cucumber</i>	Beans, Corn, English Pea, Sunflowers, Radish, Bell Pepper	Potato, Aromatic herbs
<i>Eggplant</i>	Beans, Marigold, Tomato, Jalapeños	Fennel, Mint
<i>Jalapeños</i>	Eggplant, Asparagus	Cabbage Family, Broccoli
<i>Lettuce</i>	Carrot, Radish, Strawberry, Cucumber	Broccoli, Brussels Sprout
<i>Onion Family</i>	Beets, Carrot, Lettuce, Cabbage Family, Chard	Beans, English Peas
<i>Pea, English</i>	Carrots, Radish, Turnip, Cucumber, Corn, Beans, Spinach	Onion Family, Potato, Bell Pepper
<i>Potato, Irish</i>	Beans, Corn, Cabbage Family, Marigolds	Pumpkin, Tomato, Cucumber, Spinach, Zucchini, Chard, Radish, Turnip
<i>Pumpkin</i>	Corn, Marigold	Potato, Zucchini

<i>Radish</i>	English Pea, Lettuce, Cucumber, Spinach	Hyssop, Turnip, Potato
<i>Spinach</i>	Strawberry, Peas, Radish, Bell Pepper	Potato
<i>Tomato</i>	Onion Family, Marigold, Asparagus, Carrots, Cucumber, Eggplant	Potato, Fennel, Cabbage Family
<i>Turnip</i>	English Pea, Brussels Sprout	Potato, Radish
<i>Zucchini</i>	Beans, Corn	Potato, Pumpkin



Be sure to label your plants so you know what you planted.
Photo courtesy of Reece Owens, Feeding Laramie Valley, 2016

NUTRIENT DEFICIENCIES IN PLANTS

Plants need the right combination of nutrients to grow healthy and produce an edible product. Too little or too much of any one nutrient can cause problems, and your plants will show signs of stress or die. If more than one problem is present such as water stress, insect infestation, and disease, along with a nutrient deficiency, typical symptoms may not be easily identified.

The two categories of plant nutrients found in the soil are macronutrients and micronutrients. Macronutrients are those elements that are needed in relatively large amounts. They include nitrogen, potassium, phosphorus, sulfur, calcium, and magnesium. Micronutrients are those elements that plants need in small or trace amounts such as iron, boron, manganese, zinc, copper, chlorine, and molybdenum.

Plants naturally obtain these nutrients through their root system. However, there are certain conditions that plants need to absorb these nutrients from the soil. Soil should be wet enough to allow the roots to take up and transport the nutrients. The pH of the soil must be within the range for nutrients to be released from the soil. Certain soil temperatures assist with nutrient uptake. Each species of plant can have a different optimum range for each of these conditions.

Nitrogen (N) develops healthy leaves and stems. Blood and bone meal, fish meal and emulsion, hoof and horn meal, soybean, cottonseed, and kelp meals all contain nitrogen and can be dug into the soil prior to planting or used as a side dressing. Too much nitrogen could cause the plant to produce too many leaves and no blossoms or fruit.

Phosphorous (P) is needed to grow, flower, and develop healthy root systems. Use rock and soft phosphates, bone meal, and cottonseed meal. Too much phosphorus can cause increased weed production and stunted vegetable plant growth. Sometimes manure can have a high content of phosphorus.

Potassium (K) is needed by plants to strengthen plant tissue, provide disease and pest resistance, aid in the flow of water and nutrients up and down the plant, and develop chlorophyll. Kelp meal and green sand are good sources of potassium. Use extreme caution if using wood ash or lime to increase the potassium level, as it can also raise the pH level of your soil. Typically, wood ash and lime are used on the soils in eastern states. Lemon and orange rinds and banana peels buried in the garden or added to your compost pile will aid in adding potassium to your soil. Granite dust, poultry manure and potash are other sources. However, these may have additives such as sulfate or potassium chloride in it. Refer to your [soil test](#) (see page 8) for the appropriate blend.

Signs of Nutrient Deficiencies

<i>Nitrogen</i>	Yellowing seen along the middle of lowest leaves
<i>Potassium</i>	Yellowish orange on the outside of lowest leaves
<i>Phosphorus</i>	Reddish-purple on outside of leaves, mostly on young plants
<i>Sulfur</i>	No spotting; light green leaf with pale green veins in top leaves
<i>Calcium</i>	Dark green leaves with new buds eventually dying
<i>Magnesium</i>	Whitish stripes along leaf veins and purplish underside
<i>Iron</i>	Most of leaf pales while veins stay green in newer leaves
<i>Boron</i>	Discoloration, breaking and dropping of leaf buds
<i>Manganese</i>	Pale leaves and patterned dark green along veins of new leaves
<i>Zinc</i>	In newer leaves, dark spots along leaf and edges; leaf is pale
<i>Copper</i>	Pale pink between newer leaf veins, eventually wilts and drops
<i>Chlorine</i>	Wilting, leaf mottling and yellowing
<i>Molybdenum</i>	Leaf is light green/lemon, dark spots on whole leaf except veins



Signs of nutrient deficiencies can include spotting.
Photo courtesy of Celeste Hefti, Feeding Laramie Valley, 2020

INSECTS

“When we kill off the natural enemies of a pest, we inherit their work!”
C. B. Huffaker

Beneficial Insects



Not all insects are detrimental to a garden, and many are an absolute necessity for pollination and controlling other insects. Using biological control can also minimize the use of insecticides. Remembering these tips may help in control of unwanted pests.

- Select the right predators/parasites for the job
- Maintain the right environment that nurtures the beneficial insect
- Timing is critical. Hosts at the correct life cycle must be available
- Follow the supplier's tips on applications

INSECTS:	BENEFITS:	HOW TO ATTRACT:
Aphid Midges	Eat aphids.	Grow dill.
Bees	Pollinate your fruit and vegetable plants.	Grow pollinating flowers, tomatoes, raspberries, peppers, squash, etc.
Braconid Wasps	Their larvae eat tomato hornworms, caterpillars, and several types of insects. Adults eat aphids, codling moths, garden webworms, grasshoppers, cicadas, lace bugs, ants, cabbage loopers, beetles, and flies.	Grow nectar plants with small flowers such as dill, parsley, wild carrot, and yarrow.
Damsel Bugs	Eat caterpillars, mites, aphids, and cabbage worms.	Grow caraway, spearmint, and fennel.
Ground Beetle	Eat slugs, snails, ants, cutworms, cabbage maggots, caterpillars, nematodes, thrips, weevils, and silverfish. They also help decompose your compost.	Grow perennials and plants that act as a ground cover (clover, amaranthus, and vetch). A compost or mulch pile will also attract them.

Hoverflies (Syrphid Flies)	Their larvae eat aphids, thrips, scales, moth eggs, mites, beetles, and caterpillars. Adults help pollinate your garden.	Grow common yarrow, fern-leaf yarrow, dill, and basket-of-gold.
Ladybugs	Eat aphids, mealy worms, leafhoppers, potato beetles, and mites.	Grow dill, fennel, yarrow, angelica, caraway, goldenrod, and coreopsis.
Minute Pirate Bugs	Eat almost all bugs, especially good for aphids, spider mites, and thrips. Warning: These may also eat your beneficial bugs.	Grow alfalfa, daisies, goldenrods, and yarrow.
Praying Mantis	Eat caterpillars, flies, grasshoppers, aphids, leafhoppers, spiders, moths, beetles, and crickets.	Grow shrubs, dill, raspberry, roses, and marigold. They particularly love tall grass.
Soldier Beetles	Eat grasshopper eggs, aphids, and soft-shelled insects.	Grow goldenrod, catnip, hydrangea, zinnias, marigolds, and linden trees.
Spiders	Eat aphids, caterpillars, grasshoppers, and fruit flies.	Grow larger plants such as corn so they have space to weave their webs.
Spine Soldiers	Eat caterpillars and beetle larvae (including Colorado Potato Beetle and Mexican Bean Beetle).	Grow perennial flowers.
Tachinid Fly	Their larvae eat grasshoppers, gypsy moths, cabbage loopers, Japanese beetles, armyworms, cutworms, sawflies, codling moths, peach twig borers, pink bollworms, tent caterpillars, squash bugs, and many more. Adults help pollinate your garden.	Grow dill, parsley, sweet clover, and other herbs.
Trichogramma Wasps	Their larvae eat armyworms, cabbage worms, codling moths, cutworms, leafrollers, squash vine borers, tomato hornworms, treehoppers, webworms, various caterpillars, and more.	Grow fern-leaf yarrow, common yarrow, lobelia, sweet alyssum, marigold, crimson thyme, zinnia, caraway, coriander, fennel, parsley, and Queen Anne's lace.



Beneficial insects: Green Lacewing, Ladybug, Ground Beetle, and Praying Mantis.

Plants that Repel Insects

Certain plants contain properties that repel harmful insects. Before reaching for insecticide, try planting these plants which have natural repelling properties. Using less insecticides also means more good bugs in your garden. Remember, each garden has their own microclimate and characteristics, so some experimenting on your part will be needed to decide what works best for your situation. Below are a few common plants that are used for repelling harmful insects, however it is unlikely they are perfect solutions when considered alone.

Flowers:

- **Alliums (Chives, Leeks, Shallots):** Repel slugs, carrot flies, Japanese beetles, cabbage worms, and aphids.
- **Chrysanthemums:** Repel nematodes, spider mites, harlequin bugs, Japanese beetles, lice, fleas, ticks, cockroaches, silverfish, lice, and ants.
- **Geraniums:** Repels cabbage moths, Japanese beetles, and leafhoppers.
- **Marigolds:** Repel aphids, mosquitos, whiteflies, lice, and nematodes.
- **Nasturtiums:** Repels squash bugs, beetles, cabbage loopers, aphids, and whiteflies.
- **Painted Daisies:** Repels aphids, cabbage moths, harlequin bugs, leafhoppers, nematodes, spider mites, and ticks.
- **Petunias:** Repels aphids, tomato hornworms, asparagus beetles, leafhoppers, and squash bugs.



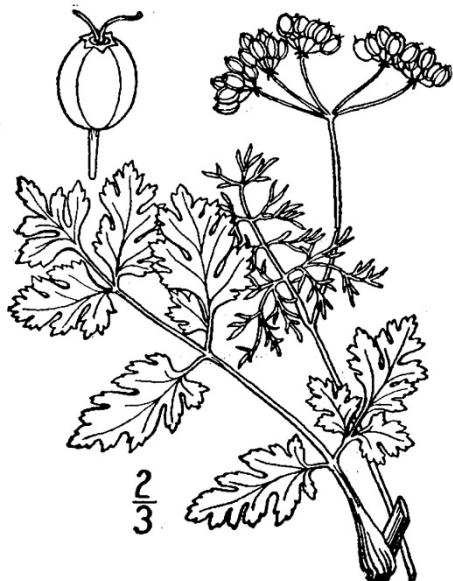
Planting marigolds repels many unfriendly insects.
Photo courtesy of Reece Owens, Feeding Laramie Valley, 2013

Herbs:

- **Basil:** Repels whiteflies, asparagus beetles, house flies, carrot flies, mosquitoes, and gnats.
- **Borage:** Repels hornworms and cabbage worms.
- **Catnip:** Repels aphids, ants, squash bugs, cockroaches, and Japanese beetles.
- **Coriander (Cilantro):** Repels aphids, Colorado potato beetle, and spider mites.
- **Dill:** Repels aphids, spider mites, squash bugs, cabbage loopers, and tomato hornworms.
- **Fennel:** Repels aphids, slugs, and snails.
- **Lavender:** Repels flies, fleas, mosquitos, caterpillars, and moths.
- **Parsnip:** Repels fruit flies, house flies, red spider mites, and pea aphids.
- **Peppermint:** Repels aphids, whiteflies, squash bugs, and mosquitos.
- **Rosemary:** Repels carrot flies, cabbage loopers, snails, and slugs.
- **Sage:** Repels cabbage and carrot flies, black flea beetles, cabbage loopers, and maggots.
- **Spearmint:** Repels moths, beetles, ants, aphids, cabbage loopers, and squash bugs.
- **Thyme:** Repels white flies, ants, cabbage loopers, maggots, corn earworms, and tomato hornworms.
- **Wormwood:** Repels codling moths, carrot flies, cabbage loopers, ants, and whiteflies.

Other:

- **Garlic:** Repels Japanese beetles, carrot flies, root maggots, aphids, spider mites, caterpillars, cabbage loopers, ants, and even rabbits.



Coriander is useful for repelling unfriendly insects and attracting beneficial insects such as ladybugs and green lacewings - Image courtesy of USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. An illustrated flora of the northern United States, Canada, and the British Possessions. 3 vols. Charles Scribner's Sons, New York. Vol. 2: 647.

Insect Damage Prevention

A healthy garden is the best defense to prevent an invasion of insect damage. The following are suggestions for maintaining a healthy garden:

- Build healthy, organic soil using properly heated compost or manure. Use clean mulch as a top dressing.
- Remove weak plants and transport them to the garbage farthest from your garden.
- Seaweed mulch or spray contains many trace elements that plants need.
- Clear garden of debris and weeds to minimize insect habitat.
- Rotate crops each season to avoid re-infestations of pests that may have survived over winter.

- Intermix plants—refer to “[Plants that Repel Insects](#)” section (page 44).
- Water the soil near your plant, not the foliage.
- Disinfect all your tools between garden areas, or at a minimum, after you have been working with infested plants.
- Wash your hands prior to gardening and after handling infested plants.



Inspect your plants often to assess insect damage and maintain a healthy garden.
Photo courtesy of Celeste Hefti, Feeding Laramie Valley, 2020

Insect Control Options

The terms “pesticide” and “insecticide” are sometimes used interchangeably but they are not the same product. Insecticides are specifically for killing insects. Pesticides are used to manage, kill, and repel insects, rodents, mites, weeds, slugs, and snails. Unfortunately, these products are not always selective in destroying insects. Beneficial insects can also be a casualty using some of these products. Below are some suggestions for organic control.

- Visiting your garden daily, hand-picking insects and placing them in a bucket of soapy water.
- Use floating row covers as temporary barriers to get plants past critical stages.
- Pheromone traps are filled with strong odors that attract the opposite sex. Unfortunately, the males are attracted but not the females.
- Sticky traps are made of a rigid material of various colors and are coated with a sticky substance. Insects that are attracted to that color are caught. This trap also catches beneficial insects.
- Insecticidal soap contains unsaturated long-chain fatty acids from animal fats that dissolve the skin of insects. The insect must come in contact while the soap is liquid. If the product is dry it will not have any effect on the insect. Do not use this product during the heat of the day.
- Oil sprays are used to suffocate the insect and must come in direct contact with the insect. Do not use this product if your plant needs water or during the heat of the day.
- Bacillus Thuringiensis (BT) is a naturally occurring bacterium in the soil. This product comes both in a liquid or dry form and is used to target one specific type of insect. When the insect takes a bite of a plant that BT has been applied to, a protein is released, the insect stops feeding and dies in a few days.
- Parasitic Nematode - Not to be confused with the root-knot nematode. Once the nematode is inside the insect, it releases a bacterium that kills the insect within a couple of days.

Current Organic Insecticides

Insect Dust Diatomaceous Earth: Fine talcum type powder made from tiny fossilized water plants. This dust has microscopic, razor sharp edges to cut through the insect’s protective covering, drying it out and killing them. If the powder is ingested, it will shred their insides. Avoid breathing in the dust. It can be used to control adult flea beetles, sawfly, coddling moth,

twig borer, thrips, mites, cockroach, slugs, snails, aphids, earwigs, silverfish, ants, and spider mites. It can also be used for bedbugs, cabbage root flies, carrot root flies, fleas, and pill bugs.

Milky Spore Powder: Is a natural occurring bacterium that controls Japanese Beetle grubs.

Safer Brand Insect Soap: Kills soft bodied insects such as aphids, mites, and more on contact.

Bonide Insecticidal Soap: Insecticidal soap is a contact killer for both insect and mite pests. It kills pests by disrupting membrane and cellular functions of the pests. Use on adelgids (egg sacks that resemble small tufts of cotton), aphids, earwigs, grasshoppers, psyllids, scale insects, tent caterpillars, sawfly larvae, wooly aphids, thrips, whitefly, and wooly aphids.

Neem Oil: A component in Neem Oil is Azadirachtin which helps deter insects from feeding on your plants, acts as a repellent and interferes with the hormone system preventing them from maturing to the egg laying adult sage. It breaks the cycle of the insect population. Neem Oil also acts as a fungicide against fungi, mildew, and rusts. Use against nematodes, mites, aphids, whiteflies, thrips, hornworms, leafminers, gypsy moths, weevils, webworms, loopers, and sawflies.

Monterey Horticultural Oil: Insects, mites and eggs are killed with direct contact with the oil by smothering. Insects affected are aphids, bristly rose slug, rose leafhoppers, scale, thrips, whiteflies, and mites.

Nolo Bait: Nolo Bait contains a Nosema locustate spore that is consumed by the insect that causes them to become lethargic and stop eating. They are then eaten by healthy grasshoppers causing a domino effect. Infected females can pass the spores through the egg-laying process. Use for killing grasshoppers and Mormon crickets.



WEEDING

A weed is simply defined as a “plant out of place” and can range from a pine sapling growing in your flower beds to finding arugula in a spinach bed. In some cases, these uninvited plants are called “volunteers” when they have been planted elsewhere in the garden but have since wandered. Weeds can indicate properties of soil health like compaction or nutrient deficiencies, so if species continue appearing after several seasons, it might be in your best interest to do a [soil test](#) (page 8) or ask a soil consultant. For short-term solutions, proper weeding is critical for your garden’s health.



Pull weeds often to avoid weeds taking over your garden. Make sure to remove the entire plant (roots, leaves, flowers) to prevent them from coming back - Photo courtesy of Sydney Edwards, Feeding Laramie Valley, 2019

Tips for weeding:

- Weed when soil is moist (not wet).
- *Do not pull weeds by their foliage*, pull by the base of the stem to remove the roots.
- For larger weeds, use a gardening trowel or hand spade to help you dig the roots up.
- Remove all parts of the weed including the leaves.
 - **Note:** Never add any parts of weeds to your compost pile.
- Use a hoe for when weeds are just poking out (shallow cultivation).
- At their sprouting stage, vegetables and weeds can be easily confused. If it is difficult to discern the two, wait several days until identifiable features, like the vegetable's true leaves, can be seen before pulling any out.

Common weeds you may find in your garden:

Barnyard Grass - This grassy weed is found in moist, nutrient-rich soils such as garden beds or lawns. They typically have thick stems, with a purple tint near the base of the stem. Their leaves are flat and smooth, typically growing 4-12 inches long with a distinct white midvein. Their seedpods look quite spiky and can grow to be 4-8 inches long.



Barnyard grass.

Black Nightshade - This weed is found in ditches and cultivated fields. Their leaves are smooth or slightly hairy with a wavy edge. Young leaves are slightly purple underneath. Their flowers are white with five petals and closely resemble tomato and potato flowers.



Black Nightshade.

Canada Goldenrod - Found in pastures, hayfields, and ditches along the road. Their leaves are smooth with jagged edges. Leaves typically have three veins on the upper surface. The flowers are small and bright yellow, and typically grow in tight clusters. The stems have tiny spikes on them that are usually felt, not seen. Some Goldenrods may be edible but beware of poisonous look-alikes.



Fully grown Canada Goldenrod.

Common Purslane - Found in gardens, open fields, and sandy soils. Their leaves are deep green, teardrop-shaped and fleshy. Their leaves feel like a typical succulent. This low-lying, creeping weed usually does not grow higher than 6 inches. Stems have a slight reddish or bronze sheen. Their flowers are extremely small, yellow, and typically have 5 petals. These weeds are edible and highly nutritious but beware of poisonous look-alikes.



Common Purslane - Photo courtesy of Reece Owens, Feeding Laramie Valley, 2020

Curly Dock - Found in disturbed soils such as gardens, fields, or roadsides. Their leaves are bright green, smooth, wavy, and slightly thick. Their stems are tall, not usually branched and have a reddish tint, especially in cooler temperatures. Their flowers are small and green. Parts of these plants are edible but beware of poisonous look-alikes.



Seeding Curly Dock - Photo courtesy of Blake Lineweaver, Feeding Laramie Valley, 2020

Dandelion - Possibly the most easily recognized weed. They typically grow in well-watered or moist areas such as gardens, lawns, pastures, and meadows, but are known to pop in cracks in the pavement and other odd locations. Their leaves are spiky, toothy, deeply notched, and hairy. Leaves are generally clustered at the crown of the root and can be from 2-12 inches long. The flowers are yellow with petal-like rays. Dandelion plants (root, flower, and leaves) are edible, but beware of poisonous look-alikes.



Dandelion leaves - Photo courtesy of Celeste Hefti, Feeding Laramie Valley, 2020

Kochia - Commonly found in gardens, cultivated fields, roadsides, and ditches. Leaves are fuzzy, green-gray, and small. More mature leaf blades have 3-5 veins and are 0.5-2 inches long. The flowers are usually inconspicuous. Seedlings typically appear like a green-gray mat and will quickly take over all available space.



Kochia plant leaves are typically hairy.
Photo courtesy of Celeste Hefti, Feeding Laramie Valley, 2020

Prostrate Pigweed - These are commonly found in gardens, lawns, near roads or creeks. They do very well in sandy soils. Leaves are oval with broader tips at the base, and about 0.5 inches wide. Stems are generally smooth and red or purple. Flowers are typically small and grow in clusters. These weeds typically sprawl along the ground in a circular form and are low-lying.



Close up of a prostrate pigweed.

Russian Thistle - These are common in dry regions in Wyoming and can be found in rangelands and irrigated cropland. Seedlings look like grass seedlings when they first emerge. Seedlings have long, narrow, and fleshy leaves. Mature leaves are narrow, small, and scale-like. Stems are branched, with red or purple stripes. Flowers are green and have spiny floral bracts. These are large bushy plants that can grow between 0.5-3 feet tall. These are commonly blown along in the wind once they dry out, break off, and tumble across your neighborhood.



Russian Thistle stems are usually red or purple striped.

Tumble Pigweed - This bushy weed is typically found in gardens, croplands, rangelands, and roadsides. Leaves are pale green with red on the underside. They are teardrop-shaped with wavy edges. Seedling leaves are a dark green on the top and reddish or purple on the underside. Stems are erect, spiny, light green or white and heavily branched. Flowers grow in small clusters at the base of leaves. These are commonly blown along in the wind once they dry out, break off, and tumble across your neighborhood spreading their seeds along the way.



Tumble Pigweeds grow bushy when matured.

HARVESTING GUIDELINES

Knowing when to pick your vegetables can be tricky. Information on the back of the seed packet will give you an estimate of when your vegetables should mature. However, many things can affect the date when your vegetables are at their prime including: soil fertility, temperature and amount of precipitation received during the growing season.

Leafy vegetables, such as spinach and lettuce, normally taste better when they are young. Fruit bearing vegetables, like tomatoes and peppers, have more flavor when they are more mature. The taste for some root crops improves after a slight frost. Some root crops can actually stay in the ground through fall and part of winter until you are ready to use them. You will want to harvest herbs before they go to seed.

When to harvest your vegetables is also a personal preference. The intended use for your vegetable will determine when you want to pick it. An example would be letting a zucchini grow larger for baking bread or stuffing.

Note: I prefer to harvest early in the morning after the dew has dried. Vegetables will have a higher water content during that time.



Harvesting spinach. Use scissors or pruners to save time.
Photo courtesy of Sydney Edwards, Feeding Laramie Valley, 2019

Below are some general guidelines when certain vegetables are ready for picking:



Asparagus: Pick when they are about 8 inches tall and 3/4 inch in diameter. Stop harvesting about 5 weeks after initial harvest. This will give the asparagus time to fern out, produce seed, and store the nutrients they need to survive the winter.



Beans: Pick when they are plump, but you cannot see the seeds bulging out. They should snap in half easily.



Beets: Ready for harvesting when you can see the shoulders protruding from the soil. Remember the beet tops are edible. Harvesting a few leaves off each plant is ok, just leave enough on the plant for the photosynthesis process to continue.



Broccoli: Pick before the flower buds open.



Brussels Sprouts: They mature from the bottom up. Pick by twisting off the Brussels sprout from the stalk when they are one inch in diameter.



Cabbage: Harvest when the head feels firm. The cabbage will split if it gets too large.



Carrots: The variety and your personal preference will determine when you pick your carrots. Look for shoulders protruding from the soil. Carrots can be left in the ground for harvesting during the winter and may taste sweeter. Be sure to mulch well with straw.



Cauliflower: Cauliflower is one vegetable that I have had difficulty growing in this area. The heads normally won't get very large. Harvest when the head looks full and while the curds of the head are still smooth.



Corn: Harvest when the silks dry out and turn brown. The kernels should be plump and emit a milky sap when punctured.



Cucumber: Depending on the variety, the desired cucumber size will vary. Harvest when they are firm and smooth. Do not allow them to turn yellow unless it is a yellow variety of cucumber.



Garlic: Dig the plants up when the second set of leaves begins to yellow, which may occur as early as July, or when the tops will fall over and turn brown. Dig up and dry the garlic bulbs in a cool, dark place. Do not wash before storing.



Kale: Harvest when the color is a deep green and have firm leaves. You can harvest Kale throughout the growing season. This may keep overwinter if well covered with straw.



Kohlrabi: Harvest when the bulb is about 3 inches in diameter.



Leeks: Harvest when stalks are 1 inch in diameter.



Lettuce: My preference is growing leaf lettuce (Romaine). Harvest the outer leaves when they get 4 to 6 inches tall. Harvest head lettuce (butter) when it feels slightly firm.



Onions: A bunching onion can be harvested at any size you want. Onions grown for bulbs should be harvested after the tops have fallen over. Dig them up and let dry before storing. Some varieties will store better than others.



Spinach: Harvest when the leaves are about 6 inches long, cutting away the outer leaves first. Make sure you harvest before the flower stalk forms.



Winter Squash and Pumpkins: Cut vines 2-3 inches long and remove any blossom remnants from mature squash. After harvesting, let your squash cure in a warm, sunny, well-ventilated place between 75-80°F for approximately 10 days. Curing toughens up the skin and extends its storage life. When ready for storage the outer skin should be very firm.



Harvesting the garden - Photo courtesy of Reece Owens, Feeding Laramie Valley, 2013

STORING VEGETABLES DURING THE WINTER

Storage of vegetables after harvest was common practice by our ancestors. With access to a larger variety of fresh produce year-round, the need for home storage has decreased. However, there are benefits of having home storage if you have a garden and have excess amounts of fruits and vegetables that store well that you would like to enjoy later in the year. Usually, produce grown in the garden has better flavor and, most importantly, you can control how your vegetables are raised. Below are some basic suggestions to keep in mind while storing your vegetables for the winter.

- **Store Things Dry and Dirty:** The process of cleaning things causes tiny scratches and damage that may shorten the storage life of the produce, so store things dirty but dry and wash right before use.
- **Store Only the Healthy:** When you store your produce, check for disease and damage. Do not store any diseased produce and set aside damaged produce for early use.
- **Check Periodically:** Go through your stored produce and remove for use or compost anything that is starting to decay.
- **Ideal Conditions:** You do not need exactly perfect conditions to be successful in storing months' worth of produce.
- **Certain Varieties:** Select varieties that are designed for storage or mature later in the season such as the Yukon Gold or Kennebec potato varieties.



Onion harvest - Photo courtesy of Reece Owens, Feeding Laramie Valley, 2016

Apples: Use caution when storing apples with other vegetables, as they give off ethylene gas that causes other vegetables to rot. They can be stored in tubs with lids to prevent this effect. Select storage varieties. Leave the stems on. Store in plastic tubs with lids. Keep them shallow as storage too deep will bruise them. Check frequently.

Butternut Squash, Pumpkins and Other Winter Squash: Store winter squash in a well ventilated dry and cool room with temperatures between 50-60°F. Humidity should be relatively low (30-50%). Check your stored squash monthly to identify and use up any fruit that shows signs of decay. Butternut squash are one of the longer storing squash and may store up until February.



Pumpkin harvest - Photo courtesy of Celeste Hefti, Feeding Laramie Valley, 2018

Cabbage: Use varieties that are known for their storage capabilities. Harvest the cabbage leaving the root intact, wrap in newspaper and store in crates, or sit in a bucket of moist sand. Storage temperature should be between 32-40°F with 80-90% humidity. They do well in humid refrigeration. Even if outer leaves get gross and moldy, you can peel them away to find a good head underneath.

Dry Beans: Harvest beans after they are mostly dry on the vine and spread out to dry for several weeks. The beans can be removed from the pods after this drying by putting the pods in a bag and banging the bag with a bat, then cut a small hole in the bottom of the bag and the beans will fall out. Store in dry containers with tight lids. Freezing will not harm dry beans.

Garlic: Dig the plants up when the second set of leaves begins to yellow, which may occur as early as July. If you wait too long to harvest, the cloves will begin to separate as they dry, and the heads won't store as well. Cure your garlic in a dry, dark place. Place the cured trimmed garlic in mesh bags, old nylon stockings, a wire basket, or a crate. It is important that the storage container allow air to circulate through. Store garlic in a cool, moderately dry location at temperatures between 35-40°F. Another option is to braid the dry foliage (tops) of garlic and hang in a cool dry spot with good airflow.

Note: Do not use plastic bags for storing as humidity encourages the bulbs to sprout.

Onions: In late summer, the leaves of onion plants flop over. This signals that it is time for the plants to stop growing and start preparing for winter. Allow the plants to remain where they are until the necks begin to tighten and the foliage yellows. Harvest the onions and move them

to a protected location where they will stay dry. Spread the onions out in a single layer and let them cure for two weeks. During this time, the necks will wither and turn brown, and the papery skins will tighten around the bulbs. Once the necks have dried and there is no more moisture in the stem or leaves, you can bring your onions indoors and store them in mesh bags or bushel baskets. Keep them cool (32-50° F.) and away from light. Another option is to braid the dry foliage (tops) of the onions and hang in a cool dry spot with good airflow.

Note: Do not use plastic bags for storing as humidity encourages the bulbs to sprout.

Potatoes: In late summer/fall when the potato foliage has died back but before a killing frost, your potatoes can be dug and cured for storage. Cure the tubers by laying them out on newspaper in a well-ventilated place that is cool (45-60°F) and dark to prevent them from turning green. After about two weeks, the skins will have toughened up. Rub off any large clumps of dirt (potatoes should never be washed before storage) and cull any damaged tubers, which should be eaten, not stored. Treat the tubers very gently so as not to bruise or cut them. Nestle your spuds into ventilated bins, bushel baskets, a Root Storage bin, or a cardboard box with perforated sides. Completely cover the boxes or baskets with newspaper or cardboard to eliminate any light. Even a little light will cause potatoes to turn green and be rendered inedible. The ideal storage temperature for potatoes is 35-40°F, though they will usually keep for several months at 45-50°F. Red and Yukon potatoes should be used first, Russets or Kennebecs will store longer. Storing potatoes in the refrigerator will cause the starches to turn into sugars and alter the flavor and texture.

Note: Do not store potatoes and onions together because they can release moisture and gases that will cause the other to spoil faster.



Stored potato harvest - Photo courtesy of Reece Owens, Feeding Laramie Valley, 2013

Sweet Potatoes: After harvest, cure the sweet potatoes for 7-14 days in a well-ventilated room with temperatures between 75-80°F. After potatoes have cured, wrap individual potatoes in newspaper and store in a cardboard box, paper bag or basket and keep in a dark but well ventilated room with temperature between 55-60°F. Add an apple to prevent the potatoes from budding.

True Root Vegetables:

Beets, Carrots, Parsnips, Rutabaga, Turnips, Celery Root, Radishes, and Kohlrabi

These vegetables need high humidity to stay crisp. To store these crops in a refrigerator or in sand, start by harvesting the roots. Handle them gently to avoid bruising or nicking. Use

scissors to cut off all but 1/2inch of the foliage. Rub the roots gently (do not wash them in water) to remove most soil. Do not cut off the root end because this will invite decay. Place in a plastic bag with a few drops of water, fold over the flap and store in the refrigerator. These vegetables need some air circulation, so do not use twisty ties or zip-lock the bag completely. If stored in a root cellar, keep the temperature between 32-40°F with 90-95% humidity.



Harvest of carrots and radish.

Photo courtesy of Alex Shannon, Feeding Laramie Valley, 2018

Another option for storing root vegetables (Carrots, Parsnips, Celery Root) is to create a humid storage area by packing the roots in damp sand or sawdust. Prepare the roots as above. Moisten clean sand in a large container (tub, wooden box, 5-gallon bucket or plastic-lined cardboard box.) Lay vegetables on the sand or sawdust in a single layer, not touching each other. Cover them completely with sand or sawdust and continue layering until the container is full. Store at 32-40°F. Remove stored vegetables as needed. The vegetables should last until early spring.

A third technique (for cool climates) is to store these crops (Carrots, Beets, Parsnips) right in the ground. Before hard frost, cover the un-harvested crop with a 12-18inch layer of straw or leaves. The shoulders of beets are particularly susceptible to frost damage, so be sure to cover them before heavy frost. Lift back the mulch and harvest as needed. If spring comes before all the roots have been harvested, dig, and use them up before the soil begins to warm.

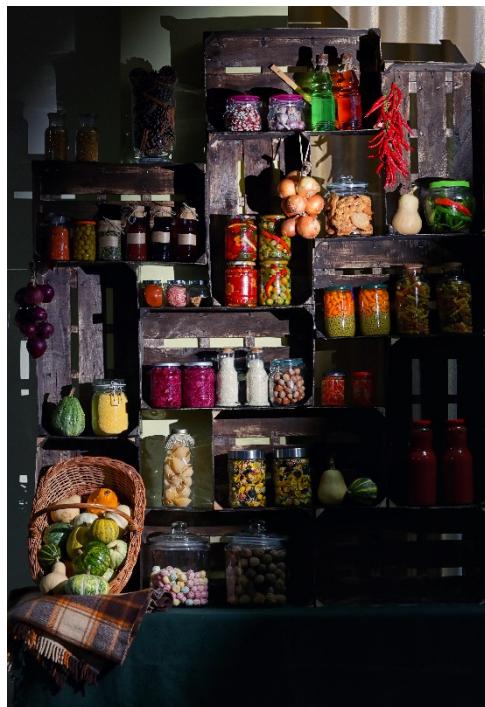
Note: Harvest beets when they are almost mature in the fall and temperatures begin dropping to 30°F. If storing carrots indoors, harvest prior to ground freezing and dry well.

Potential Storage Space Ideas

Spaces that are cold but don't freeze or may only freeze if very cold outside (on these nights you can take your containers inside) are good options for root vegetables and other produce where refrigeration is recommended. You would need to set things up to have higher humidity in some way.

Below are some common areas where you can easily store your produce during the winter.

- Entryways
- Stairwells & Bulkheads
- Attached garages
- A cellar or basement
- Four season porches
- Drafty closet that you don't open often



Cellars are an excellent area for storing your produce.

Happy Gardening!

“The love of gardening is a seed once sown that never dies.”
-Gertrude Jekyll



Enjoying a day in the garden - Photo courtesy of the Dodge Family, Growing Resilience, 2016



For more information about the Growing Resilience project visit:
www.growingresilience.org

Contact Feeding Laramie Valley for any questions, updates, or comments at:

www.feedinglaramievalley.org | Phone: 307.223.4399 | Email: info@feedinglaramievalley.org



VEGETABLE CHEAT SHEETS

The following are several cheat sheets or reference guides for growing specific vegetables in Wyoming. These cheat sheets are designed for you to take with you into the garden. The following are vegetables that have been found to be commonly grown in Wyoming. Each page will outline a few of my favorite varieties, some general tips for success, the difficulty level of each vegetable, whether to start them indoors or outdoors, when and how to plant, watering, weeding and thinning tips, and when and how to harvest.

Beets - **Easy**

Bell Peppers - **Hard**

Broccoli - **Medium to Hard**

Brussels Sprouts - **Easy**

Bush Beans - **Easy**

Cabbage - **Easy to Medium**

Carrots - **Easy to Medium**

Eggplant - **Medium to Hard**

Jalapenos - **Hard**

Lettuce - **Easy**

Onions - **Easy to Medium**

Pole Beans - **Easy**

Potatoes - **Easy to Medium**

Radishes - **Easy**

Snap Peas - **Medium**

Snow Peas - **Medium**

Spinach - **Easy**

Sweet Corn - **Medium**

Swiss Chard - **Easy**

Tomatoes - **Medium to Hard**

Turnips - **Easy**

Zucchini - **Easy to Medium**



Beets

Skill Level: Easy

Start: Outdoors

Suggested Varieties for Wyoming

Detroit Dark Red

50-60 days to mature

Excellent crisp taste

3 inches in diameter

Distinct deep-red color

Needs partial or full sun

Golden Detroit

50-60 days to mature

Crisp mildly-sweet flavor

3 inches in diameter

Light orange color outside, yellow inside

Needs full sun

Things to Note:

- The foliage of a beet plant can be harvested for salad greens while the root grows. Up to 1/3 of the foliage can be harvested without damaging the plant.
- Be sure the soil is at least 45°F when planting the seeds.
- Beets are a cool season crop and can have their seeds planted directly outdoors. Start indoors for earlier harvest.
- Make sure the soil stays evenly moist throughout growing period, especially while the seeds are germinating.
- Remember, the best information can be found on the back of your seed packet.**
- Companion plants: Cabbage and Onion plants.*
- Poor companions: Beans and Mustard plants.*



Starting From Seed:

- Start seeds outdoors around mid-May. Find a space in full or partial sunlight/grow light, depending on the seed's variety.
- Make holes 1 inch deep and 3-4 inches apart. Place 2-3 seeds in each hole.
- Space rows 12-15 inches apart.

Watering:

- Keep the soil constantly moist (not wet) while waiting for the seeds to sprout.
- Once sprouted, give the plants at least an inch of water every week for 5-8 weeks.
- Water for around **10 to 15 minutes daily**. Be sure the soil around the base of the plant is fully absorbing the water.
- Do not let the water "pool" around the base of the plant.



Beets (*Continued*)

Skill Level: Easy

Start: Outdoors

Weeding:

- Put a marker where you first planted the seeds in the ground to avoid confusing them with weeds later.
- Pull weeds around the beets as soon as they are noticed.

Thinning:

- Begin thinning once the seedlings have grown to about 5 inches.
- To avoid damaging the root, cut the tops off of the foliage. **Do not pull.**

Harvesting:

When:

- *Foliage*- Begin harvesting after the plant has grown to about 5 inches. Harvest the foliage before it grows past 6 inches for best flavor.
- *Roots*- Beets are one of the plants you can harvest when you prefer. However, the bulbs will become tougher and harder to eat the longer they stay underground.

How:

- *Foliage*- Carefully snap or cut the piece of foliage off at least one inch away from the root.
- *Roots*- Pull from the base of the foliage close to the bulb. Pull straight up and lightly twist. If the soil around the plant is hard, use a spade to loosen the soil before pulling.





Bell Peppers

Skill Level: Hard

Start: Indoors

Suggested Varieties for Wyoming

Early Crisp

68 days to maturity

Sweet, red variety

Matures sooner and is more durable than most

Needs full Sun

King of the North

65 days to maturity

Crisp, red variety

Does well in colder weather

Needs full Sun

Things to Note:

- Sweet types of peppers can thrive in the warmer parts of Wyoming.
- Bell Peppers thrive in warmer temperatures and should not be transplanted to the garden until after the last frost.
- If the temperature drops below 60 degrees Fahrenheit, or if the temperature rises much above 90 degrees, your plant will not form its fruit.
- Strong winds can also cause the flowers to fall without having time to form fruit.
- **Remember, the best information can be found on the back of your seed packet.**
- **Companion plants:** Spinach and Lettuce.
- **Poor companions:** Beans and Peas.



Starting From Seed:

- Start with starting soil and containers at least 2.5 inches deep for your seeds.
- Fill and compact the soil in the containers making sure there are no air pockets. Using your finger, make two holes per cell about a quarter inch deep per container. Place a seed in each hole and cover with more starting soil. Pack down again to make sure there are no air pockets.
- Move containers to a warm spot around 70-75 degrees Fahrenheit. You don't need direct sunlight at this stage. Cover your containers to keep the soil moist and help germination. Be sure to check daily.
- Once seedlings start to sprout, move the containers to a light source (either direct sunlight or grow lights) then remove the covers completely.



Bell Peppers

(Continued)

Skill Level: Hard

Start: Indoors

Transplanting:

- This plant is recommended to be started indoors.
- Please remember peppers thrive in warmer temperatures and should not be transplanted outside until after the last frost.
- Space the plants 2 feet apart within a row. Space rows 3 feet apart.

Watering:

- Keep soil consistently moist (not wet) throughout the growing season. This is especially important in the sprouting stages.
- Try to avoid the leaves of the plant. Aim for base of the plant.

Weeding:

- Pull weeds as soon as they are noticed.
- Be careful not to confuse the Bell Pepper plants with common weeds!

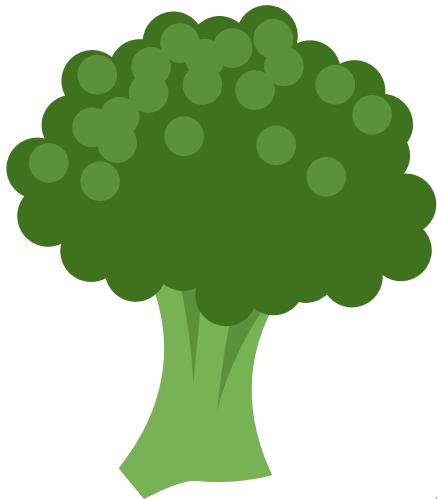
Thinning:

- As seeds begin to sprout, use your hands to thin the smaller or sickly sprouts when they get to be about 3 to 4 inches tall.

Harvesting:

- **When:** Harvest peppers as soon as they reach the desired size and color. Usually harvested when green, but can be left on the plant until red, orange, yellow, or purple.
- **How:** Cut stem as close to the fruit as possible. *Be sure to use gloves when harvesting.*





Broccoli

Skill Level: Medium to Hard

Start: Indoors

Suggested Varieties for Wyoming

Green Goliath

55-60 days to mature

Known for its flavorful taste

Heads: Tight buds, blue-green, 10-12 inch

Multiple side shoots

Very high yield

Bonanza

55 days to mature

Excellent mild flavor

Heads: Tight buds, dark green, 9 inch

Multiple side shoots

Very adaptable to soil types

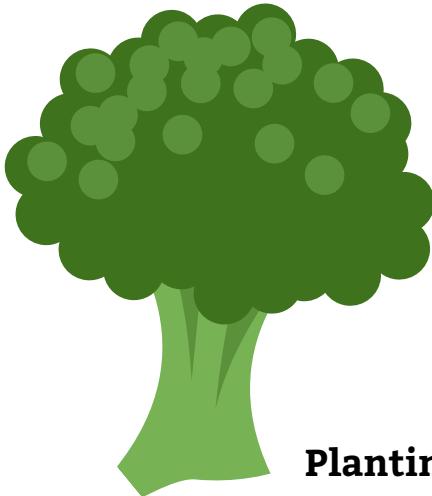
Things to Note:

- Broccoli are cool weather plants.
- Broccoli need full sun and moist, fertile, slightly acidic soil.
- Avoid getting broccoli heads wet when watering.
- Remember, the best information can be found on the back of your seed packet.
- Companion plants: Celery and Potatoes.
- Poor companions: Bell Pepper and Jalapeños.



Starting from Seed:

- Start seeds indoors around mid-March to early April.
- Begin with starting soil and small containers, at least 3-4 inches deep.
- Fill and compact the soil in the containers making sure there are no air pockets.
- Using your fingers, make a hole about ½ inch deep per container.
- Place 1-2 seeds in each hole, cover with starting soil, and gently pack down to remove air pockets.
- Place containers in a warm area (about 70°F).
- When seedlings emerge, place in an area with full sunlight, or 3-4 inches below a grow light. Keep grow light on 16 hours per day, and off 8 hours per day. Raise the grow lights as the seedlings grow taller.
- Fertilize seedlings after 3-4 weeks using a starter solution.



Broccoli (Continued)

Skill Level: Medium to Hard

Start: Indoors

Planting Seedlings Outside:

- *A week before transplanting*, take containers outside in a sheltered area to accustom the seedlings to outdoor conditions and reduce shock. If risk of frost overnight, cover containers or bring indoors.
- Transplant seedlings outside 3 weeks before average last frost date.
- Find an area in full sunlight and make rows 30 inches apart.
- Within a row, plant each seedling at least 18 inches apart.
- Fertilize broccoli 3 weeks after transplanting.

Watering:

- Apply 1.5 inches of water a week to maintain consistent moisture.
- Be sure to water **around 15 minutes daily**. Make sure the soil fully absorbs the water and does not pool around the plant.
- Do not get the developing heads wet when watering.

Weeding:

- Weed early and often.
- Control weeds by cultivating often or use mulch to prevent their seeds from germinating.

Thinning:

- Thin seedlings with your fingers when they are 1-2 inches tall to prevent overcrowding.
- Make sure seedlings are between 16-18 inches apart after transplanting.

Harvesting:

- **When:** Broccoli heads reach maturity when they are 3-6 inches across and the buds are firm and tight. Harvest before yellow flower buds start to open. Smaller side shoots develop after the main head has been removed and can be harvested for 1-3 weeks.
- **How:** Cut 3-4 inches of the stem below the head, at an angle. For best taste, harvest in the morning before the soil heats up.





Brussels Sprouts

Skill Level: Easy

Start: Indoors

Suggested Varieties for Wyoming

Long Island Improved

90 days to mature

Sweet flavor

Bright-green sprouts; 1 to 1.5 inch diameter

Plant: 24 inch height, 12 inch spread

Semi-dwarf variety; stocky, closely spaced leaves

High yields

Jade Cross

85-90 days to mature

Subtly sweet with crisp texture

Light-green sprouts; 1-2 inch diameter

Plant: 24-30 inch height, 18-24 inch spread

Dwarf variety; stocky, closely spaced leaves

High yield; handles freezing well

Things to Note:

- Brussels sprouts are a cool season plant; they do best in temperatures around 60 to 70°F.
- They require a long growing season and lots of space to grow.
- Frost isn't always a bad thing! Brussels sprouts touched by frost before harvesting typically have a better flavor.
- Use a heavy clay soil to help keep the plants upright.
- Regularly remove the base leaves of the plants to increase sprout yield and improve flavor.
- **Remember, the best information can be found on the back of your seed packet.**
- **Companion plants: Beets and Celery.**
- **Poor companions: Strawberries and Pole Beans.**



Starting from Seed:

- Start seeds indoors 7-8 weeks before your average last frost date.
- Begin with starting soil and containers at least 3 inches deep.
- Fill and compact the soil in the containers making sure there are no air pockets.
- Using your fingers, make a hole ¼-½ inch deep per container.
- Place 1-2 seeds in each hole, cover with starting soil, pack down to remove air pockets, and gently water keeping the soil moist, not wet.
- Place containers in a warm area (around 65-70°F) with full sunlight/grow light. Do not leave the grow light on for more than 16 hours at a time. Seedlings need dark periods of about 8 hours each day.
- After 3-4 weeks, begin adding fertilizer every 2 weeks.
- **One week before transplanting**, take containers outside in a sheltered area to accustom seedlings to outdoor conditions and to reduce shock. If risk of frost overnight, cover containers or bring indoors.



Brussels Sprouts (Continued)

Skill Level: Easy

Start: Indoors

Transplanting:

- Transplant after the last average frost. Seedlings are ready when they are 5 to 7 inches tall with three sets of leaves into an area with full sun.
- Use a cover to protect the seedlings from the cold for the first 2 to 3 weeks outside.
- Within a row, space each plant about 24 inches apart. Rows should be spaced 24 to 36 inches apart.
- Plant the seedlings so that the lowest leaves on the plant are right above the soil.

Watering:

- Keep soil moist (not wet). Soil should absorb water, not pool up around the plants.
- Water **twice a day for a total of 10 minutes.**
- Water immediately after repotting or transplanting.
- Water early in the morning or evening; avoid watering when the sun is at its highest.
- Always water directly on the soil and avoid getting the leaves wet.

Weeding:

- Pull out weeds (by hand) as soon as they are noticed.
- Brussels sprouts have shallow roots, removing weeds by other methods may damage them.

Thinning:

- Using your hands, remove the bottom base's yellowing leaves regularly to keep the plant healthy and improve production time.

Harvesting:

- **When:** Sprouts are a bright green and about 1 to 2 inches in diameter. Sprouts should be firm but not rock hard.
- **How:** Twist the sprouts until they break off the plant. Harvest from the bottom to the top. Continually check and harvest the sprouts as soon as they become ripe to help the plant produce faster.





Bush Beans

Skill Level: Easy

Start: Outdoors

Suggested Varieties for Wyoming

Blue Lake

50-60 days to mature

Tender yet crisp flavor

Dark-green, plump and stringless pods

Upright, medium-thick, 6 inch pods

10 inch spread, 15-20 inch height

High yield; heirloom

Gold Mine

50-55 days to mature

Ultra sweet crisp flavor

Pale yellow wax bean; grows in clusters

Upright, 5-5.5 inch pods

10 inch spread, 15-20 inch height

Early producer

Things to Note:

- Beans need moderately-rich, well-drained soil.
- Don't plant too early or when soil is too cold or the seeds will rot.
- For higher yields, use a bean inoculant (found in nurseries) prior to planting. An inoculant is a nitrogen-fixing bacteria that helps fertilize your seed.
- Avoid adding too much fertilizer that is high in nitrogen. Too much nitrogen will result in lush foliage, but fewer and smaller pods.
- Plant beans every two weeks to extend harvest.
- Remember, the best information can be found on the back of your seed packet.**
- Companion plants: Corn and Potato.*
- Poor companions: Onion and Garlic.*



Starting from Seed:

- Plant seeds outdoors around mid-May or anytime after last Spring frost. Make sure the minimum soil temperature is 50°F.
- In an area with full sun, make 1.5-2 inch holes 4 inches apart, in rows about 18-24 inches apart.
- Place 2-3 seeds in each hole, cover with soil, lightly pat down, and gently water the area.
- Seedlings should emerge within 10-14 days.
- When the seedlings are 1-2 inches high, thin them so each plant stands 12 inches apart.
- Mulch every few weeks to retain soil moisture and to keep the roots cool.
- Sow new seeds every 1 to 2 weeks for continuous harvest throughout the summer.



Bush Beans (*Continued*)

Skill Level: Easy

Start: Outdoors

Watering:

- Keep soil moist (not wet). Water should not pool up around your plants.
- Water **twice a day for a total of 20 minutes**. Soil should be wet and stick to your finger in clumps.
- Water early in the morning or evening, especially if you are using a sprinkler system.
- Ideally, use a drip or trickle system to deliver water at low pressure at soil level.
- Be sure to water directly on the soil and avoid getting the leaves wet.
- Beans will stop flowering with irregular watering.

Weeding:

- Regularly remove weeds or add mulch to prevent their seeds from germinating.
- Use shallow cultivation to avoid disturbing the roots.

Thinning:

- Thin prior to watering - *do not handle the plants when they are wet!*
- Thin to 12 inches apart when the seedlings are about 1-2 inches by removing the smaller sprouts with your fingers.

Harvesting:

- **When:** Harvest 2-3 weeks after the plant flowers. Pick when young, firm and tender before the seeds inside have fully developed. *Do not wait until the seeds are bulging or they will taste tough.* Pick green beans every day; the more you pick, the more beans grow.
- **How:** Gently snap or cut the bean off the plant. Fresh beans should snap easily when broken.





Cabbage

Skill Level: Easy to Medium

Start: Indoors

Suggested Varieties for Wyoming

Red Acre

75-100 days to mature
Bright, reddish-purple heads
Crisp and tender flavor
Head size: 5-7 inch in diameter, 2-3 lb
Resistant to cabbage yellowing

Golden Acre

65 days to mature
Soft-green heads
Crunchy texture; sweet and spicy flavor
Head size: 5-7 inch in diameter, 3-5 lb
Resistant to cabbage yellowing

Things to Note:

- Cabbages are a cool season crop.
- Plant spacing affects head size – cabbages that are closer together grow smaller heads.
- Cabbages require fertile soils and continuous fertilization.
- Remember, the best information can be found on the back of your seed packet.**
- Companion plants: Beets and Onions.*
- Poor companions: Pole Beans and Tomatoes.*



Starting from Seed:

- Start seeds indoors 6 to 8 weeks before the average last frost date.
- Begin with starting soil and containers (at least 2 inches deep).
- Fill and compact the soil in the containers making sure there are no air pockets.
- Using your fingers, make one hole about $\frac{1}{4}$ to $\frac{1}{2}$ inch deep per container.
- Place 2 to 3 seeds in each hole, cover with starting soil, and pack down to remove air pockets.
- Place containers in an area with full sun/grow light, and maintain soil temperatures 60°F minimum.
- 1 week before transplanting, take containers outside in a sheltered area to accustom seedlings to outdoor conditions and reduce shock. If risk of frost overnight, cover containers or bring indoors.



Cabbage (Continued)

Skill Level: Easy to Medium

Start: Indoors

Transplanting:

- Transplant outdoors as early as 3 to 4 weeks before the average last frost date.
- In an area with full sun, make several rows at least 2 to 3 feet apart.
- Within a row, plant seedlings at least 18 inches apart.
- When transplanting, make sure 1 to 2 inches of the stem are buried.
- Apply a thick layer of mulch to retain moisture and better regulate soil temperature.
- Fertilize again 3 weeks after transplanting.

Watering:

- Cabbage plants require consistently moist (not wet) soil.
- Plants require about 1.5 inches of water to the soil weekly. Water at **least 10 minutes daily.**
- Be sure the water is being fully absorbed by the soil. Make sure not to let the water pool around the plant.
- If the soil is dry at a depth of 3 inches, water more frequently.

Weeding:

- Regularly remove weeds as they pop up.
- Weeds compete with nutrients and will slow cabbage growth.

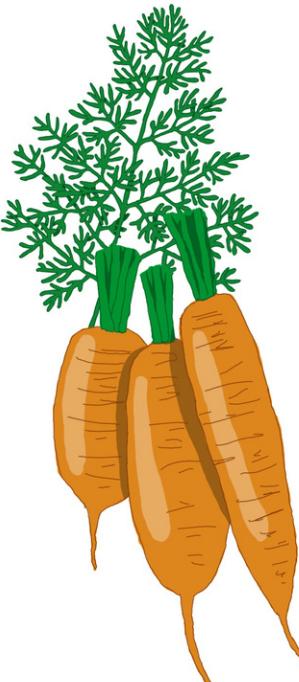
Thinning:

- Be sure to thin sprouts with your fingers regularly to avoid overcrowding.
- Thin by removing smaller or sickly looking sprouts.
- When seedlings reach about 5 inches tall, thin (using your hands) to make sure that they are at least 18 inches apart.

Harvesting:

- **When:** Cabbage heads are large and firm. Size of head depends on the variety chosen.
- **How:** Cut each head at its base. After harvesting, bring inside or put in shade immediately.





Carrots

Skill Level: **Easy** to **Medium**

Start Outdoors

Suggested Varieties for Wyoming

Autumn King

70-80 days to mature

Popular variety with a sweet flavor

Dark orange/red color

Roots: 10-12 inch long, 2.5 inch diameter

Excellent cold tolerance

High yield; stores well

Danvers Half Long

75 days to mature

Excellent sweet flavor

Dark orange color

Roots: 6-8 inch long, 3 inch diameter

Grows well in many types of soil

Stores well

Things to Note:

- Carrots are a cold-tolerant plant and can withstand light frosts.
- Carrots provide a long period of harvest, but they will lose flavor and taste woody if left in the ground too long.
- Use well-drained, deep and loose soils (ex: sandy loam).
- Cover exposed crowns to prevent the root from greening.
- Transplanting is not recommended.
- **Remember, the best information can be found on the back of your seed packet.**
- **Companion plants: Peas, Lettuce, Onions**
- **Poor companions: Parsnips, Potatoes, Dill**



Starting from Seed:

- Start seeds outdoors 1 to 2 weeks before the average last frost date.
- Make rows at least 18 inches apart in an area with full sun and deep soil.
- Make holes 2 inches apart and $\frac{1}{4}$ to $\frac{1}{2}$ inch in depth.
- Place 1 to 2 seeds in each hole and cover with soil.
- Keep seeds moist (not wet) during germination.
- Do not allow the soil to crust before the seedlings emerge (2-3 weeks).



Carrots (Continued)

Skill Level: Easy to Medium

Start Outdoors

Watering:

- Water for **10 minutes twice a day**.
- Keep moist but not saturated.
- Water should not pool on top the soil.
- Water with a drip system or other low-pressure system.

Weeding:

- Weed regularly by shallow hoeing or by hand.

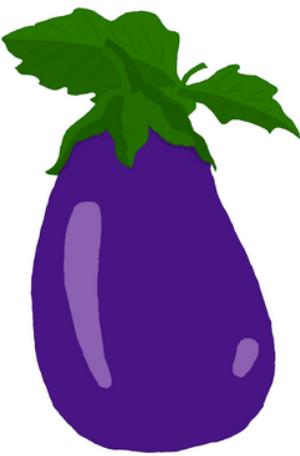
Thinning:

- Thin carrot plants to stand 3 inches apart when seedlings are 3 inches high to prevent overcrowding.
- Thin by using your fingers to gently pull the smaller or sickly looking plants up by the root (not the foliage).

Harvesting:

- **When:** The orange shoulder of the carrot pushes through soil. Harvest when they are about $\frac{3}{4}$ of an inch across the top. Carrots may be dug any time after they reach the desired size but must be pulled up before the ground freezes.
- **How:** Grab the carrot by the root (not the foliage) and lightly twist while pulling up. If the soil is hard, use a spade or garden fork to loosen the dirt around the carrot before pulling it up.





Eggplant

Skill Level: **Medium** to **Hard**

Start: Indoors

Suggested Varieties for Wyoming

Hansel Hybrid

55 days to mature

Non-bitter, mild, tender taste

Slender, miniature dark purple with few seeds; fruit appear in clusters

Fruit size: 2-10in long, 1in diameter

Plant height: 3ft

High yielding

Diamond

70 days to mature

Non-bitter, tender taste; mild texture

Slender, purplish-black with pale green flesh; fruit appear in clusters

Fruit size: 9in long, 3in diameter

Plant height: 2ft

Disease resistant

Things to Note:

- Eggplants require relatively high temperatures.
- Use row covers, water walls, or other garden devices to retain heat.
- For high altitude areas, we recommend transplanting seedlings into a hoop house or greenhouse.
- **Remember, the best information can be found on the back of your seed packet.**
- *Companion Plants: Beans and Tomato.*
- *Poor companions: Fennel and Mint.*



Starting from Seed:

- Start seeds indoors 7 to 8 weeks before the average last frost date.
- Begin with starting soil and containers (at least 2 inches deep).
- Fill and compact the soil in the containers making sure there are no air pockets.
- Using your finger, make one hole about $\frac{1}{4}$ inch deep per container.
- Place 4 seeds in each hole, cover with starting soil, and lightly pack down to remove air pockets.
- Place containers in an area with full sun/grow light and maintain soil temperatures 80-90°F minimum.
- After true leaves (second set of leaves) form, thin to 2-3 inches apart.
- 1 week before transplanting, reduce soil temperature to 60°F. Transplant when seedlings grow 3-4 inches tall.



Eggplant (Continued)

Skill Level: Medium to Hard

Start: Outdoors

Planting Seedlings Outdoors :

- Transplant into your garden at least 1-2 weeks after average last frost date.
- Choose an area with full sun and well-drained fertile soil. A week before transplanting, add a 1-2 inch layer of compost manure.
- Place seedlings 24-30 inches apart in rows 30-36 inches apart, adding a shovelful of compost or manure to the bottom of each hole. Cover with more soil.
- Place a stake 1-2 inches away from each seedling to provide support.
- Water immediately after transplanting. Add an additional layer of manure after transplanting to retain soil moisture and heat.
- Add fertilizer every 2 weeks until harvest.

Thinning:

- Using your fingers, thin seedlings after true leaves appear to 2-3 inches apart.
- Keep plants at least 24 inches apart once transplanted.
- Remove the terminal growing points for a bushier plant.



Watering:

- Be sure to water your eggplants **10 to 15 minutes a day**.
- Soil should be kept moist (not wet) and stick to your fingers. Do not let the water pool around the soil.
- Use a soaker hose or drip system at ground level.

Weeding:

- Add layers of mulch regularly to suppress weeds.

Harvesting:

- **When:** The eggplant has a shiny, glossy finish. Over-mature eggplants will be dull, soft, and squishy. Once the skin does not rebound to gentle pressure from your finger, it is ripe.
- **How:** Cut the fruit leaving about an inch of the stem attached. **Do not pull!**



Jalapeños

Skill Level: **Hard**

Start: Indoors

Suggested Varieties for Wyoming

Big Chile

68 days to maturity

Enjoy as a green or as a spicier red color

Fruits: 2 to 4 inches long and 1 inch wide

Needs full sun

Biker Billy

66 days to maturity

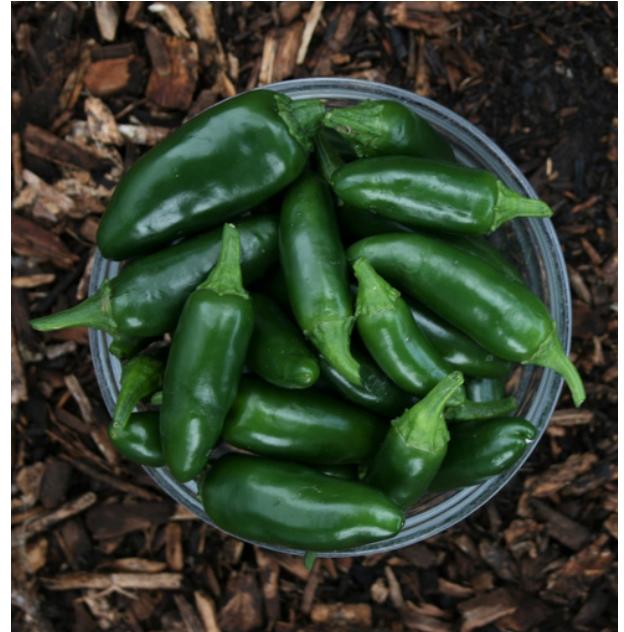
Enjoy as a sweet red or as a mild green color

Fruits: 3 ½ inches long and 2 inches wide

Needs full sun

Things to Note:

- Hot types of peppers can thrive in the warmer areas of Wyoming.
- Jalapeños should not be transplanted to the garden until after the last frost.
- Jalapeño plants are very temperature sensitive. If the temperature drops below 60°F, or rises much above 90°F your plant will not form fruit.
- Strong winds can also cause the flowers to fall without having time to form fruits.
- **Remember, the best information can be found on the back of your seed packet.**
- *Companion plants: Eggplants and Asparagus.*
- *Poor companions: Cabbage and Broccoli.*



Starting From Seed:

- Start with starting soil and containers at least 2.5 inches deep for your seeds.
- Fill and compact the soil in the containers making sure there are no air pockets.
- Using your finger, make two holes per cell about a quarter inch deep per container. Place a seed in each hole and cover with more starting soil. Pack down again to ensure there are no air pockets.
- Move containers to a warm spot around 70-75°F. You don't need direct sunlight at this stage. Cover your containers to keep the soil moist and help germination. Be sure to check daily.
- Once seedlings start to sprout, move the containers to a light source (either direct sunlight or grow lights) then remove the covers completely.



Jalapeños

(Continued)

Skill Level: Hard

Start: Indoors

Transplanting:

- It's recommended this plant is started indoors.
- Peppers thrive in warmer temperatures and *should not be transplanted outside until after the last frost.*
- Within a row, space the plants 24 inches apart and space rows 36 inches apart.

Watering:

- Keep soil consistently moist (not wet) throughout the growing season. This is especially important in the sprouting stages.
- Try to avoid the leaves of the plant. Aim for the base of the plant.
- Try and water for at **least 10 to 15 minutes daily.**

Weeding:

- Pull weeds as soon as they are noticed.
- Be careful not to confuse the jalapeños plants with common weeds!

Thinning:

- As seeds begin to sprout, use your fingers to thin the smaller sprouts when they get to about 3 to 4 inches.

Harvesting:

- **When:** Harvest peppers as soon as they reach the desired size and color. The mature jalapeños are often hotter than the new fruits.
- **How:** Cut jalapeños off at the stem as close to the fruit as possible. *Be sure to use gloves when harvesting.*





Lettuce

Skill Level: Easy

Start: Outdoors

Suggested Varieties for Wyoming

Head Types

Butter Crunch	Ithaca
65-70 days to mature	65-70 days to mature
Sweet flavor, crisp texture	Crisp texture
Durable	Sturdy
Boston and Bibb lettuce	Big and firm heads
Needs full to partial sun	Needs full sun

Leaf Types

Black Seed Simpson	Crispy Frills
45 days to mature	50-80 days to mature
Sweet, delicate flavor	Sweet, crunchy flavor
Very adaptable	Somewhat heat tolerant
Frilly, loose leaf heads	Ruffled broad leaves
Early producer	Grows back easily

Things to Note:

- Lettuce is a cool season crop and can benefit from a light frost.
- High sunlight and warm summer weather can cause a bitter flavor, especially in Bibb varieties.
- Lettuce grows well partially shaded garden areas.
- There are 4 types: Bibb, Head, Cos/Romaine, and Leaf.
- Be careful not to mistake common weeds for your lettuce!
- **Remember, the best information can be found on the back of your seed packet.**
- *Companion plants: Carrot and Radish.*
- *Poor companions: Brussel Sprouts and Broccoli.*



Starting From Seed:

Leaf varieties:

- Start outdoors 2 weeks before the last average frost date. Sow in rows 8-12 inches apart with about 10-20 seeds per foot. Alternatively, sprinkle the lettuce seed evenly in 1 inch deep holes.
- Leaf lettuce can be planted in between rows of slower growing crops. They also make a good border around flower beds.
- Make several plantings to have lettuce available over a long period of time.

All other varieties:

- Start outdoors 2 weeks before the last average frost date.
- All lettuce varieties may be planted on the shady side of tall crops or in other cool areas of the garden.
- Sow in holes 1 inch deep, spaced 12-18 inches apart, in rows 24-30 inches apart.
- Plant every 2-3 weeks to have longer harvest times.



Lettuce (Continued)

Skill Level: Easy

Start: Outdoors

Watering:

- Keep soil consistently moist (not wet) throughout the growing season.
- Ideally, water early in the morning or late evening.
- Be sure to **water 10 to 15 minutes daily**.
- Make sure the soil is fully absorbing the water and not pooling at the surface.
- Avoid getting the leaves wet and aim the water at the base of the plant.

Weeding:

- Constantly keep an eye out for growing weeds around the plant and pull out weeds once they are noticed.

Thinning:

- While the lettuce grows, harvest every other plant or the largest plants as part of the thinning process.

Harvesting:

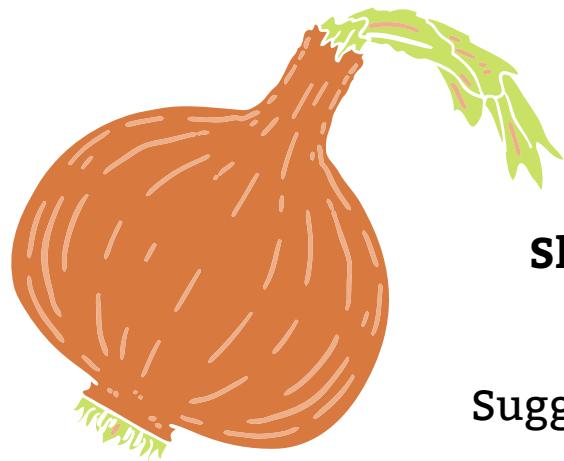
• When:

- **Leaf lettuce:** Harvest when plants are 5-6 inches tall, taking the outer leaves first.
Harvest every other plant or the very largest plants first.
- **Bibb lettuce:** Harvest when the leaves begin to cup inward and take a form of a head.
- **Romaine lettuce:** Harvest when the leaves have overlapped to form a tight head about 4 inches wide at the base and 6-8 inches tall.
- **Head lettuce:** Harvest when the leaves overlap to form a firm head. Size depends on variety.

• How:

- You may either cut off individual leaves, cut the whole bunch about an inch from the soil surface, or dig up the whole plant. The first two methods will allow for a second harvest.





Onions

Skill Level: Easy to Medium

Start: Indoors

Suggested Varieties for Wyoming

Walla Walla

80-90 days to mature

Sweet, mild, juicy flavor

Light-brown outer layer with white flesh

Long-day variety

Bulb size: 4-6 inch diameter

Grows to be 10-12 inches tall

Red Candy

95 days to mature

Sweet, mild taste

Glossy, deep-red outer layer with white flesh

Intermediate-day variety

Bulb size: 3-4 inch diameter

Grows to be 24-30 inches tall

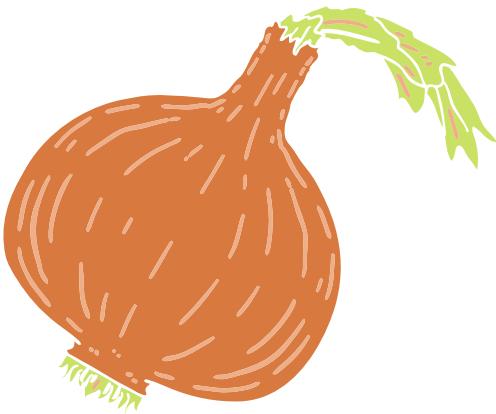
Things to Note:

- Onions form bulbs in response to day-length and cold. Long-day or intermediate-day varieties are recommended for Wyoming.
- Planting onion sets (small onion bulbs) are recommended. Avoid onion sets that have bulbs larger than 1 inch in diameter.
- Onions grow best in raised beds or in raised rows at least 4 inches high.
- Thinned plants can be used like green onions.
- **Remember, the best information can be found on the back of your seed packet.**
- *Companion plants: Beets and Carrots.*
- *Poor companions: Beans and Peas.*

Starting from Onion Sets:



- Start onion sets indoors in mid-March, or about 4 weeks before average last frost.
- Begin with starting soil and containers at least 3 inches deep and 3 inches wide.
- Fill and compact the soil in your containers making sure there are no air pockets.
- Using your fingers, make a hole about 1-1.5 inches deep in each container.
- Place 1 onion set in each hole, cover with soil, and gently pack down to remove air pockets.
- Put containers in an area with full sun or grow light, and keep soil temperatures at 50°F minimum.
- Fertilize often (manure or compost) for larger bulbs after 3-4 weeks.
- **About a week before transplanting**, take containers outside in a sheltered area to accustom seedlings to outdoor conditions and to reduce shock. If risk of frost overnight, cover containers or bring indoors.



Onions (Continued)

Skill Level: Easy to Medium

Start: Indoors

Transplanting:

- Plant in the garden 2 weeks prior to the average last frost.
- Select an area with full sun and fertile, well-drained soil (i.e. sandy loam).
- Make rows at least 12-18 inches apart.
- Plant seedlings 3 to 4 inches apart in holes $\frac{3}{4}$ inch deep.
- Add a layer of fertilizer after transplanting and gently water.

Watering:

- Onions need at least 1 inch of water per week, especially during bulbing phase.
- Be sure to water at **least 5 minutes once a day**. Soil should be moist, not wet. The soil should stick to your fingers in clumps, not be runny.
- A ditch or furrow irrigation method is recommended to provide water to the roots while keeping the tops dry.
- Avoid watering the foliage. Onions are susceptible to disease if their leaves are regularly wet.

Weeding:

- Onions have shallow roots and need to be weeded carefully and regularly.
- Reduce weeds by regularly adding mulch between rows.

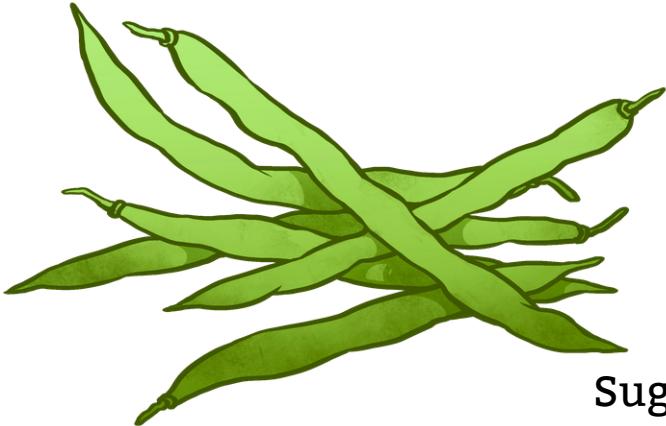
Thinning:

- Using your fingers, thin to 4 inches apart when seedlings are 1-2 inches high to prevent overcrowding.

Harvesting:

- **When:** You may harvest for green onions when the plants reach 6-8 inches tall and the stalks are still fairly thin and white at the bottom. When approximately 2/3 of the tops fall over and the foliage begins to dry, harvest the remaining onions.
- **How:** Dig out the bulbs carefully. Lay them out in the sun to allow the foliage to completely dry and the skin to toughen so they will keep longer. Cure the onions indoors in a warm, dry place for 2-3 weeks. Then cut off the foliage, leaving 1 inch above the top of the bulb.





Pole Beans

Skill Level: **Easy**

Start: Outdoors

Suggested Varieties for Wyoming

Kentucky Blue

60-65 days to mature

Dark-green meaty pods, 7-9 inches

Sweet with a smooth texture; stringless

Early maturing, high yield

Fortex

60 days to mature

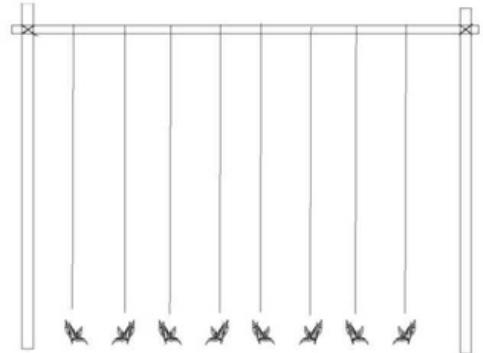
Dark-green slender pods, 7-11 inches

Delicious, firm texture; stringless

Early maturing, high yield

Things to Note:

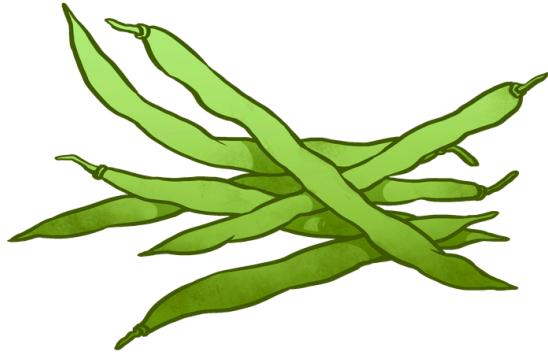
- Beans need moderately-rich, well-drained soil.
- Pole beans vine and need support (trellis, stake, fence, etc). If planting with corn, the corn stalks can act as a support.
- Beans have shallow roots, add mulch regularly to keep them warm and retain soil moisture.
- Add a light layer of compost or composted mature halfway through their growing season. Avoid a high-nitrogen fertilizer or there will be lush foliage but very few beans.
- Plant beans every two weeks to extend your harvest.
- **Remember, the best information can be found on the back of your seed packet.**
- **Companion plants: Corn and Radish.**
- **Poor companions: Onion and Beets.**



Sketch of a simple garden trellis

Starting from Seed:

- Start seeds outdoors 0-2 weeks after the last spring frost or when the soil temperature is at least 60°F.
- **Using single poles:**
 - Dig holes 1-2 inch deep, 3-4 inches apart in rows 4 feet apart.
 - Next to each hole, bury a pole 5-6 inches deep. Bury the pole deeper if it cannot stand on its own.
 - Place 6-7 seeds in each hole, cover with soil, and lightly water the area.
- **Using a trellis:**
 - Dig 2 holes, 10 inches deep, at the ends of your row. If your row is longer than 6 feet, dig an additional hole in the middle of your row.
 - Place a 6-8 foot wooden post in each hole, and fill with dirt. Firmly tamp down the soil to make sure each pole can stand on its own.
 - Lay a 2x4 piece of wood (at least 6 feet long) on top of the posts to create a crossbar. Use a drill and 3 inch screws to firmly attach the wood to the posts.



Pole Beans (*Continued*)

Skill Level: Easy

Start: Outdoors

Starting from Seed (*Continued*):

- **Using a trellis (*Continued*):**

- Between the posts, push landscaping staples (also known as garden staples or pins) into the ground, 6 inches apart.
- Take a length of twine or string, tie the end to the crossbar then loop the twine to the ground. Loop it around the first landscaping staple, back up to the crossbar, then back down to the second landscaping staple. Continue looping the twine around the crossbar and the rest of the garden stakes. Tie off the twine and cut the end.
- Next to each landscaping staple, dig holes 1-2 inch deep.
- Place 5-6 seeds in each hole, cover with soil, and water the area.

Watering:

- Keep soil moist (not wet).
- Water twice a day for a total of 10 to 15 minutes. Soil should be wet and stick to your fingers in clumps. Water should not pool up on the surface.
- Water early in the morning or in the evening for best results.
- Ideally, use a drip or trickle system to deliver water at low pressure at the soil level.
- Be sure to water directly on the soil and avoid getting the leaves wet.
- Beans will stop flowering with irregular watering.

Weeding:

- Regularly remove weeds and add mulch to prevent their seeds from germinating.
- Use shallow cultivation to avoid disturbing the bean's delicate roots.

Thinning:

- Thin to 12 inches apart when the seedlings are about 1-2 inches by removing the smaller or sickly looking sprouts with your fingers.
- Thin prior to watering - do not handle the plants when they are wet.

Harvesting:

- **When:** Harvest 2-3 weeks after the plant flowers. Pick when young, firm and tender before the seeds inside have fully developed. *Do not wait until the seeds are bulging or they will taste tough.* Pick beans every day; the more you pick, the more beans grow.
- **How:** Gently snap or cut the bean off the plant. Fresh beans should snap easily when broken.





Potatoes

Skill Level: Easy to Medium

Start: Outdoors

Suggested Varieties for Wyoming

Dark Red Norland

85 days to mature

Slightly sweet with smooth texture

Dark red skin

Oblong, slightly flattened, medium to large sized potatoes with shallow eyes

Excellent boiled, roasted and fried

Disease resistant

Kennebec

80 days to mature

Earthy, nutty flavor with starchy texture

Light brown, easy-to-peel skin

Oblong, medium to large sized potatoes with shallow eyes and brown speckles

Excellent baked, roasted, and fried

Disease resistant

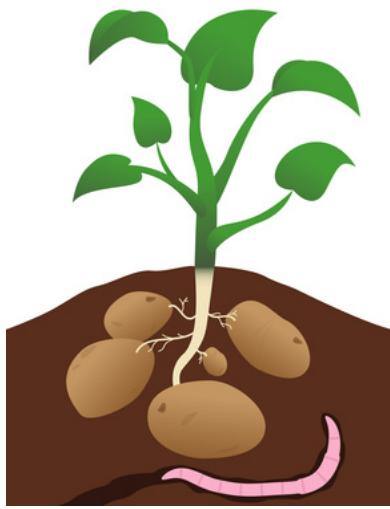
Things to Note:

- Potatoes don't have seeds – Seed potatoes (small potatoes or "tubers" with growing buds) are used instead.
- Potatoes are a cool weather crop. Long periods of 90°F weather could kill the plant.
- The foliage is fragile and is very susceptible to frost.
- Keep direct sunlight off of the tubers or they will turn green.
- Hilling prevents potatoes from getting sunburned, which can cause them to turn green, taste bitter and become toxic.
- Potatoes like acidic, well-drained fertile soil.
- **Remember, the best information can be found on the back of your seed packet.**
- *Companion plants:* Beans and Corn.
- *Poor companions:* Turnips and Radish.



Starting from Seed Potatoes:

- Plant potatoes in early May or 1-2 weeks before the average last frost date.
- In an area with full sun, use a shovel to dig a trench 6 inches wide and 8 inches deep, tapering the bottom to 3 inches wide.
- Space rows 3 feet apart and spread manure or compost at the bottom of each trench.
- One to two days before planting, cut the large seed-potatoes into golf ball size pieces with at least 2 eyes on each piece. Smaller seed-potatoes may be planted whole.
- Every 12-14 inches make a hole 3-4 inches deep, place a seed-potato piece (cut side down) in each hole, and cover with soil.



Potatoes (Continued)

Skill Level: Easy to Medium

Start: Outdoors

Starting from Seed Potatoes (Continued):

- When sprouts appear (12-16 days after planting), begin hilling by using a hoe to fill in the trench with an additional 3-4 inches of soil and leaving the plant exposed a few inches.
- When plants are 6-8 inches tall repeat hilling process (see previous step), leaving the soil mounded 4-5 inches above ground level.
- Add mulch between the rows after the plants have emerged to regulate soil moisture, temperature, and suppress weeds.

Watering:

- Water for about 10 minutes twice a day.
- Do not allow water to pool at the surface.
- Ideally, water either early in the morning or in the evening.
- Maintain an even soil moisture when sprouts appear until several weeks after blossoming.
- Tubers can become misshapen with irregular watering.

Weeding:

- Weed often to reduce competition for nutrients.
- Use mulch often to prevent weed germination.

Thinning:

- No thinning necessary.

Harvesting:

- **When:** The foliage turns brown and dies.
- **How:** Cut off foliage when they turn brown, then wait 1.5 to 2 weeks before harvesting. Place harvested potatoes in a cool, dry place for up to 2 weeks to cure.





Radishes

Skill Level: Easy

Start: Outdoors

Suggested Varieties for Wyoming

Cherry Belle

21 days to mature
Crisp, firm flesh
Sweet and mild flavor
Cherry-red skin, round and smooth
 $\frac{3}{4}$ to 1 inch wide
Early producer

French Breakfast

23 days to mature
Very crisp and mildly spicy
Pungent smell when young
Scarlet skin, fades to white at the bottom
2 to 3 inch long and $\frac{3}{4}$ inch wide
Tolerates moderate heat

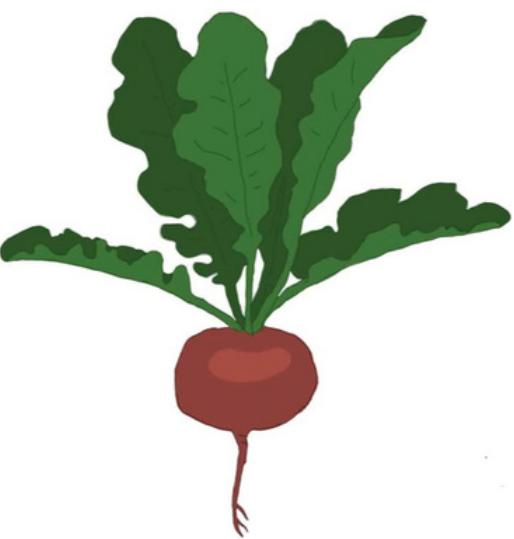
Things to Note:

- Radishes are a cool weather crop - hot, dry conditions adversely affect quality
- Make small weekly sowings to ensure a steady supply of radishes.
- Never plant radishes in a bed that contained a cole crop (i.e. Brussels sprouts, cabbage, cauliflower, kale, etc.) in the last three years.
- Avoid over-fertilizing.
- **Remember, the best information can be found on the back of your seed packet.**
- *Companion plants: Spinach and Lettuce.*
- *Poor companions: Potatoes and Turnip.*



Starting from Seed:

- Plant seeds outdoors 2 weeks before the last average frost in an area with full sun and well-drained, loose soil.
- Before planting, remove any rocks from your garden bed and add 1 to 3 inches of compost or all-purpose fertilizer to the planting site.
- Make a $\frac{1}{2}$ inch deep hole every 1 to 2 inches in rows 6 inches apart.
- Place 2 to 3 seeds in each hole, cover with starting soil and gently pat down to remove air pockets.
- Thin seedlings to be 2 to 3 inches apart after sprouting (about 7 days).
- Plant another round of seeds every 1 to 2 weeks for a continuous harvest.



Radishes (*Continued*)

Skill Level: Easy

Start: Outdoors

Watering:

- Consistently keep the soil moist (not wet) during germination.
- Plants need to be watered **twice a day for about 10 minutes** each time.
- Ideally, water early in the morning or in the evening.
- Make sure the water is fully absorbed by the soil. Do not let water pool up around the plants.
- Use a drip or trickle system that delivers water at low pressure at the soil level for best results.

Weeding:

- Weeds will quickly overwhelm your radishes if you aren't careful.
- Control weeds by cultivating often or use mulch to prevent their seeds from germinating.

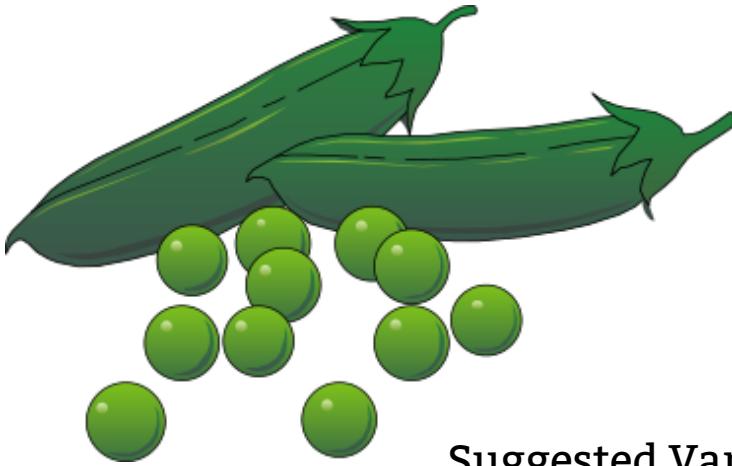
Thinning:

- Thin to about 2 to 3 inches apart once the seedlings emerge (about 7 days) to prevent overcrowding.
- To thin, use your fingers and gently pull on the base of the seedlings that are smaller or sickly.

Harvesting:

- **When:** About 25 days after planting (depending on variety), or when roots are 1 inch in diameter at the soil surface. Finish harvest before warm weather comes. *Radishes will become spongy and overly spicy if not harvested in time.*
- **How:** Grab the radish close to the root and pull the plant straight up, twisting slightly if needed. Avoid pulling the foliage.





Snap Peas

Skill Level: Medium

Start: Outdoors

Suggested Varieties for Wyoming

Sugar Ann

55-70 days to mature
Crisp, sweet, fleshy, round pods
2-3 inch pods
Vines: 18-24 inch height
Crop support recommended
Disease resistant

Super Sugar Snap

64 days to mature
Extra sweet, plump, round pods
3-4 inch pods
Vines: 60-72 inch height
Crop support recommended
Disease resistant

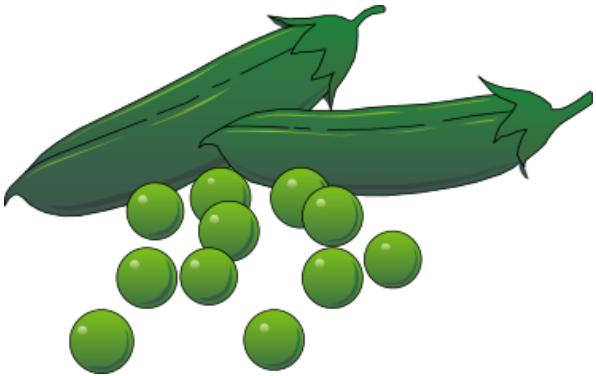
Things to Note:

- Snap peas are a cool season crop - hot, dry conditions adversely affect quality and yield.
- Use crop supports such as a trellis net or chicken wire to keep vines upright and prevent disease.
- Hoe carefully when cultivating to avoid disturbing the shallow roots.
- **Remember, the best information can be found on the back of your seed packet.**
- **Companion plants: Beans and Carrots.**
- **Poor companions: Onions and Chives.**



Starting from Seed:

- Start seeds in early to mid April, or as soon as the soil can be worked.
- Prior to sowing, add fertilizer to the soil (wood ash is recommended).
- In an area with full sun, make double rows spaced 6 inches apart with 24 inches between each set of rows.
- Plant seeds 2 inches apart and 1 inch deep. Cover with fine soil.
- Keep seeds moist (not wet) during germination.
- Thin to 6 inches apart when seedlings are about 1-2 inches high.
- Install crop support, if needed, by suspending the bottom of the support just above the seedling.



Snap Peas

(Continued)

Skill Level: Medium

Start: Outdoors

Watering:

- Water regularly during dry periods for uninterrupted growth.
- **Be sure to water for at least 10 minutes a day.**
- Water enough to where the soil is fully absorbing the water.
- Do not let the water pool on the top of the soil.
- Keep the soil consistently moist, not wet, to avoid rot and other diseases.

Weeding:

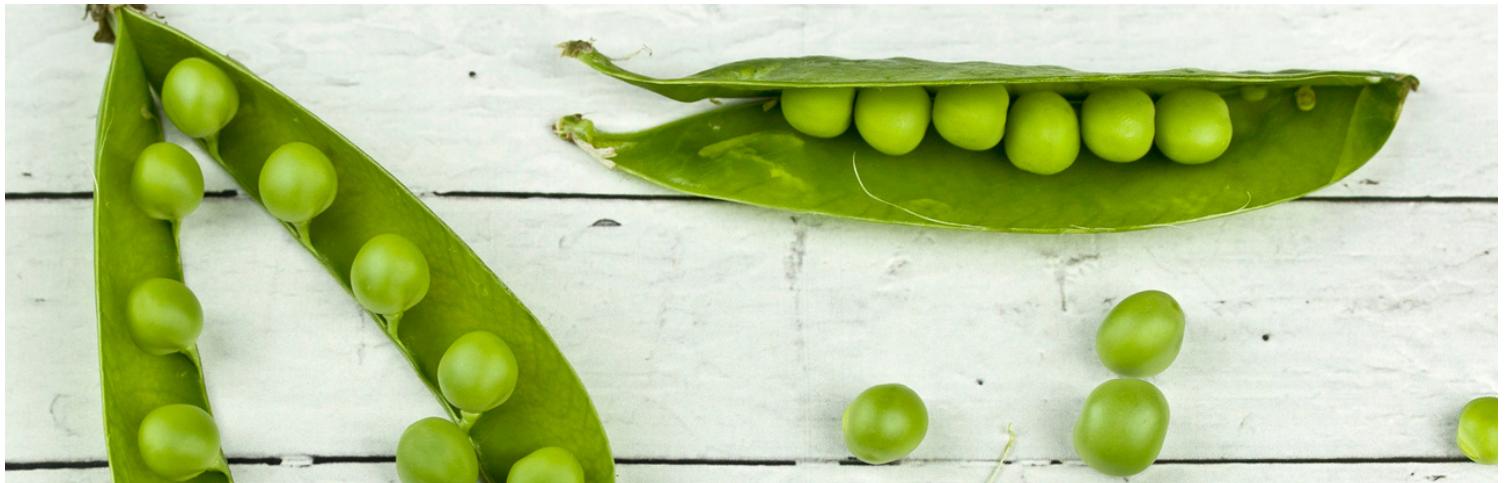
- Weed often to reduce competition for nutrients and overcrowding.
- Use mulch or cultivate often to prevent weed germination.
- Weed carefully to avoid disturbing the shallow roots of your peas.

Thinning:

- Thin to 4-6 inches apart when seedlings are about 1-2 inches tall.
- To thin, use your fingers to pull from the base of the plant.

Harvesting:

- **When:** The pod is rounded, bright green, and has a nice sheen. If the seeds have made ridges on the pod and the pods are dull green, it is past prime harvesting.
- **How:** Holding the vine gently in one hand, snap the pod off with the other hand. Harvest regularly (every few days) for higher yield.





Snow Peas

Skill Level: Medium

Start: Outdoors

Suggested Varieties for Wyoming

Oregon Giant

65-70 days to mature

Sweet, mild, flat, and crunchy pods

4-5 inch pod length

Vines: 26-30 inches

No crop support needed

Disease resistant

Dwarf Grey Sugar

60-70 days to mature

Sweet, stringless, fleshy, and pale green pods

2-3 inch pod length

Vines: 2 to 2.5 feet long

Use crop support

Disease resistant

Things to Note:

- Snow peas are a cool season crop - hot, dry conditions adversely affect quality and yield.
- Well draining soils are needed (i.e. sandy soils).
- Use crop supports such as a trellis net or chicken wire to keep vines upright.
- Hoe carefully when cultivating to avoid disturbing the shallow roots.
- **Remember, the best information can be found on the back of your seed packet.**
- **Companion plants: Carrots and Beans.**
- **Poor companions: Onions and Garlic.**



Starting from Seed:

- Plant outside in mid-March, or as soon as the soil can be worked, in an area with full to partial sunlight.
- Make rows 12-18 inches apart with holes 2-3 inches apart and $\frac{1}{2}$ to 1 inch in depth.
- Place 2-3 seeds in each hole, cover with soil, and fertilize.
- Keep seeds moist (not wet) during germination.
- Install crop support if needed by suspending the bottom of the support just above the young plants.
- Add mulch regularly to promote soil moisture and regulate heat.



Snow Peas (*Continued*)

Skill Level: **Medium**

Start: Outdoors

Watering:

- Snow peas need consistent watering.
- Keep the soil moist (not wet) for continuous growth.
- **Make sure to water 10 minutes to 15 minutes daily.**
- Water enough to where the soil is fully absorbing the water.
- Do not let the water pool on the top of the soil.
- Soggy, wet soil may lead to mildew and other diseases.

Weeding:

- Weed regularly to encourage air circulation and prevent disease.
- Weed carefully to avoid disturbing the shallow roots.

Thinning:

- Using your fingers, thin so that the plants are 3-4 inches apart to prevent overcrowding.
- Crowded snow peas spread disease quickly and are harder to harvest.

Harvesting:

- **When:** Pods are long and thin, just as the seeds begin to develop. Seeds should look like small bumps. *Do not wait until the seeds get too fat to harvest or the pods will lose flavor.*
- **How:** Holding the vine gently in one hand, snap the pod off with the other hand every 1-3 days after pods are ready.





Spinach

Skill Level: Easy

Start: Outdoors

Suggested Varieties for Wyoming

Avon

35-45 days to maturity

Mildly sweet flavor

Broad, slightly crinkled deep green leaves

Fast growing, slow to bolt

Can be sown twice

Does well in full or partial sun

Teton

45-50 days to maturity

Smooth, mild flavor

Dark green, oval leaves

Sturdy hybrid, slow to bolt

Perfect for beginners

Does well in full or partial sun

Things to Note:

- Spinach is a cool-season crop, grown in early Spring and in the Fall.
- Under favorable weather conditions, some varieties will mature as early as 35 days after planting.
- Be wary of warm temperatures in the summer, they will cause bolting and seed development.
- **Remember, the best information can be found on the back of your seed packet.**
- *Companion plants: Bell Pepper and Radish.*
- *Poor companions: Potatoes.*



Starting From Seed:

- In early May, dig holes 2 inches deep and 12-18 inches apart. Place 1 to 2 seeds in each hole, cover with soil, and lightly pat down to remove air pockets.
- Alternatively, start planting in late July for a Fall harvest.
- To produce spinach over a longer period of time, make several staggered plantings.

Watering:

- Keep the soil constantly moist (not wet) while waiting for the seeds to sprout.
- Water for around 10 minutes daily. Be sure the soil around the base of the plant is fully absorbing the water.
- Do not let the water "pool" around the base of the plant.
- Avoid getting the leaves wet to prevent the spread of rot or disease.



Spinach (Continued)

Skill Level: Easy

Start: Outdoors

Weeding:

- Pull weeds as soon as they are noticed.
- Be careful not to confuse the spinach plants with common weeds!

Thinning:

- When plants are 3 inches tall, thin plants to 4 to 6 inches apart. Be sure to cut the whole plant at soil level.
- Add your thinned spinach to your salads for a tasty treat!

Harvesting:

- **When:** Outer leaves are 6 inches long.
- **How:** Simply cut the plant at the soil level when harvesting. For continuous harvest, cut away the outer leaves first. *Make sure you harvest before the flower stalk forms (when it begins to bolt).*





Sweet Corn

Skill Level: Medium

Start: Outdoors

Suggested Varieties for Wyoming

Latte

65-70 days to mature

Tender, sweet flavor

5 feet 8 inches tall

8-inch ears, yellow and white kernels

Strong tip fill

Early Sunglow

63-70 days to mature

Sweet taste, mild texture

4 to 4.5 feet tall

7-inch ears, deep yellow kernels

Typically yields 2 ears

Things to Note:

- Sweet corn is a warm weather crop. Use early maturing varieties for maximum success.
- Soils should get no cooler than 65°F during initial germination, especially for supersweet varieties.
- Grow multiple rows of corn. Single rows tend to grow poorly.
- Keep different varieties far apart from one another (at least 30-36 inch rows) to prevent cross-pollination.
- Plant seeds in the north side of your garden to avoid shading the rest of your crops.
- Yellow leaves are a sign of too little nitrogen fertilizer. Dark green leaves are a sign of too much nitrogen fertilizer.
- **Remember, the best information can be found on the back of your seed packet.**
- **Companion plants: Pole Beans and Squash.**
- **Poor companions: Tomatoes and other corn varieties.**



Starting from Seed:

- Start seeds outdoors 1 week before the average last frost.
- Choose an area with full sun and on the north side of your garden and make rows 30-36 inches apart.
- Plant seeds 12 inches apart in holes 1 to 1.5 inches deep. Seedlings should emerge after 1 to 2 weeks.
- When the stalks are 8 inches tall, mound up soil around the plants to prevent the corn from falling over. Stalks may need an extra support in windy areas.
- Fertilize when corn is knee high and again when the silks (fine hairs on the ears) form.



Sweet Corn (*Continued*)

Skill Level: Medium

Start Outdoors

Watering:

- Sweet corn needs to get at least 1 to 2 inches of water per week.
- Be sure to water **at least 10 minutes daily**.
- Make sure the water is being fully absorbed and not pooling at the base of the plant. You want to be sure the soil stays moist but not wet.
- Water deeply to 6 inches during pollination and ear filling times. This amounts to about **15 minutes daily**.
- Be sure to keep an eye out for thin, curled, "pineapple" leaves. They are a sign the corn needs more water.

Weeding:

- Weed carefully to avoid damaging surface roots.
- Keep weeds under control during the growing season by either cultivating often or use mulch to prevent their seeds from germinating.

Thinning:

- Thin to make sure the seedlings remain at least 1 foot apart after seedlings reach 3-5 inches tall.
- Do not remove suckers (small ears) from the bottom of the plant, it will slow growth of the corn.

Harvesting:

- **When:** About 17-20 days after the first silk appears on the ear. Mature kernels should be firm and will exude milky sap when punctured. Immature kernels will exude clear liquid when punctured, while overly mature ears will have tough and doughy kernels.
- **How:** Harvest in the morning or when it is cool. Grab the ear firmly and twist downward. Avoid breaking the stalk when harvesting.





Swiss Chard

Skill Level: Easy

Start: Outdoors

Suggested Varieties for Wyoming

Bright Lights

55 days to maturity

Very colorful stalks comes in gold, pink and crimson

Sturdy variety, rarely bolts

Crisp, mild flavor

Does well in partial sun

Lucullus

60-70 days to maturity

Crumpled green leaves with white stalks

Sturdy variety, never bolts

Has constant heavy yields

Mildly sweet taste

Does well in partial sun

Things to Note:

- Swiss chard can withstand both hot weather and frost, from spring until late fall.
- Many harvests can be made from the same plant throughout the growing season.
- **Remember, the can find the best information on the back of your seed packet.**
- **Companion Plants: Onions and Beans.**
- **Poor companions: Corn and Potatoes.**



Starting From Seed:

- Start Swiss chard plants outside 2 to 3 weeks before the last average frost date.
- Dig 1 inch holes, 3 inches apart. Place 2 to 3 seeds in each hole, cover with soil, and lightly pat down to remove air pockets.
- Make rows 18 inches apart.

Watering:

- Keep the soil constantly moist (not wet) while waiting for the seeds to sprout.
- Once sprouted, give the plants at least an inch of water every week for 5 to 8 weeks.
- Water for around 10 to 15 minutes daily.
- Be sure the soil around the base of the plant is fully absorbing the water. Do not let water "pool" around the base of the plant.
- Water early in the morning or evening for best results.
- Be sure to water directly on the soil and avoid getting the leaves wet.



Swiss Chard

(Continued)

Skill Level: Easy

Start: Outdoors

Weeding:

- Put a marker where you first planted the seeds in the ground to avoid confusing them with weeds later.
- Pull weeds around the plant as soon as they are noticed.

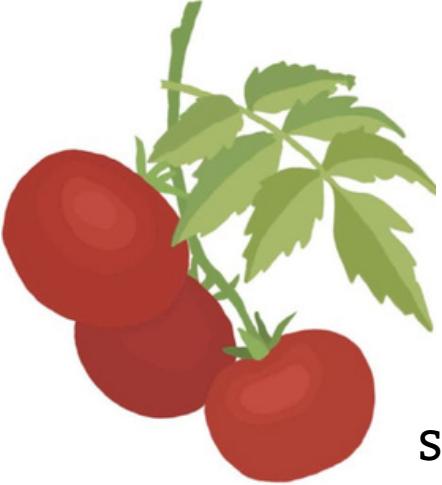
Thinning:

- The plants should be thinned to 8 to 12 inches apart in each row after they are about 3 to 4 inches tall.

Harvesting:

- **When:** Begin to harvest when desired leaf size is reached. Many harvests can be made from the same plant throughout the growing season.
- **How:** Harvest the original leaves gently to be sure leaves will re-grow and you should be able to harvest again. Remove outer leaves near ground level with a sharp knife, leaving the smaller central leaves. Avoid cutting into the growing point or the bud in the center of the plant, as this is where new leaves develop.





Tomatoes

Skill Level: Medium to Hard

Start: Outdoors (Seedlings)

Suggested Varieties for Wyoming

Nikolayev Yellow Cherry

60-70 days to mature

Bursting sweet/acid flavor

Round to oval shaped fruit, around 3/4-inches, with
bright-yellow color

Does well in colder climates

Disease resistant

Grows to be 36-60 inches tall

Sasha's Altai

50-60 days to mature

Moderately sweet, award-winning flavor

Thinned-skinned, bright red, slightly
flattened, and round

Does well in colder climates and higher
altitudes

Grows to be 40-50 inches tall

Things to Note:

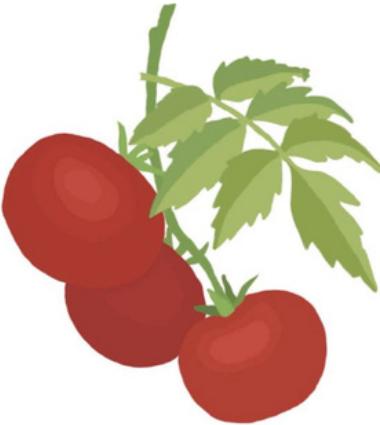
- Tomato seeds take a long time to sprout and need to stay warm.
- A wall of water (a heavy piece of plastic, sectioned into cells and filled with water) is recommended to retain heat.
- Avoid getting the leaves wet as much as possible.
- We recommend starting from seedlings, instead of from seed.
- Be sure to space out the plants at least 24 to 36 inches apart.
- Prune your tomato plant regularly to maintain airflow and prevent disease.
- **Remember, the best information can be found on the back of your seed packet.**
- **Companion plants: Onions and Carrots.**
- **Poor companions: Cabbage and Potatoes.**

Planting Seedling Outdoors:

- Pick a spot with plenty of sun.
- Planting near a south facing wall, rocks or jugs of water is recommended. They absorb heat during the day and will release it at night keeping your plant warm.
- When your seedlings are more than a foot tall, plant them 24-36 inches apart in a trench about 8 inches deep and 6 inches wide. Lay the plant on its side in the trench. Carefully bend the stem so the top part is above the soil. Fill in with soil and add a support (stick or a tomato cage) to help seedling stand up right.
- Make sure to have a cover ready in case of a late, unexpected frost.



A wall of water surrounding a tomato seedling



Tomatoes (*Continued*)

Skill Level: Medium to Hard

Start: Outdoors (Seedlings)

Starting from Seed:

- Start your seeds indoors around 6 to 8 weeks before your average last frost date.
- Begin with starting soil, containers (at least 2.5 inches deep) and lids.
- Fill and compact the soil in the containers making sure there are no air pockets.
- Using your finger, make two holes about 0.25 inch deep per container.
- Place a seed in each hole, cover with soil, and lightly pack down to remove air pockets.
- Place containers in a warm area (around 70-75°F) and cover to keep soil moist.
- Once seedlings start to sprout, move the containers to a light source (either direct sunlight or grow lights) and remove the cover.
- When the seedlings have two sets of leaves begin fertilizing them once a week.
- Re-pot your plant when the roots fill the container (usually after a month). The size of the pot depends how many times you want to re-pot before transplanting outside.
- Put a thin base of planting soil on the bottom of the new container, then place the seedling in the pot, and fill the pot with soil.
- Seedlings may be transplanted outside or in a hoop house after all threat of frost has passed.

Watering:

- Keep soil moist (not wet).
- Water **twice a day for a total of 10 minutes**. Stop before water begins to pool on the soil.
- Water immediately after re-potting or transplanting.
- Water early in the morning or evening for best results.
- Be sure to water directly on the soil and avoid getting the leaves wet.

Weeding:

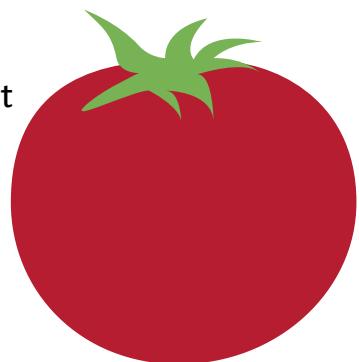
- Regularly remove weeds as they pop up with gentle cultivation.

Thinning:

- Thin when seedlings grow to about 2 inches by removing the smaller sprouts in the container with your fingers.
- As the plant grows, be sure to prune regularly.
- Cut off all yellowing leaves. Any new tiny branches sprouting in a spot where the branch meets the stem on the plant should be removed.

Harvesting:

- **When:** The color of the fruit is bright, the fruit is firm to the touch and the fruit is fragrant but not overpowering.
- **How:** Pull the fruit from vine. Twist fruit if needed.





Turnips

Skill Level: Easy

Start: Outdoors

Suggested Varieties for Wyoming

Purple Top White Globe

50-60 days to mature

Very healthy and sweet variety

Smooth with a purplish-red top

Does well in full sun

Disease resistant

Grows 12-15 inches tall

Tokyo Cross

35-40 days to mature

Excellent crisp taste

White, rounded tubers

Does well in full sun

Great choice for beginner gardeners

Grows 10-12 inches tall

Things to Note:

- Turnips are a cool-season crop, they can be planted for late-spring or late-fall harvest.
- Some varieties are grown only for their foliage or “greens” while others are grown for their root.
- **Remember, the best information can be found on the back of your seed packet.**
- *Companion plants: Brussels Sprouts and Peas.*
- *Poor companions: Potatoes and Radishes.*



Starting From Seed:

- Pick a spot in full sun or partial shade.
- Plant the seeds 2 to 3 weeks before the last average frost date for late spring/early summer harvest, or plant late summer/early fall for an Autumn harvest.
- Plant the seeds in holes 1/2 inch deep and 12 to 15 inches apart. Space rows 12 to 24 inches apart.

Watering:

- Keep soil consistently moist (not wet) throughout the growing season.
- Be sure to water 10 to 15 minutes daily.
- Make sure the soil is fully absorbing the water and not pooling at the base of the plant.
- Be sure to water directly on the soil and avoid getting the leaves wet.



Turnips (Continued)

Skill Level: Easy

Start: Outdoors

Weeding:

- Constantly keep an eye out for growing weeds around the plant and pull out weeds once they are noticed.

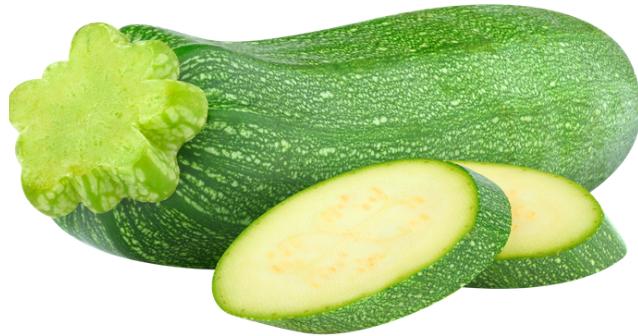
Thinning:

- The plants should be thinned to 3 to 4 inches apart in the row after they are established.

Harvesting:

- **When:** Harvest when bulbs are 2 to 3 inches in diameter or when the shoulder is "peeking" through the dirt. *Turnips will become woody and unappetizing if they grow larger than 3 to 4 inches in diameter.*
- **How:** Twist off the top of the foliage once the plant grows to about 6 inches tall. To avoid damaging the tuber, cut the foliage about 1 inch above the top. To harvest the turnip, hold the the base of the foliage, pull straight up and twist slightly. You may also use a gardening fork to help lift the tuber out.





Zucchini

Skill Level: Easy to Medium

Start: Indoors

Suggested Varieties for Wyoming

Black Beauty

50-60 days to mature

Sweet flavor with minimal seeds

Crisp outside texture and creamy inside

Dark green skin and white flesh

6 to 8 inches long

Bush: 3 feet spread, 3 feet height

Jackpot Hybrid

42 days to mature

Mild, delicate flavor

Creamy texture

Medium dark green skin with speckles

6 to 8 inches long

Bush: 2.5 feet spread, 1.5 feet height

Things to Note:

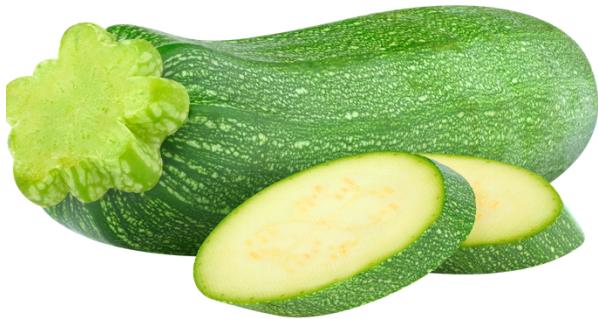
- Need well-drained, fertile soil; amend with compost before planting.
- To protect the shallow roots, use mulch to help retain soil moisture and heat.
- Remember, the best information can be found on the back of your seed packet.
- Companion plants: Corn and Beans.
- Poor companions: Potatoes and Pumpkin.



Starting from

Seed:

- Start seeds indoors 2 to 4 weeks before the average last frost date.
- Begin with starting soil and containers at least 2 inches deep.
- Fill and compact the soil in the containers making sure there are no air pockets.
- Using your finger, make one hole about one inch deep per container.
- Place 3 to 4 seeds in each hole, cover with more starting soil, and gently pack it down to remove air pockets.
- Place containers in an area with full sun/grow light, and maintain soil temperatures 60°F minimum.
- Seedlings will emerge after 10 to 14 days.
- Using your fingers, thin to one plant per container when seedlings have two sets of leaves.



Zucchini (Continued)

Skill Level: Easy to Medium

Start: Indoors

Planting Seedlings Outdoors:

- Be extra careful when transplanting!
- Transplant 1 to 2 weeks after average last frost date, or when outside soil temperature is at least 60°F.
- Before transplanting, apply a layer of compost to the soil outside.
- In an area with full sun, plant seedlings 8 to 12 inches apart in rows 24 to 36 inches apart.

Watering:

- Keep soil moist (not wet).
- Water about **twice a day for 10 minutes each time**. Soil should continuously absorb water. Do not let water pool up around the plants.
- Water immediately after repotting or transplanting.
- Water early in the morning or evening.
- Be sure to water directly on the soil and avoid getting the leaves wet.
- Ideally, use a drip or trickle system to deliver water at low pressure at the soil level.

Weeding:

- Control weeds by cultivating often or use mulch to prevent their seeds from germinating.
- Weed carefully to avoid disturbing the shallow roots.

Thinning:

- Thin to one plant when seedlings have two sets of leaves by removing the smaller and sickly sprouts in the container with your fingers.
- Once outside, thin seedlings to 12 inches apart once they are 4 to 5 inches tall.

Harvesting:

- **When:** Fruits are small and the skin is shiny. Harvest every 2 to 3 days when fruit is 2 inches in diameter. *Zucchini will lose their flavor and will stop production if left on the vine for too long.*
- **How:** Gently twist the fruit until it snaps off the vine.

