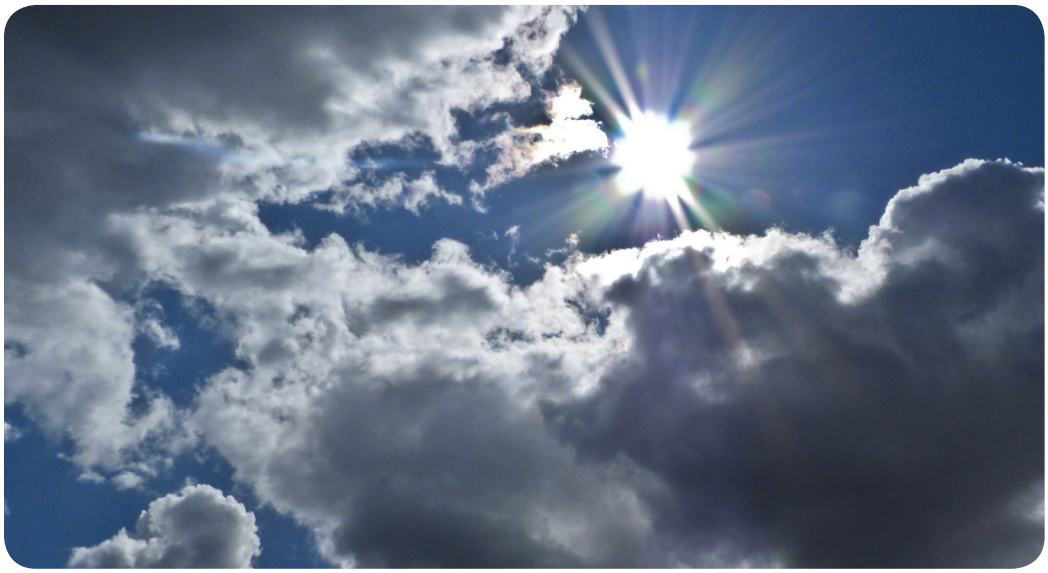
GROWING TIPS AND TRICKS

Gardens new and old can benefit from a good understanding and evaluation of the three major growing components: sun, soil, and water. These three aspects work together, allowing our plants to grow, flourish, and reproduce. When one aspect suffers, so does our garden.



SUN

While we can't change the number of hours in the day or the direction of the sun, we can make good choices about the placement of our gardens. Vegetable gardens need full sun, which is typically defined as 6 or more hours per day. In genenal, the more sun you can get, the faster and more robust your plants will grow.

Check for obstructions on the east, west, and south sides of your garden. The sun will always hang in the Southern part of the sky, tracking east to west. Trees, buildings, fences, and other barriers may cast shade on your garden, especially in winter, spring, and fall when the sun tracks lower on the horizon. You may want to prune or remove those barriers, or relocate your garden to a sunnier area.

Evaluate how shade will move in your garden throughout the year so that you'll have adequate sun all the time.

GROWING TIPS & TRICKS

WATER

Access

Water access will come from somewhere on the property and you will work with your school's maintenance crew to develop a plan to get that water into the garden. It is important to work with Blayne Radford, Grounds Management Supervisor, when coming up with any plan where permanent structures are placed.

Some gardens are lucky enough to have water nearby, but others may need to bury a couple of pipes. Whatever the needs may be, the easier it is to access the water, the more likely it is that you and volunteers will actually use it. Take the time to get the water right where you'll need it.

Conservation

Once you have water access, you can examine water conservation. The two main ways to conserve water in the garden are mulch and the use drip tape, soaker hoses, or some other non-spraying watering style.

Mulch helps suppress weeds, moderate soil temperature, and retain moisture. It's one of the gardener's best tools.

Common Mulches and Their Characteristics

MATERIAL	DEPTH	WATER RETENTION	INSULATING EFFECT	WEED CONTROL	DECOMPOSITION RATE	COMMENTS
Leaves	3 in.	Fair	Good	Fair	Slow	Adds nitrogen; chop for permeability.
Grass clippings	1 in. max.	Good if unmatted	Good	Fair	Rapid	Green adds nitrogen; avoid grass treated with pesticides and herbicides.
Compost	3 in.	Good	Good	Fair	Rapid	Adds nutrients; can mix with leaves, other mulch.
Straw	1–2 in. chopped	Good	Good	Good	Fairly slow	Robs nitrogen; highly flammable; avoid oat straw.
Cocoa hulls	1 in.	Good	Good	Good	Slow, adds nitrogen	May develop mold; smells like chocolate.
Mixed bark	2–3 in.	Good	Good	Good	Slow	Replace every 2 years.
Redwood bark	2–3 in.	Fair	Good	Fair	Very slow	Robs nitrogen; earthworms avoid redwood.
Newspaper	2 layers	Good	Good	Best	Rapid lasts 1 season	Cover with another mulch to hold in place.
Evergreen boughs	Several layers	Fair	Good	Fair	Slow	Good for erosion. Remove in spring.
Pine needles	1.5 in.	Good	Good against wind	Good	Slow	Good for acid soil.
Sawdust	1.5 in.	Fair	Good	Good	Slow	Robs nitrogen, high carbon content; low earthworm activity.
Wood shavings	2–3 in.	Fair	Fair	Fair	Very slow	Robs nitrogen, hardwoods better than pine or spruce.
Wood chips	2–4 in.	Good	Good	Good	Fairly slow	Doesn't rob nitrogen.
Seaweed	4–6 in.	Good	Good	Best	Slow	Adds nitrogen, potash, sodium, boron.
Green cover crop	Full height	Good	Good	Good	Till under	Adds nitrogen.
Stone	2–4 in.	Fair	Good	Fair	Negligible	Permanent mulch; adds some trace elements.
Landscape fabric	1 layer	Good	Good	Good	Slow, lasts several years	Use in permanent beds; cover with top mulch.
Plastic	1 layer 1–6 mil.	Excellent	Good	Best	Breaks down after a season or two	Adds nothing to soil; black good for heating soil.

This chart was developed by Brooklyn Botanic Garden and can be found at the following address: http://www.bbg.org/pdf/tipsheets/UsingMulch_0513.pdf

GROWING TIPS & TRICKS

When watering by hose, sprinkler, or broadcaster much of the water is lost through evaporation. Little of this water makes its way down to the soil line. Using drip tape, soaker hoses, or some other creative way to get the water underneath the plants and directly to the soil will help improve the health of your plants and eventually save you time.

Water droplets on plants can also cause damage during the sunny, hot times of the days. If you need to do any overhead watering, avoid the hottest, sunniest times of the day. Watering early in the morning is best for plants as it allows them to dry out throughout the day, keeping potential fungal disease at bay.

Catchment

Harvesting water is the final step that can help you manage water in your garden. You can purchase/repurpose rain barrels to harvest water off of the roof of your school, shed, or other nearby building. This helps you have backup water nearby and helps the environment by reducing storm water runoff.

Be sure that your barrel is fitted with a lid or fine mesh screen so that mosquitos don't breed in your collected water.

Elevate your barrel off the ground and attach a valve to the bottom for quick use. Gravity will help feed the water down through the spout to fill up your watering can or hose.

SOIL HEALTH

Plant health starts with soil health. There are a lot of factors in what makes healthy plants, but a nice, diverse soil environment can make a big difference. Much of the biology in the soil is responsible for creating plant-available nutrients.

Soil tests provide a great learning experience for everyone and can help you determine the needs of your garden. Kits can be purchased, or you can send off soil samples to your local Extension Office. Springfield's closest University of Missouri Extension Office is located at the Springfield Botanical Gardens at Nathanael Greene/Close Memorial Park

The major nutrients in soil are Nitrogen, Phosphorus and Potassium (N-P-K). They each play an important role in plant development. Too little or too much of any of these nutrients can severely damage your plants and even cause harm to the environment. Be aware that more is not always better.

NITROGEN

Plants use Nitrogen in the highest amounts; it typically promotes lush foliage growth which we know is important for photosynthesis. It comes almost exclusively from the breakdown of organic matter and other biological processes. It also has a tendency to leach away quickly.

PHOSPHORUS

This macronutrient is mostly responsible for healthy flower, fruit and seed formation in plants. The main source of phosphorus for plants is decomposing organic matter.

POTASSIUM

Potassium helps plants develop strong root systems and fight off diseases. This mineral comes primarily from the slow weathering of minerals in the soil and slightly from decomposing organic materials.
Ideas for organic fertilizers are alfalfa pellets, blood meal, bone meal, compost, poultry bedding, cottonseed meal, fish emulsion, fish meal, kelp meal, greensand, and rock phosphate.

GROWING TIPS & TRICKS

Building Compost

Regardless of your soil test results, adding compost can help feed and contribute to the biology in your soil. The combination of soil biology and organic matter results in a slow-release of nutrients over time as the soil microbes break down the organic materials into compost.

There is a lot of information out there on building compost and it can be a little intimidating, but don't worry! Nature creates compost all the time without our help and as long as you follow a few "recipe" guidelines, you'll be on your way to a garden essential.

Diversity in your compost pile is a good thing. You want about a 30:1 ratio of carbon to nitrogen, but don't let that number alarm you. If you get way off, your compost pile will let you know. You want a good mix of "greens" and "browns." Greens are rich in nitrogen and heat up your compost pile, while browns are rich in carbon and the base of your pile. Proper compost heats up (stick your hand in there and feel!), breaks down relatively quickly, and doesn't smell.

Meats, animal byproducts, and eggs are not recommended for your compost pile

Check out this kid-friendly instructional guide from Cornell University, complete with activities and a glossary. http://cwmi.css.cornell.edu/compostingwastestoresources.pdf

CROP ROTATIONS AND CROP FAMILIES

Different crops use up different quantities of soil macro and micronutrients. They also attract different kinds of pests and diseases that can overwinter in the soil. In order not to deplete too much of one nutrient and to help avoid those nasty pests, rotate your crops.

Crop rotation is simple once you learn which crops belong to which families (see the chart below). The University of Missouri Extension suggests that you wait 3 years before planting the same family in the same bed. A good garden map will help you plan a rotation.

SAMPLE ROTATION

	Bed A	**Bed B**	**Bed C**	**Bed D**
Year 1	Carrots	Broccoli	Tomatoes	Zucchini
Year 2	Zucchini	Carrots	Broccoli	Tomatoes
Year 3	Tomatoes	Zucchini	Carrots	Broccoli
Year 4	Broccoli	Tomatoes	Zucchini	Carrots

GROWING TIPS & TRICKS

COMMON CROP FAMILIES

Botanical Family Name	Common Family Name	Crops
Apiaceae	Carrot Family	Carrot, Parsley, Celery, Parsnip
Asteraceae	Composite Family	Lettuce, Jerusalem Artichoke
Brassicaceae	Mustard Family	Kale, Broccoli, Cauliflower, Cabbage, Brussels Sprouts, Radish, Rutabaga
Chenopodiaceae	Goosefoot Family	Beet, Chard, Spinach
Cucurbitaceae	Gourd Family	Summer squash (Zucchinis), Winter squash, Pumpkins, Watermelons, Cantaloupes, Cucumbers
Fabaceae	Pea Family	Peas, Beans
Liliaceae	Onion Family	Onions, Garlic, Scallions, Leeks, Chives
Poaceae	Grass Family	Corn
Solanaceae	Nightshade	Tomatoes, Potatoes, Peppers, Eggplant

Gardeners swap a lot of information about what crops work together in sequential years (i.e. planting corn the year before potatoes may increase your potato yield). If you are interested in researching and experimenting, have at it! It's fun to try out new things and experiment in the garden. Proper record keeping comes in pretty handy when testing out theories.

GROWING TIPS & TRICKS

PLANTING SCHEDULE

The University of Missouri Extension Office provides a planting schedule for common crops in our area. This document also provides information on plant spacing, average days to harvest, and expected yields. Please note that for Springfield, Missouri you should use the "North Missouri" column, due to the Ozark Plateau elevation and our weather patterns.

Like the guide states, the plant varieties listed are just a select few that have done well in our region. You should feel free to try new things and see what works for you in your garden. You may also want to consider planting heirloom varieties so that you'll be able to save seed for future planting.

When considering which plants to grow, it's a good idea to think about kid-friendly veggies that are easy to use in your school cafeteria. Here is a list of suggested vegetables and their planting times:

Suggested Vegetable	Approx. Days to Harvest**	Suggested Seeding Dates***
Carrot	70-85 days	3/25 - 4/10 7/20 - 7/30
Cucumbers	65-70 days	5/10 – 5/30
Green Beans (bush)	50-70 days	4/25 – 5/30 7/25 – 8/5
Kale	50-65 days	3/25 – 4/5
Onions	100-120 days	3/25 – 4/15
Peas (Snap)	65 – 75 days	3/25 – 4/10
Peppers	70-80 days	5/15 – 5/30
Potato	100-120 days	4/1 – 4/15
Radishes	25-35 days	
Summer Squash	80-90 days	5/15 – 5/30
Sweet Potato	150 days (slips)	5/15 – 6/5
Tomato (Cherry and Grape)	65-80 days	5/15 -5/30
*Lettuce (head)	55-80 days	3/25 – 4/20
*Spinach	40-50 days	4/1 – 4/20 7/20 – 8/10

*Lettuce and spinach are more difficult to use in the cafeterias, but are great options for class taste tests.

**Days to harvest can vary with plant variety, so be sure to check your seed packets.

*** Some crops have two sets of dates. This indicates that you may be able to get a spring and fall crop. Some dates are only listed once, but many of these crops can be planted throughout the summer, so long as they can mature and fruit before cold temperatures set in, like cucumbers and summer squash.

This information is pulled from MU Extension's Vegetable Planting Calendar. These are suggested da
test but remember that you do have room to try different things. Even though the chart does not suggest growing lettuce in the heat of summer, it does not mean that it is impossible. Building relationships with your nearby community or Master Gardeners will help you learn the ins and outs of planting.

Find this resource here: http://extension.missouri.edu/explorepdf/agguides/hort/g06201.pdf

GROWING TIPS & TRICKS

Direct Seeding vs. Transplants

Direct seeding is when plant seeds are placed directly in the spot where they will grow. This can be done by hand or with a variety of precision seeding tools available at farm resource stores.

Transplanting is when seeds are started in trays or fl ats, germinated to the seedling stage, hardened off , and then transplanted out into beds. "Hardening off" is a term used to describe getting young plants adjusted to their new homes. When we start seedlings in trays, we often have them in a protected space. These plants may never been exposed to the true elements (wind, large temperature variations, direct overhead sun, etc.). It's important to expose transplants to these conditions gradually to get them ready to live outside. If you skip this step, you may lose plants due to transplant shock (the sudden change in environmental conditions).

Both direct seeding and transplanting methods have their uses. For some plants, it is necessary to start them inside so that you'll have enough growing days for a decent harvest before the seasons change. Tomatoes, peppers, and eggplants are examples.

You may also want to transplant for quick successions. Let's say you would like kale to replace lettuce in one of your beds. If you start kale in trays, once your lettuce is harvested completely out of the bed, you'll be able to transplant the kale that's already several weeks into growing

For many crops, you have a choice.

DIRECT SEEDING		**TRANSPLANTS**	
Pros	Cons	Pros	Cons
Large spaces can be seeded relatively quickly	Must wait for soil and outdoor temperatures to warm enough for seed germination	Can get a head start on the season; able to seed plants indoors several weeks before temps are ready	Must keep trays well-watered and at the right temperature
Will not have to spend time transplanting	Weeding becomes necessary, as plants and seeds germinate at the same time and compete	Acts as "insurance;" Allows you to keep back-up plants if some are damaged from weather, pests, disease	Risk of plants becoming root-bound before temps and beds are ready
Plants will not need to harden off, no risk of transplant shock	Will be behind in planting schedule if seeds do not germinate correctly	Allow controlled environment for best growing	Risk of transplant shock; Must "harden off" plants; allow them to adjust to the elements before planting.

GROWING TIPS & TRICKS

COVER CROPS

Bare soil can cause problems in the garden. It leads to weeds, is much more susceptible to erosion, can leach out nutrients, and even spread diseases to our plants when soil splashes onto our crops after a heavy rain or watering. For all of these reasons, we try to keep our soils covered with beneficial plants or mulches as often as we can.

Certain plantings help us cover the soil and solve some of our garden problems. These plants, known as cover crops, are a diverse group of plants that are grown for varying reasons. Some of these plants have the potential to fix nitrogen in the soil (legumes), outcompete weeds, provide a lot of organic material for our compost piles, help reduce compaction, provide living mulches, and/or can act as green manures (one plant can have for more than one of these benefits).

Some of them even provide beautiful fl owers or grains. Try experimenting with teff , buckwheat, or oats to harvest the grain for grinding your own fl our. Even plant clovers, some of which can be dried and made into teas or fl ower crowns while also feeding your soil.

Many cover crops are used in between plantings to help replenish the soil, but they are also used in the fall to help hold soils in place through the winter. Inn a school garden, you may also want to use them during the summer while teachers and students are away.

Use the glossary and chart linked below to begin experimenting with cover crops.

http://www.johnnyseeds.com/assets/information/farm-seed-comparison-chart.pdf

Glossary of Terms

Biomass: Organic Matter. Often used to help build compost piles or feed soils fresh organic matter that soil biology can break down. Keep in mind that some of these plants take awhile to decompose in the soil – those are best destined for a compost pile.

Compaction: Compression of the soil particles. When the soil becomes compressed, pore spaces disappear, making it difficult for water, roots and biology to move through the soil.

Cover Crop: A crop grown to “cover” the soil and prevent erosion. These crops are grown after the primary crop is harvested. Fast-growing annuals are ideal choices.

Green Manure: Replenishes organic matter. Nutrients are released in to the topsoil as the green manure decomposes. Green manures are often a mix of two types of seed, usually a grain and legume.

Legumes: The group of plants that supplies nitrogen to the soil through rhizobia bacteria that reside in the root structures called nodules. This will fall under “Nitrogen Fixation” in the supplied chart.

Smother Crop: Used in new ground or in weed-infested soil to outcompete the weeds.

Underseeding: The practice of using green manures as a, “living mulch.” For example, corn is often underseeded with clover once the corn reaches 2 inches. Clover out-competes the weeds and provides a green manure after the corn is harvested. The clover also fixes nitrogen into the soil.