CHAPTER 6

Planting and Maintaining the Garden

With plans in place and the garden prepared, it is finally time to discuss the planting and maintaining of the school food garden. What a great reward it is to see the happy faces of kids digging into the soil after all of the hard work involved with organizing the garden program. We offer some basic instructions for planting both seeds and transplants, followed by basic care techniques and pest control.

Continuing with the presentation of the "hows," in this Chapter, we will answer the questions:

- How do we plant our garden?
- Once planted, how do we keep the garden growing well?

Planting in the Garden

With youth and volunteers properly informed about safety procedures (see Chapter 7), they are ready to jump into planting. As part of the learning experience, you want to make sure they understand the reasoning behind where and when they are planting certain plants and then provide proper instruction and a demonstration of how to plant. By giving them this important background, you are giving them the tools to start their own gardens in the future. Here is a concise description of each step in the planting process:

❶ **Decide where to plant each crop.** It's best to sketch out a planting plan before digging in. Check seed packets and plant tags to determine plant spacing for each crop. Be sure to allow adequate space for your plants; crowded plants will not be as vigorous, healthy, or productive. Some plants, like squash and pumpkin, require more space than others, like carrots. Most vegetables do best in full sun, so place tall plants like corn on the north side of the garden to keep them from shading shorter plants. That said, you can also use this shade to your benefit, especially in hot summer climates. Plants that grow best in cooler weather, such as lettuce, appreciate a little shade during the summer months; for the biggest and tastiest harvest, plant them where they will get some light shade during the hottest parts of the summer.

❷ **Determine when to plant.** Make sure the soil is ready to be worked before you do any work in your garden. Working the soil when it is too wet can lead to compaction and poor seed germination or seedling growth due to lack of oxygen for roots. To test if the soil is dry enough, pick up a handful and squeeze it in your fist. If the soil maintains its shape when you release your grasp but crumbles easily when touched, you can dig in. If the soil stays together in a tight ball or water seeps out, it is still too wet. Wait a few days and test it again. If the soil is so dry that it does not form a ball at all, water it thoroughly and wait a day before working in the garden. Once the soil is ready, rake the planting bed with a metal garden rake to make it flat and smooth.

❸ **Follow instructions on how to plant.** You may plant your garden either by sowing seeds directly in the ground or by transplanting young plants (called transplants). Plants that need a long season to mature, such as tomatoes and peppers, are usually set out as young plants. Faster maturing plants or those that don't transplant well are usually started from seeds planted directly in the garden. See the sidebars for specific instructions for sowing seeds directly in the garden and for planting transplants.

With your plants in the ground, the next step is to continue to monitor plant growth and appreciate the wonder as plants transform as they mature.

KidsGardening.org related resource:
Transplanting and Direct Seeding

Sowing Seeds in the Garden

Growing crops from seed can save a lot of money and add to the fun of gardening, but sowing seeds correctly takes some practice. Follow these steps to maximize your success:

❶ To create a straight row, stretch a piece of string in a straight line from one end of the garden bed to the other. Pound stakes into the ground to hold the string in place.

❷ Make a shallow indentation or trough in the soil alongside the string with a finger, trowel, or hoe. Seed packages provide recommendations for planting depth, but a general rule is to plant seeds twice as deep as they are long.

❸ Place the seeds in the furrow. The seed package will recommend how far apart to space the seeds. Small seeds, like carrot seeds, are difficult to place individually. You can scatter small seeds by rubbing them between your fingers, trying for relatively uniform distribution, or you can mix the seeds with dry sand or dried coffee grounds and sprinkle the mixture into the furrows.

❹ Cover the seeds with soil, and then gently press the soil surface so the seeds will be in good contact with the soil.

❺ Write the plant name and the date seeds were planted on a row marker with a waterproof pen and place it in the soil at the end of the row.

❻ Water the planting area gently so the seeds don't get knocked out of place or flooded by the force of the water. You can use a watering can with a rose or a hose with a water breaker. Roses and water breakers are attachments with small holes that create a gentle shower.

❼ Before planting the next row, check the seed packet to find out how much space to leave between rows. Leave extra space if you plan to have a path. Repeat these steps until the entire garden is planted.

❽ Water the entire garden thoroughly when planting is complete. Keep the soil evenly moist until the seeds germinate.

Setting Transplants in the Garden

Although it's more expensive than starting from seed, planting young seedlings (called transplants) provides youth gardeners with instant results. Follow these steps when transplanting seedlings into the garden:

1. Water the seedlings in their containers a couple of hours before transplanting. You want the soil mix to be moist but not soggy.

2. Dig a hole in the soil with hands or a trowel where you want to place your plant. The hole should be larger than the seedling's root mass — including soil — and deep enough to bury the soil around the seedling just below the surface of the ground.

3. Remove the seedling from its container by pushing up on the bottom of the container and easing it out. If the plant won't budge from its container, spread your fingers around the stem of the plant and over the top of the soil surface. Then turn the plant and container upside down and rap the edge of the container sharply against a hard surface, taking care not to bump the plant itself. The soil ball should slide out into the palm of your hand.

4. Supporting the seedling by its rootball (not its stem), place it in the hole, and fill the hole with soil. Gently press the soil down around the seedling once the hole is filled in.

5. Water the seedlings so the soil is moist but not saturated.

6. Write the plant name and the date seedlings were planted on a row marker with a pencil or waterproof pen and place it in the soil at the end of the row.

7. Check the plant label to determine how much space is needed between rows. Leave extra space if you plan to have a path. Repeat these steps until the entire garden is planted.

8. Water the entire garden thoroughly when planting is complete.

Maintaining the Garden

Once your seedlings have been transplanted and your direct-sown seeds have germinated, the plants will need routine care to keep them thriving. Weeding, mulching, and fertilizing are key garden tasks you need to schedule to maintain your garden's health. Keeping weeds under control helps your plants by reducing competition for resources. Spreading mulch, like wood chips or straw, lessens weed problems, helps conserve soil moisture, and prevents soil erosion. Applying fertilizer at recommended rates can help to produce robust plants and a bountiful harvest. Following is an overview of these basic garden tasks.

Weeding

A weed is simply a plant growing where we don't want it to grow. Weeds are just plants doing exactly what they've evolved to do: take advantage of and colonize an available ecological niche – in this case, open soil in the garden. However, in the garden, weeds compete with our cultivated plants for light, moisture, and nutrients, so we need to keep them in check.

Weeding doesn't have to be a time-consuming chore if it is done regularly when weeds are still small in size and number. But before young gardeners begin weeding it's important to teach them to identify which plants are weeds so they can distinguish them from the seedlings they have planted and remove the correct plants.

Weeds can be removed by hand or with tools. You can use a hoe to cut off small weed seedlings or use a cultivating tool to turn them under the soil. It's crucial to get rid of weeds before they flower and go to seed, or they'll end up sowing a lot more weeds for you to pull next year. Also, try to completely remove the roots of perennial weeds, as many reproduce readily from sections of roots or underground stems that have been left behind.

Mulching

Low-maintenance weed control begins with mulch. Mulch is any material used to cover the soil to prevent weed growth, slow water loss, and/or prevent erosion. Mulching is an important practice in any sustainable garden. Organic mulches, such as weed-free straw (make sure it is herbicide-free), salt hay, sheets of newspaper, grass clippings (from herbicide-free lawns), and chopped leaves, also add organic matter to the soil as they decay and improve soil structure.

Organic mulches tend to keep the soil cool and are good for crops that prefer cool conditions, such as broccoli and peas. When using these kinds of mulch around warmth lovers like tomatoes and peppers, let the soil warm up for a few weeks after planting before spreading mulch.

Shredded bark and wood chips are also organic mulches, but they take longer to break down than non-woody mulch materials, so they are generally more suited to use in paths and around perennial plants (those with a life cycle longer than one year) and woody plants like trees and shrubs. Wood-based mulches are a good option for native plant and pollinator youth gardens.

"The children are truly inspired. They love every task assigned in the garden whether planting or maintenance. The children have a true sense of accomplishment at seeing something grow from seed into something to eat or to simply enjoy. The garden has also created a sense of ownership in the children. We have seen leadership abilities emerge. Faculty and parents have been impressed by the level of commitment and responsibility shown by the students while working on projects for the Learning Garden."

— CHRISTINE SOTELO
ST. LAWRENCE O'TOOLE SCHOOL, CA

How deep should the layer of organic mulch be? Although it varies with the material used, in general, a 2- to 4-inch-deep layer will do a good job keeping weeds down. Apply coarser materials like straw more thickly; finer materials like grass clipping more thinly. If you are using grass clippings, let them dry in the sun for a couple of days before spreading them in the garden to keep them from matting down. Be sure not to pile mulch up directly against the stems of plants; keep it an inch or two away from stems to minimize pest and disease problems.

Inorganic mulches, including sheets of plastic, landscape fabric, and stones or gravel, will not decay and can be useful in perennial beds and around trees and shrubs. Dark plastic mulch is often used around heat-loving crops, such as tomatoes and peppers, because it absorbs heat from the sun to warm the plants' roots. If you decide to use plastic mulch, be sure to lay down drip irrigation or soaker hoses underneath it, as the plastic will not let rainwater through.

Watering

All living things need water to live and thrive, making it one of our most valuable natural resources. Adopting efficient watering practices not only conserves water and boosts plant health, but it's also another way to empower kids to help protect precious resources through their work in the garden. Depending on where you live, rainfall may help water your garden for most of the year, but in dry climates and when plants are growing vigorously during summer months you may need to water frequently. Most gardens need to have a water source close by and a practical plan for getting water from spigot to soil.

Common methods of irrigation include:

Hand watering. This method is usually the cheapest in terms of equipment costs. By using proper techniques, it can also be an efficient use of water. As you use a hose or watering can to irrigate you can be selective, watering each plant or plot as it needs. You can monitor how far moisture penetrates into the soil and adjust your watering time as necessary. It's important to apply water directly to the soil beneath the plants and to avoid excessive runoff onto sidewalks and other paved surfaces.

If you choose to use watering cans, select models that are the right size for your gardeners to avoid spills and injury.

Remember that a gallon of water weighs 8 pounds, so watering cans get heavy quickly! Fortunately, watering cans are available in many different sizes. Or you can save money by using half-gallon or gallon milk and juice jugs with handles.

If you prefer using hoses, choose adjustable spray nozzles that allow you to stop the flow without having to turn off the spigot, and that offer a range of volume and pressure options. This will ensure that you have the appropriate pressure for various kinds of plantings and reduce water waste.

The downside of hand watering is the time and energy needed. A strong and reliable team of kids and volunteers is necessary to monitor the weather and water when needed, especially during vacation breaks.

Sprinklers. Sprinklers decrease the manpower needed for watering. You can purchase hose-end sprinklers or install a system of underground pipes with spray heads. Both types can be made even more efficient and flexible by attaching manual or automatic timers.

Hose-end sprinklers are the least expensive option and can be a good choice if you have lots of beds scattered around. Some produce a spray that moves in a circular motion, others cast a fan that can move back and forth, and still others resemble mini-tractors that "drive" through the garden guided by the hose! You can turn them off and on by hand or purchase a timer to do it for you. The first time you operate your sprinkler, observe the spray pattern to make sure it's applying water where you need it and not to paved surfaces.

Built-in sprinklers use underground pipes and spray heads. They tend to be more sophisticated to use and expensive to install, but they can be useful for permanent beds. There are many different types of spray heads, including pop-ups, rotors, and bubblers that allow you to choose the direction and pressure of water delivery. Most built-in sprinklers are controlled by automatic timers you can program to water at the most appropriate time of day, even if you're away. A helpful feature available on some automatic timers is a moisture sensor that prevents sprinklers from activating during rain! It is important to check the system regularly to make sure broken sprinkler heads are not wasting water or delivering spray to paved areas, and that spray isn't overlapping and overwatering some plants.

The main benefit of sprinklers is convenience, and this is what makes them the least efficient irrigation method. Once they're on schedule, we often forget to monitor them and end up with dried up or drowned plants and wasted water. You also have very limited control over the spray, so some plants get water whether they need it or not. Much of water sprayed into the air is lost to evaporation and wind drift, and since you don't have to be present to operate them, it might be weeks before you discover a broken sprinkler head that is wasting water or starving plants of moisture.

Drip Irrigation. Drip irrigation provides a happy medium between hand watering and sprinklers. Drip systems allow for more selective water

application and can provide the convenience of automatic watering. Drip irrigation equipment is more costly on the front end than hand watering, but less expensive than installing underground sprinkler systems. Water savings and convenience can give you a rapid return on your initial investment. There are two main types of drip irrigation: soaker hose and emitter.

Soaker hoses have small pores along their surface that leak water directly to the soil at a slow rate, allowing for increased absorption and less water waste. Soaker hoses are a good option for rows and beds of vegetables and annual plants.

Emitter hoses feature components that are calibrated to deliver a precise amount of water, such as 1/2 or 1 gallon per hour. There are a variety of types. One kind features pipes with built-in emitters. Others let you attach small-diameter, flexible tubes capped with emitters to a main feeder hose, allowing you to locate emitters right under individual plants or in pots. Emitter irrigation is a great system for watering beds with permanent plantings.

Both drip irrigation options deliver water more efficiently than sprinklers with less chance for water loss due to wind and runoff, and they can be attached to timers and moisture monitors to allow for increased flexibility in scheduling. By delivering water directly to the soil, they are more selective than a sprinkler, but not quite as targeted as hand watering.

For optimal operation, you may need to add a pressure regulator to reduce and equalize water flow through the system and a filter to prevent small particles in the water from clogging pores and emitters. In some areas, insects such as ants may enter emitters in search of water and may cause clogs.

Here are some additional watering tips:

When to water. Irrigate during early morning hours. Much of the water applied in the heat of the day is lost through evaporation. Evening watering can contribute to disease problems because plant leaves stay wet longer. Watering during windy periods increases water loss.

Where to apply water. Since plants absorb moisture through their roots, it makes the most sense to apply water to the soil. Overhead watering is inefficient; also, wetting the foliage can lead to disease problems. (If your garden is in a dusty area, rinse leaves occasionally if dust builds up on foliage.)

Watch the weather. As best you can, adapt your watering schedule to weather and changing seasons. Although watering every Monday and Wednesday might be convenient for you, it may not be the right schedule for your plants and may waste water.

How much to water. It is better to water thoroughly a few times a week than to apply a little bit every day. You want to moisten the soil to a depth of 6 to 8 inches to encourage deep, strong root growth. For all but fast-growing, shallow-rooted plants, allow the soil to dry to a depth of 1 inch before watering again.

Avoid runoff. Avoid letting your irrigation water run off onto paved areas or down storm drains. If you notice runoff, apply water more slowly in cycles, taking small breaks between applications to allow the soil time to soak up moisture.

Know your soil. How fast your soil absorbs water will vary by soil type and the amount of organic matter in the soil. Clay soils are slow to absorb water but tend to hold moisture longer, so they need less frequent watering. Sandy soils are better able to absorb water, but they also drain quickly and do not hold water well, so they dry out faster. Adding compost and other organic matter to your soil will improve water penetration in clay soil and water retention in sandy soil.

Fertilizing

Although plants make their own food (carbohydrates) from atmospheric carbon dioxide and water through the process of photosynthesis, they need to take in additional nutrients for healthy growth. Plants take up these nutrients mainly from the soil through their roots. Many of these nutrients are commonly available in the soil, but there may be some that are not available in the amount needed by the plant. Nutrients may also be present but unavailable to plants if the pH (acidity/alkalinity) of the soil isn't suitable for them. A soil test will tell you the pH of your soil and if it needs amending for the crops you're growing. (See Chapter 4 for more information on soil testing.) Gardeners can make up the difference by adding organic or synthetic fertilizers to the soil. Fertilizers contain one or more of the nutrients that are needed for the growth, repair, and proper functioning of plants, such as nitrogen, phosphorus, and potassium.

Any product sold as a fertilizer has a nutrient analysis on the label consisting of three numbers. These numbers tell you the percentage of the three major nutrients – nitrogen (N), phosphorus (P), and potassium

Is Compost a Fertilizer?

Compost consists of the partially decomposed remains of plant materials. While it contains plant nutrients such as nitrogen, phosphorus, potassium, along with micronutrients, these are present in smaller and more variable amounts than in products sold as fertilizers. This doesn't mean, however, that compost (and other types of organic matter) doesn't nourish plants and provide big benefits to overall soil health.

As with organic fertilizers, compost releases its nutrients to plants gradually over time as soil organisms feed on the materials the compost is made from. Also, in the process of digesting the compost, soil microbes produce a sort of "glue" that helps soil particles stick together into aggregates. This gives the soil a crumb-like structure that allows air to move and water to soak in, creating conditions that support healthy root growth. Compost helps the soil hold onto nutrients, keeping them from leaching out of the reach of plant roots and making any fertilizers you add more effective. It improves the water-holding capacity of sandy soils and the drainage and aeration of clay soils.

Adding a 2 to 3 inch layer of compost to your garden in the spring and fall is a great way to promote healthy soil – soil that offers a full spectrum of nutrients, abounds with beneficial soil organisms, and provides plant roots with the air and water they need for good growth.

(K) – that the fertilizer contains. ("Complete" fertilizers contain all three of these nutrients.) For example, a fertilizer with a 5-10-10 nutrient analysis contains 5% nitrogen, 10% phosphorus, and 10% potassium. Other fertilizers may contain only one or two of these major nutrients. For example, bone meal contains N and P, but no K so its analysis is 4-12-0. In addition, some fertilizers contain micronutrients, such as boron, zinc, and iron, that are needed by plants in very small amounts; these may be listed on the label but are not included in the product's three-number analysis. The product label should also tell you how much to use for different kinds of plants. Keep in mind that too much fertilizer can be just as detrimental to plant growth as not enough. Always follow label instructions and apply correctly.

Adding appropriate amounts of fertilizer at the beginning of the garden season is part of good soil preparation, setting the stage for a thriving garden. However, some plants may benefit from an additional dose of nutrients over the course of the growing season.

Organic vs Synthetic Fertilizers – What's the Difference?

Both organic and synthetic (also called chemical) fertilizers provide plants with nutrients, but in different ways. Organic fertilizers are made from materials of plant or animal origin with little or no processing. Examples include liquid seaweed, fish emulsion, bone meal, blood meal, alfalfa meal, cottonseed meal, composted manure, and complete fertilizers made from a combination of materials. They may also contain naturally occurring minerals that have received minimal processing, such as rock phosphate and greensand. The nutrients in organic fertilizers are released gradually over time through the action of soil microorganisms, providing a long-lasting source of plant nutrition. This slow release, however, means their nutrients aren't readily available when the soil is cool and microorganisms are not very active, for example in early spring. Organic fertilizers generally help support living organisms in the soil and may improve soil structure. Organic fertilizers also naturally contain a variety of micronutrients, which are vital to plant health but are needed only in small amounts.

Chemical fertilizers are manufactured from chemically processed raw materials such as natural mineral deposits and even air (as a source of nitrogen) and come in granular, water-soluble, and liquid forms. Generally, synthetic fertilizers contain fewer kinds of nutrients than organic fertilizers, mainly nitrogen, phosphorus, and potassium, and these nutrients are more concentrated. They are also more readily available for uptake plants, as they don't need the action of soil microorganism to convert them forms that plants can use. But because they are concentrated and soluble, it is easier to over-apply synthetic fertilizers, which can harm plants, and they do not help to nourish those important soil microbes or improve soil structure as organic materials do.

This is called side-dressing. Crops that will benefit from some additional fertilizer during the growing season, known to gardeners as "heavy feeders," include cabbage, broccoli; tomatoes, eggplant, and peppers; cucumbers, squash, and melons; and sweet corn. Granular fertilizer can be scratched into the soil near the base of the plants, or you can apply a water-soluble fertilizer like fish emulsion to the soil around the plants. Monitoring growth and health of plants can often help you determine if additional nutrients are needed.

Dealing with Pest and Diseases

It's safe to say that, sooner or later, every garden will encounter a pest or disease problem. The specific problems that can occur will depend on the crops you're growing and where in the country you're gardening. Fortunately, there are some easy strategies to make pest and disease problems less likely to occur and less damaging when they do. Even so, there will likely be occasions when pests or diseases reach levels where some sort of control measures may be warranted. It's a good idea to think ahead of time about the type of pest and disease controls you think will be appropriate in your youth garden and to have a plan in place for implementing them if the need arises.

Get familiar with pests and diseases.
Familiarizing yourself with which pest and disease problems you're likely to encounter is a good first step in coming up with a control plan. While many pests and diseases are widely distributed, some are most problematic only in certain areas. Knowing what to be on the lookout for makes figuring out what's causing a problem much easier. There are many sources for information on vegetable pests and diseases; one of the best is your state Extension Service. The information it provides on its website, in publications, and through local Master Gardener and other programming is targeted to the problems that are most likely to be troublesome in your part of the country.

Insects probably come to mind first when thinking about garden problems, and some are certainly major pests of vegetable crops. But it's important to remember that not all insect visitors to your garden are bad guys. Some — lady beetles, for example — eat harmful pests. Others, such as honey bees and native bees, in their quest for nectar, transfer pollen from plant to plant, making possible the development – and harvest – of fruits such as zucchini and pumpkins. So, it's important to learn to identify the "good bugs" — the insects who are working with you for garden success. Read on for information on ways to encourage beneficial insects and pollinators.

And not all pests are insects. Mites may appear similar to insects, but they are actually more closely related to spiders (if you peer at them through a hand lens you'll see eight tiny legs, not six), while slugs and snails are mollusks.

Diseases are caused by a variety of tiny pathogens, including fungi, bacteria, viruses, and nematodes (microscopic, worm-like animals). However, not all diseases are infectious; some, like blossom end rot in tomatoes or sunscald on peppers, are the result of poor environmental or cultural conditions.

Practice prevention. As they say in sports, the best offense is a good defense. Here are ways you can keep pests and diseases from gaining a foothold in the first place. While some of these strategies require advanced planning, they will stack the deck in favor of a thriving garden and make your gardening experience much more rewarding and fun.

Feed the soil. Just as people who eat a nutritious diet and get adequate exercise and rest are less likely to get sick, robust plants are better able to fend off pests and diseases. Healthy soil is the foundation for healthy plants. Regularly add organic matter like compost to encourage thriving populations of the soil microbes and other beneficial critters needed for healthy soil.

Practice good garden sanitation. Clean up the garden well at the end of the growing season. Many pests and diseases carry over from one year to the next in plant debris in the garden. Don't compost any obviously infected or infested plant material. You can't depend on your compost piles to heat up enough to kill pests and diseases.

Rotate the location of related plants in the garden from year to year. This helps to thwart soil-borne pests and diseases. A 3-year rotation is best for most crops, but if this isn't practical in your space, just do the best you can.

Monitor soil moisture. Aim for soil that is not too wet and not too dry – just consistently, evenly moist. Try to avoid getting the tops of plants wet when you water, as wet foliage promotes the development of many diseases. Use soaker hoses or drip irrigation, or water early in the day so leaves dry quickly in the sun. Don't work in the garden when leaves are wet from rain or dew to avoid spreading diseases from plant to plant.

Space plants out so there is good air circulation around them. Crowded plants trap humidity, encouraging diseases.

Don't import problems. Examine any transplants carefully (especially leaf undersides) before buying to make sure there are no unwanted stowaways, and only select vigorous, healthy-looking plants.

Plant lots of flowers to attract beneficial insects. Although the focus of your school food garden is on fruits and vegetables, let Mother Nature help with pest control by

encouraging the insect species that prey on pests, helping to keep a natural balance in the garden. Include flowers in the food garden to provide pollen and nectar to feed predatory and parasitic insect species at certain stages in their life cycle. Plants with blossoms consisting of umbrella-shaped clusters of small flowers, such yarrow or dill, and daisy-like flowers, like golden marguerite and coneflowers, are especially attractive to many beneficials. A border of flowers around the vegetable garden is an excellent way to provide food and shelter for them. Learn to recognize all life cycle stages of the "good pests/bugs" so you don't mistake them for troublemakers. Immature stages may look very different from adults.

Choose disease-resistant varieties if possible. These are varieties that have been bred to be less susceptible to some of the common diseases of a particular crop. Look for letters after the variety name indicating resistance, or check the plant catalog, seed packet, or tag for information. For example, tomato varieties with the letters V and F after their names are resistant to Verticillium and Fusarium wilts, two common tomato diseases.

Keep weeds under control. They not only compete with your crops for nutrients, light, and water; some weeds can host pests as well. The same pests that attack garden crops can also infest nearby weeds that are in the same botanical family. Spreading mulch is a great way to keep weeds down and help conserve soil moisture.

Use barriers and traps. Lightweight fabric row covers that let water and sunlight through are very effective in preventing certain pest problems, such as leaf miners in spinach or caterpillars in broccoli. In non-fruiting crops that don't need pollinating, you can even leave row covers in place all season long. Flowering crops such as cucumbers and squash can benefit from row covers to keep flea beetles and cucumber beetles away when plants are young and most vulnerable to damage. Once plants begin to flower, remove row covers to let bees reach flowers for pollination. Cutworm collars and mats around cabbage stems to prevent root maggot egg laying are other examples of effective barriers. Placing saucers of stale beer in the garden to lure slugs in to drown is a time-honored and effective trap.

They're Heeeeere! Even with the best preventative measures, there's bound to be a pest or disease outbreak in your garden sooner or later. If you take time now to decide what kinds of control measures you consider appropriate for your garden, you'll be better prepared to deal with any problems that arise. Will you take a hands-off approach and let nature take its course? Will you limit controls to physical methods such as barriers, traps, and handpicking? Will you consider using pesticides or fungicides? Will you use only organically acceptable pesticide and fungicide controls? Who will be responsible for applying pesticides? There is no one right or wrong approach; it's whatever works best in your particular setting.

Check your plants frequently for the first signs of insects and disease. It's much easier to nip a small problem in the bud than to control a severe one. You may be able to stop a small aphid infestation by simply knocking the insects off plants with a strong stream of water from a hose. If you wait until your

plants are swarming with aphids, more drastic measures will be needed.

On the other hand, don't pull out intensive treatments when they're not needed. Before resorting to insecticide sprays, even "organic" ones, make sure that the number of pests and the damage they are causing warrant that level of control. Extermination of all pests isn't necessarily desirable. If you're enlisting the help of beneficial insects, they need to have some of the pests around to feed on or they'll move on to greener pastures. What's needed is a balance where there are enough pests to support beneficials, yet not so many that they are causing an unacceptable amount of damage to your crops.

Be sure to identify specifically what pest or disease you're observing in order to know what control measures, if any, are appropriate. Do some research to understand the life cycle of any pest or infectious disease and at which stages in the life cycle treatments are most effective. A list of some of the most common garden insect pests can be found in Appendix B. Keep in mind that some problems are caused by poor weather or growing conditions, not insects or disease organisms. Solving these problems involves changing the environmental conditions that led to them, where possible, not the use of pesticides.

Consider physical controls first. Larger insects like tomato hornworms and Japanese beetles are relatively easy to control by handpicking (if you're squeamish, just wear gloves!). Some kids love this garden job! Handpicking insects is easiest in the early morning or evening when cool temperatures make them sluggish. Dispose of them by dropping them into a bucket of soapy water (the soap breaks the

water surface tension so they can't escape). Picking off and disposing of infected leaves may control the spread of some diseases at their outset.

If a problem is severe and you decide use of a pesticide is warranted, keep these things in mind in order to use it safely and effectively.

Choose pesticides carefully. Lower-toxicity, often naturally derived insecticides are generally the most appropriate choices for youth garden use and have the least harmful effect on beneficial insects. These include insecticidal soap, horticultural oil, botanical insecticides like neem oil and pyrethrin, and microbial insecticides like *Bacillus thuringiensis* (Bt). Some of these products may be suitable for organic gardening; look for OMRI certification on the label to be sure. Different pesticides are effective against different pests; check the label to make sure you are using an appropriate product for the particular plant you're treating and the pest you want to control. Make sure that the pest or disease you are trying to control is vulnerable to an applied pesticide. For example, squash vine borers are caterpillars that tunnel into the vines. Once inside the stems, they are out of the reach of any externally applied insecticides.

Read the label. No matter what type of pesticide you use, including "organic" ones,

always read the label completely before you apply it, and follow all its instructions and precautions exactly. If you are gardening at a school or another public building, check with your administrator to find out if there are any regulations in place governing pesticide use. If you do get approval to treat your problem, make sure that the plant you are treating and the pest or disease you are trying to control are both listed on the label. Following the label ensures that you are applying the product in a manner that is safest for the applicator, the plant it is being applied to, and non-target organisms like bees, while most effectively controlling the pest or disease-causing organism.

Fungicides are preventative. Fungicides can prevent the spread of diseases caused by fungi to uninfected parts of the plant, but they will not cure existing infections. They must be applied at the first sign of infection or before infection occurs to be effective, and usually require repeat applications to keep plants protected. Fungicides will not control diseases caused by viruses, bacteria, or nematodes; only non-chemical controls are appropriate for these organisms in a school setting. Organic fungicides containing beneficial bacteria are relatively new and effective options for controlling diseases.

Be cautious with home remedies. You can find all sorts of recipes for homemade pesticide treatments in garden books and online, and some of these may be effective. But some may also have the potential to harm plants. For example, there are many recipes for homemade soap sprays, but there is no way to know if the particular brand of soap might have something in it that can harm your plants or be less effective in controlling pests. Commercially prepared insecticidal soaps have been specifically formulated for and tested on plants, and you are more assured of getting the results you expect when you use them. If you do decide to try a homemade treatment, try it on a small number of plants first to see if it causes any plant injury before applying it on a larger scale.

Don't let all this all this talk of insect and disease problems discourage you! While you're likely to encounter pests and diseases in your garden at some point, often they will not cause major problems, especially if you have put at least some of the preventative measures discussed earlier in place. And usually only a few crops in any particular season will be affected. Even though bean beetles may be chomping on your beans, your tomatoes, lettuce, and cucumbers may be thriving! Remember that planting a diversity of crops is one way to minimize the impact of any pests and diseases that occur. If one kind of vegetable develops major issues every year in your garden, consider simply planting something else in its place. There are lots of

different veggies to choose from, and you may end up expanding your youth gardeners' food horizons by trying something new.

As we said before, there is no one correct approach to dealing with pest and disease problems in a youth garden. Taking a hands-off or low-input approach is just as valid as employing more intensive control strategies. No one is going to go hungry next winter if you decide to simply let those bean beetles feast on the green beans – and they can offer a great opportunity for youth to learn about an insect with complete metamorphosis in its life cycle!

One of the great things about a youth gardening program is that just about everything – even a pest infestation – can be a springboard to learning. The life cycles of many insects and fungi are nothing short of amazing. Learning about these kinds of organisms really comes to life when kids can go out into the garden and observe them in action, even if they are feeding on the tomatoes!

Observing interactions between predatory and parasitic organisms and their prey is a good way to introduce concepts like the food web and the interconnectedness of natural systems. Finding tomato hornworms covered with the rice grain-like cocoons of parasitic wasps — and learning why these parasitized caterpillars should be left in the garden to allow wasps to complete their life cycle — will vividly illustrate these concepts to students.

Identifying introduced pest species like Japanese beetles or brown marmorated stink bugs can be the starting point for a discussion on the impact of invasive species on an ecosystem. And learning that those brightly colored caterpillars feeding on parsley, dill, or carrot leaves will turn into beautiful swallowtail butterflies helps kids understand that there are really no "bad bugs" in nature — in the complexity of a balanced ecosystem, all creatures have value and a role to play.

Summer Maintenance

Summer break is a common maintenance challenge for youth gardens, especially for those located on school grounds. In many areas of the country, much of the growing season occurs outside of the regular school session. If your program takes a break during summer months when your garden season is at its peak, here are some tips to help you keep your garden thriving over the summer months, ready for more learning and fun when kids return in late summer or early fall:

Enlist volunteers. Recruit summer volunteers to care for and harvest from the garden. In addition to students, parents, and teachers, approach community members and service organizations like Scouts, 4-H, or church youth groups about donating time to care for the garden. Some volunteers may be willing to adopt a bed for the whole summer; others will be interested in helping on a more limited basis. If possible, have one volunteer serve as overall garden coordinator for the summer. Create and distribute a written schedule so that someone is checking on the garden on a regular basis. Email or phone call reminders will likely be needed. Also, make sure to provide adequate instructions and guidance if the volunteers are not familiar with the garden procedures.

Schedule work days. You might hold a work day one Saturday per month to knock

down weeds or complete other tasks such as making mid to late-summer plantings for fall harvest. Reward volunteers by letting them harvest and take home any ripe produce on the day of their service. You might also consider organizing volunteers to donate garden produce to a local food pantry or other community organization. Be sure to check with the organization first to make sure it is able to handle donations of fresh produce.

"I always say that the most important thing we are growing in the garden is our children."

— KIMBERLY GEORGE
CHICAGO YOUTH CENTERS
ABC POLK BROS.

Tap into summer youth programs. If your school runs a summer session or hosts a summer camp program on school grounds, get in touch with teachers or summer camp counselors to see if they are interested in taking advantage of your outdoor garden classroom during the summer months in exchange for upkeep. Or you might consider pairing up with a nearby local organization that runs a summer youth program, such as a library, parks and recreation department, or day camp for periodic summer garden care and learning.

Install irrigation. Drip irrigation equipment is available at most home improvement stores for a reasonable price, and you can set it up to run on inexpensive timers. It might be worth your while to search for someone to donate an automatic irrigation system.

Use mulch. A layer of organic mulch reduces weed growth and maintains soil moisture, while adding organic matter to the soil as it breaks down with time. In vegetable beds use inexpensive organic mulch such as sheets of newspaper topped with straw. If you also have flower gardens on your school grounds, use a 2- to 3-inch-deep layer of more durable organic mulch, such as shredded bark in these beds.

Harvest in the spring. Another approach is to focus on crops that can be planted and reach harvestable size by late spring while school is still in session. The warmer your climate and the earlier your spring frost date, the easier this option will be. Cool-season crops that mature quickly, like spinach, lettuce, beets, and radishes, are all good choices for spring and early summer harvest in many parts of the country. Once your plants have been harvested, cover the bare soil with a thick layer of mulch to discourage weeds and prevent soil erosion. The mulch will gradually break down over the summer and winter, adding organic matter to enrich the soil for the following year's crops.

Plant in late Summer for fall harvest. It's also possible in many parts of the country to plant fast-maturing crops in late summer, as soon as students arrive back for the start of a new school year, for harvest in the fall. Or summer volunteers can start crops that need more growing time in mid to late summer; then returning students can take over the care and harvesting. The longer the growing season in your area and the later your fall frost date, the more options you'll have in terms of suitable crops. You can also extend your fall growing season with cold frames, row covers, or hoop houses to protect crops from the cold.

KidsGardening.org related resource:
Extend the Season with Plant Coverups

Build soil during the summer. If you are not growing plants in your garden over the summer, plant a summer cover crop to suppress weeds and add organic matter to your soil. Fast-growing buckwheat is a good summer cover crop in most areas and is great for keeping weeds down. Cut the plants down about a week after they begin flowering so they don't set seeds. On a small scale, plants can be cut down with hedge shears. Cut the shoots down in layers from top to bottom so they are chopped into relatively small pieces as they're cut. You can then leave the chopped shoots on top of the soil as mulch. If you plan to plant vegetables for fall harvest, just pull the chopped shoots aside and dig holes for transplants. To prepare a seedbed for planting, turn the chopped shoots into the soil with a shovel; then let them decompose for a few weeks before planting seeds. Check with your local Extension Service to for more information on other summer cover crops that are well suited to your area.

Cool-Season Gardening and Beyond

Spring and summer are the most popular gardening seasons in schools, but as your garden program matures and you begin to witness the impact it has on your youth gardeners, you may want to begin exploring ways to extend your garden season. Check out the *Cool-Season Vegetable Gardening Guide* in Appendix C for planting tips for a successful fall and/or early spring garden.

Putting the Garden to Bed

Whether you choose to continue your garden over the fall months or just wrap things up after summer plants are harvested, by cleaning up your garden properly you are laying the groundwork for a good spring garden season.

Remove plant debris. It's important to clean up food garden beds well at the end of the season, removing plant debris (including weeds) that might harbor pests and diseases that could re-emerge the next year. If this plant debris shows obvious signs of insects or disease, it's better to dispose of it rather than add it to your compost pile. Taking it to a municipal compost drop-off rather than putting it in the trash is fine. Unlike most home compost piles, materials in these large-scale composting operations usually reach temperatures high enough to kill off pest and disease organisms.

Cover bare soil. After you've cleared the garden, give the soil a winter blanket. Soil that is left bare over the winter is vulnerable to erosion from wind and water. Rain falling on bare soil can compact it, and rain and snow melt can leach nutrients in the soil out of the reach of plant roots. Covering soil with mulch or a cover crop will also reduce the number of weeds sprouting over the winter and spring.

> **Mulch.** One way to protect the soil is to cover your garden beds with a thick layer of mulch for the winter. Fallen leaves are generally plentiful (and free) in autumn and work well, especially if they are chopped first to make them less likely to blow in the wind. An easy way to chop leaves is to run them over with a lawn mower and collect them in the mower's bag. But other materials, such as dried grass clippings and clean straw, will also work.

Winter cover crop. An even better method of winter soil protection is planting a cover crop. A good cover crop grows fast, blanketing the soil and competing with weeds. Cover crops also grab onto nutrients in the soil, keeping them from leaching away over the winter; then return them when the cover crop is tilled into the soil in spring. The decomposing cover crop plants add new nutrient wealth to the soil and create good "tilth" (physical condition of the soil). The types of winter cover crops that are suitable for planting in your school garden in late summer and early fall will depend on your region of the country. Check with your local Extension Service to find the ones that will do best in your area.

KidsGardening.org related resource:
Seven Ways to Nurture Healthy Soil in Fall

Gardening through the Winter

In most areas of the country, outdoor gardens will be dormant during the coldest winter months (although in climates with moderate winters some crops can be grown during winter). However, you can continue youth gardening activities indoors using sunny windows and grow lights. Check out the Indoor Gardening Guide in Appendix D for an introduction to indoor growing options or for more extensive resources, visit KidsGardening.org to find out more information about our publications GrowLab Classroom Activities for Indoor Gardens and Grow Lights and GrowLab®: A Complete Guide to Gardening in the Classroom.

In Summary

The activities of planting and maintaining your school garden bring planning to life and allow young gardeners to enjoy the fruits of their labor. By taking the time to set up safety guidelines for planting (see Chapter 7) and adopting practices to ease garden maintenance and appropriately care for your space in each season, you are ensuring a rich and enjoyable experience for all.