Building the Garden Beds

Each schoolyard is different with unique needs and opportunities, ranging from congested, urban and asphalt to spacious, rural and pastoral. Teachers and administrators have a host of human factors to consider in siting the garden at their school. The location should also support the needs of the vegetables, herbs and fruits that will be grown.

The optimum requirements for most garden plants are: direct sunlight for a minimum of six-to-eight hours a day; ample available water; good drainage, and nutrient rich soil. **Good soil is the key to success in the garden**. It provides a medium for root growth including nutrients, water, air and a home for many beneficial organisms.

Roots anchor the plant in the soil, absorb water and minerals, and store excess food for future needs. There are two types of roots. **Fibrous roots** spread out near the soil surface to capture water and minerals. **Taproots** penetrate deeper into the soil to meet these demands. Food is stored in both root types, although taproots provide more concentrated food storage, such as is found in the carrot.

Existing soil can be amended to provide additional nutrients and improve the drainage, aeration and water holding capacity. Start by identifying the type of soil and collect samples to send to UMass for **soil testing**. This will identify nutrient needs, pH and any contamination with leads and other heavy metals. Soil test results may take up to six weeks. Follow the recommendations and start planting.

If the soil is found to be contaminated, or if asphalt or construction fill is the only available medium in the schoolyard, there are other gardening options that utilize soil that is newly brought to the site. Consider building raised bed gardens above ground or on asphalt or try gardening in containers.

Filling the raised bed garden beds at the Alice Beals Elementary School in Springfield.

In-Ground Garden Beds

The advantage to creating your garden beds directly in-ground using existing soil are many. They will be less expensive and easier to construct, requiring only the funds for soil testing, added soil amendments, and the labor to dig the beds. In-ground garden beds also provide the ability to till the soil deeply enough to grow crops with deep roots such as potatoes.

The garden can be prepared early in the spring as soon as the soil has dried out enough to begin working. Strip the top two-to-three inches of sod and plants with a spade and remove any deep rooted weeds and rocks with a hoe. Use a rototiller for larger spaces or dig by hand with a spade. Consider **double digging** to provide a root zone as much as 24 inches, which is ideal for root crops and other garden vegetables.

Double Digging

The **Double-Digging Method** of garden bed preparation is based on the idea that when the soil is well prepared and fed, plants will thrive. The soil in the bed is loosened, conditioned and fertilized to the depth of two feet.

First **remove sod and plants**, making sure to get as many roots as possible. Then **divide** the bed into one-foot wide strips running the entire length.

Start at one end and **dig a hole 1 foot square and 1 foot deep**. Move the soil to the opposite end of the bed (it will be used to fill the last hole.) Then **loosen the soil** at the bottom of the hole to the depth of another foot.

Add soil amendments such as compost (3-to-6" per hole), drainage materials and fertilizer, following the directions on the label.

Dig a second hole next to the first one, the same size (1' x 1' x 1'). Put the soil into the hole that you dug previously. Loosen the soil at the bottom of the second hole to the depth of another foot and then add soil amendments.

Continue digging holes taking out soil to the depth of a foot, transferring it to the proceeding hole, loosening the soil at the bottom of each new hole, and adding soil amendments, until you reach the end of your row. Then turn and go back the other way. At the end of the bed, dig your final hole. Loosen the soil at the bottom, add soil amendments, then backfill with the soil removed from the first hole dug.

Double Dug Beds newly planted with beans, lettuces, peppers and broccoli in mid-May.

Go over the bed again, **mixing the amendments thoroughly** into the soil. The finished bed will be slightly mounded. **Rake smooth and water thoroughly.** Allow the bed to settle for up to two weeks. Add paths and avoid walking on beds.

The same double dug beds in mid-June with broccoli and lettuces ready to harvest.

Plan ahead and cover the new garden area in the fall with a plastic tarp, rug or cardboard. By spring the grass will be dead, and the soil can be tilled without having to remove the sod. Or try the **Lasagna Method** for building up the soil described below. In-ground beds can also be planted with a cover crop in the fall of winter rye, oats, wheat or clover. Dig these plants under in the spring to add an excellent source of nutrients and fast-decomposing "green manure." Whatever method you use, be sure to **add lots of compost** incorporated into the soil of new gardens or spread on top of existing beds.

Lasagna Layering

The **Lasagna Layering Method** of garden bed preparation involves composting in place by building up soil with layers of mulches. Lasagna gardens can be built on poor soil. Pick a spot out of strong winds with adequate sun.

Gather a variety of green and brown mulches. "Green" mulches include grass clippings, fresh garden cuttings, annual weeds without seeds, composted animal manure and seaweed. "Brown" mulches are chopped materials such as fall leaves, straw, hay, shredded paper, used potting soil, sawdust and wood ash.

Stake the area and trim grass to the ground. If soil is contaminated, put down an impermeable barrier such as landscape fabric.

Layer materials starting with cardboard or wet newspaper. Then layer brown and green materials as high as you like. Put a shovel full of soil in between layers to activate microorganisms. Finish with a layer of compost, wood ash or biochar.

Leave the layers to **break down for several months.** A little moisture will speed the process. You can also speed decomposition by covering the beds with black plastic or a tarp. Try adjusting the brown to green ratio to about 4/1 to create more heat.

Lasagna Layered bed prepared with cardboard and newspaper and topped with mulch and compost.

Raised Garden Beds

Raised beds make gardening possible on sites where growing plants would otherwise be impossible, such as asphalt, rooftops, patios, rock ledges, steep slopes and when existing soil is contaminated, poorly drained or consists of construction fill. These bottomless structures take more work initially and have more associated costs, but once built, they are highly productive and easier to maintain, holding the soil above ground.

Since all soil for the raised beds is brought new to the site, **optimum soil conditions** for plant growth can be achieved. Work with a local nursery to assure quality topsoil, compost and other soil amendments are delivered.

Soil in these beds will **drain faster**, be **easier to work**, and will have **less** weed and insect **problems.** They will **warm up earlier** in the spring, raising soil temperature 8-13 degrees allowing for early planting. They are also easier to reach and maintain. Young children will be able to clearly see these beds, reducing trampling.

Raised bed gardens newly built and planted in mid-April at the Manthela George School in Brockton.

If the raised bed will be sitting on top soil that is suitable for vegetables, consider **loosening the soil below the bed** to a depth of one foot to provide for additional root growth. If the soil is contaminated, add a landscape fabric barrier between the soil and the raised bed. For sites where the soil is impaired or unworkable, plan to construct garden beds that are deep enough to permit the widest range of vegetables.

Building the Raised Bed

A raised bed is a bottomless frame set into a shallow trench. The sides can be most any durable building material including rock, brick, concrete, inter-locking blocks and recycled plastic timbers. The most common material is lumber. **Rot resistant** hemlock, cedar or redwood will last longer than soft woods such as pine. Avoid pressure treated wood preserved with toxins as well as creosote-treated railroad ties. Use **galvanized or stainless steel** screws or bolts to put the bed together.

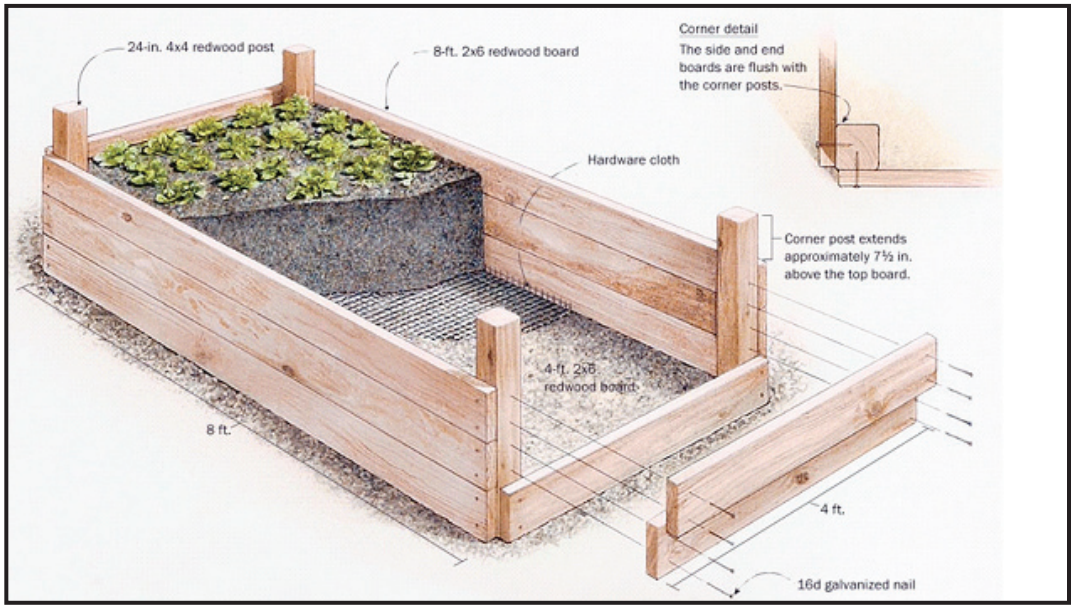
Choose a **flat location in full sun** on soil, gravel or asphalt. This will hold the sides of the beds even. If available, a north-south orientation takes best advantage of available light. A t**wo-to-three foot wide** by **six-to-eight foot long bed** will be wide enough to support sprawling plants, but narrow enough to reach easily from both sides. The ideal height is **one-to-two foot tall** for most crops. If possible, build more than one bed to make it easier to rotate crops and meet the watering needs of specific plants. Leave **paths of at least two feet** between the beds.

Begin by removing the weeds, turf and rocks. **Level the soil or asphalt.** Outline the bed dimensions with a chalk or strings. Dig with vertical strokes along the outline, just deep enough to bury about half of the first course of lumber. If the soil below the bed is poorly drained, dig down a few inches deeper and put a layer of coarse stone or pea gravel at the bottom. Then add a layer of landscape fabric above the gravel to hold the soil separate from the gravel. If the soil is on asphalt or compacted gravel, put down a two inch layer of gravel in the bottom of the bed covered with landscape fabric to allow for good drainage and soil separation.

Putting the raised bed planters together at the Alice Beals Elementary School in Springfield.

Whether planning a simple wooden frame or a raised bed with corner posts and a cap rail, **measure** the amount of wood needed before your purchase. Cut the lumber according to measurements. **Build each wall separately,** then fasten them together with galvanized or stainless steel screws at each corner, which will hold tighter and longer than nails. You may choose to sink posts into the ground for stability, either at the inside corners of the bed or halfway along the side walls. These help hold the bed in place, but can also reduce the outward pressure that a full bed exerts on the frame, which can dislodge the lumber after a single season. A cap railing that runs around the top of the bed will tie everything together.

Work with a local nursery or garden center to learn the best way to obtain **good quality top soil with high organic content.** It should clump together easily when pressed in your hand, but it should also break apart easily. This provides structure for the roots while allowing them to get the needed nutrients and water. If available soil is not high in organic matter, be sure to order additional compost. Fill the frames to the top with soil and you are ready to begin planting the garden.



Raised Bed Container image from http://images.taunton.com/enewsletters/vg/kg08-raised-beds-09.jpg

The Raised Bed Gardens at the Jackson Street School in Northampton in mid-Summer.

Container Gardens

Gardening in containers provides a means to **control the environment,** allowing for optimization of the growing culture for plants when those conditions can not be met naturally. It also provides opportunities for the gardener to overcome challenges that might limit the garden scope or area.

Plants can be **grown where soil is poor** in nutrient or water holding capacity, polluted with toxins or heavy metals, compacted by foot and construction traffic, infested with nematodes and other soil borne insects and diseases, or where competition from tree roots limits growth. The growing **medium can be amended to provide optimum** drainage, nutrients, pH or water holding capacity to meet the specific requirements of each individual plant. Vigorous growers such as mints can also be planted in pots to control their growth.

Place each where it will receive the **best light**, whether sun or shade. Frost-sensitive plants can spend the winter indoors. Vegetables can be started indoorsto extend the season. Since the soil in pots heats up quickly, you can get a jump on the season by using containers.

Containers are well suited to locations with **limited outdoor space** and where a traditional garden is impossible. A window sill, patio, deck, balcony, rooftop, driveway, stairway or even the front stoop offer opportunities for the small-scale garden. Vertical planters, trellices and hanging baskets take the garden upwards. Many fruits and vegetables have been specifically bred for container culture.

Some of the same elements that make container gardening ideal can add environmental stress for the plant. Pots hold only a limited amount of soil in which roots can spread. Soil temperature in containers is higher than that in the ground. Darker pots will heat up more quickly than lighter ones, and are better suited for the shade. Pots can dry out very quickly, most **will require watering** at least once a day.

Students garden in containers on the rooftop at the Josiah Quincy Elementary School in Boston.

Other Garden Factors

Number of Garden Beds: It is recommended to have **at least one garden bed for each class or group.** Plant perennial crops such as strawberries and herbs in a separate bed from annuals, so that the garden can be tilled easily next year. Taller crops such as corn and sunflowers may require their own garden space. Start small and grow the garden.

Width and Shape: A standard garden bed is rectangular and two- to-three feet wide by eight-to-ten feet in length. Children should be able to reach across the beds without standing in them, which would compact the soil. For preschool and younger, consider a bed 18 inches wide. Involve children in designing the garden. If they prefer circular beds, wedges or other shapes, plan so that all parts of the garden are easily accessible from outside the space.

The **Garden Paths:** should go all the way around each garden bed. Paths that are a minimum of two feet wide will allow for wheelbarrows, children working, foot traffic and trailings plants. Paths may be made from grass, wood chips or soil covered with straw or hay.

Mulch is an essential element in reducing the maintenance in the garden. It holds moisture in the soil decreasing the need for watering, protects young plants from the wind and lessens weeds. Use compost, grass clippings (if lawn is untreated), pine needles, salt marsh hay or straw from a local source that can guarantee it is weed free.

Trellis: Put trellises on the north side of the garden so that they don't shade your plants. They will also block the wind. Add posts or PVC pipe to the four corners of garden beds so that you can add frost protection or prevent plundering by hungry birds.

Wash your hands, tools and containers before harvesting anything edible.

Resources for Building the Garden Beds

Local and National Organizations

Massachusetts Department of Agricultural Resources
www.mass.gov/agr

Massachusetts Flower Growers Association
www.massflowergrowers.com

Massachusetts Nursery & Landscape Association
www.mnla.com

National Gardening Association
www.garden.org & www.kidsgardening.org

UMass Extension
www.umassextension.org/index.php/information/gardening

UMass SoilTesting www.umass.edu/soiltest/

USDA Food and Nutrition Program
www.fns.usda.gov - Grow it Books

USDA Plant Hardiness Zone MAP
www.usna.usda.gov/Hardzone/ushzmap.html

US Botanic Garden - Planning & Planting
www.schoolgardenwizard.org

Other Curriculum & Resources Websites

American Community Garden Association
www.communitygarden.org/docs/how-to_manual.pdf

American Horticulture Society www.ahs.org

California Agriculture Foundation
Gardens Curriculum www.cfaitc.org/gardensforlearning

Gro Edibles
www.groedibles.com/2011/02/how-to-build-a-raised-bed/

Junior Master Gardener Program http://jmgkids.us

My Healthy School
www.myhealthyschool.com/gardens/starting.php

New York City's School Garden Program
http://growtolearn.org

Project Life Lab Science & School Gardens
www.lifelab.org

School Garden Weekly
http://schoolgardenweekly.com

Soil & Water Conservation Society www.swcs.org

School Garden Transformations
www.schoolgrounds.ca/projects.html

USDA Natural Resource Conservation Service
www.nrcs.usda.gov and http://soils.usda.gov/

Vegetable Garden Basics - Rutgers
www.mgofmc.org/docs/VegGardBasics08.pdf

Raised Bed Container image - *http://images.taunton.com/enewsletters/vg/kg08-raised-beds-09.jpg*

Information for this resource guide was taken from the resources listed above.

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