

# OUTDOOR CLASSROOMS: Raised Beds & Containers

**As the Garden Grows, so grows the Gardner.**



[www.sustainability.fcps.net](http://www.sustainability.fcps.net)

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# WHEN IS A RAISED BED PREFERRED AT A SCHOOL SITE?

Often, compaction from construction and foot traffic makes soils on school sites devoid of air spaces and porosity. Raised beds provide an alternative to in-ground beds.

- 1.) A clearly defined area of raised bed can be filled with well-drained soil and can be improved annually with addition of organic matter and fertilizer. Knowing the history of your soil source should reduce the potential for growing vegetables in contaminated soil.
- 2.) Slow rains soak into porous soils while facilitating runoff during intense downpours.
- 3.) Soil in raised bed warms fast in spring allowing for early planting.
- 4.) Keeping foot traffic off the growing bed reduces soil compaction.
- 5.) Raised beds can be covered to extend the growing season, protect against untimely cold weather, and/or reduce the amount of rain around plants in an extremely wet year.
- 6.) Raised beds allow students with limited mobility to garden when outside walkways and appropriate height of walls around the beds are provided.



# HOW TO CONSTRUCT A RAISED BED

**1.) Size:** Beds three- to four-feet wide allow young gardeners to reach all parts of the bed for planting, weeding and harvesting without stepping on soil. Bed length depends on your site.

**2.) Depth and height:** Eight- to twelve-inch depth is minimal where soil below is not suitable for root growth. Deep beds make management easy and are required to accommodate gardeners with physical limitations. Raised beds should not be placed on blacktop or other impermeable paving materials. If this is your only option, use perforated PVC pipe in the bottom and engineer it to drain water away from the soil. This is known as a French drain.

**3.) Space between beds:** Plan walkway space between beds to accommodate moving of equipment and allow children to work two deep (3-4 feet minimum width).

**4.) Orientation:** Where is your accessible water source? Where in the school yard will your vegetables get maximum direct sunlight (preferably 6-8 hours daily)? Is the site level? Where are underground utility lines located? What arrangement of beds will school grounds manager approve that supports a low maintenance landscape plan?

# HOW TO CONSTRUCT A RAISED BED

**5.) Construction:** Cedar logs, composite, plastic or man-made decking products (plastic binder and wood fibers, dust or flour, i.e. Trex®), landscaping timbers, concrete blocks, large rocks, or bricks are suitable for walls of raised beds. Untreated lumber will only last a few years. Step-by-step instructions on line: [Sunset.com](http://Sunset.com)—"How to Build a Raised Bed for Your Garden."

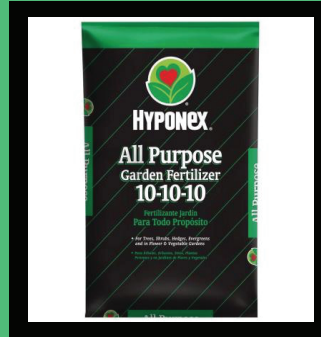
**6.) Adding soil:** Place box-like frame on soil and fill with well-drained soil mix, preferably local soil that was not compacted. Amendments like compost you've produced (minus weeds with seeds), well-rotted manure, leaf mold or coarse sand add porosity to soil. Check for local sources of soil mixes before you attempt to mix your own—a time- and energy-saver. Organic matter content will improve slowly as you incorporate composted materials during soil preparation each planting season. High plant populations require better than average soils, frequent irrigation and fertilization. Beware of bulk or bagged commercially available soils. There is no legal definition of "topsoil" or "planting soil". Some commercial preparations may have too high pH and be high in salts if they include non-composted manure and/or biosolids. Do a soil test using your Extension Service. Do not order loads of soil from out-of-state.

**7.) Raised beds without sides:** If you find a site on campus with good soil tilth (an area that already supports healthy plants), you may choose to create the garden on site without building a box. Dig down six to eight inches to create walkways and throw excavated soil on the bed. Beds should be about four feet wide at base and three feet wide at top.



# HOW TO CONSTRUCT A RAISED BED

8.) Adding compost: Plant-based compost is derived from leaves, grass clippings, wood chips and other yard wastes that have been shredded. The depth of broadcasted plant-based compost for the first-year garden should be 2-3 inches which is incorporated into the top 6-8 inches of bed area. In succeeding years, adding a 1-1 ½ inch layer of compost and tilling it into the top 3-4 inches of soil will improve soil tilth.

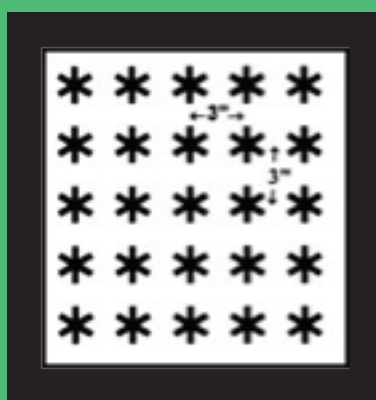


9.) Fertilizer: Using manufactured fertilizers to add soil nutrients that support plant growth is inexpensive, easy to apply and generally releases nutrients quickly. Application rates depend on what the fertilizer contains and in what amounts. If products contain multiple nutrients, the application rate depends on the nitrogen content (% nitrogen is the first number in an analysis: 45-0-0 is 45% nitrogen). The standard annual application rate for vegetable gardens is 2 pounds actual nitrogen for 1,000 square feet of garden soil (4 feet wide/25 feet long bed requires broadcasting 0.2 pound of actual nitrogen). If you buy 10-10-10 fertilizer (10% nitrogen), broadcast 2 pounds over 100 square feet of garden soil, then lightly rake it in or water it in prior to placing transplants or seeds. Blood meal (dry inert powder) provides about 13% nitrogen and fish emulsion about 4% nitrogen if you prefer to garden organically. Epsom salts contain magnesium sulfate and can be helpful as a source of magnesium and sulfur as secondary nutrients. Scientific research has shown that plants make no distinction between minerals supplied by organic sources vs. commercial fertilizers.

# HOW TO CONSTRUCT A RAISED BED

**10.) Starter fertilizers:** When setting transplants, starter fertilizers (high in phosphorus) speed growth, encourage blooming and fruiting. Starter fertilizers are water-soluble (MiracleGro®, Peters®, Schultz Plant Food®, FertilomeRoot Stimulator®, Plant Starter Solution® etc.) and can be added to the planting hole before firming soil around the transplant. 1/4 cup of Osmocote® in the planting hole benefits your new transplant for several weeks.

**11.) Block style garden layout:** The close-row, block planting is a compact design ideal for raised beds. You plant vegetables in rectangular-blocks instead of long single rows. Carrots placed on 3 inch centers. A 24-foot long row of carrots will fit into a 3' by 2' bed. Due to the higher plant density, block plantings require weed-free, fertile, well-drained soil that is rich in organic matter. (Find the chart below).



# HOW TO CONSTRUCT A RAISED BED

**12.) Mulching:** After planting, mulch beds to reduce weeds, conserve soil moisture and regulate soil temperatures. Do not use grass clippings or shredded materials that were treated with pesticides.



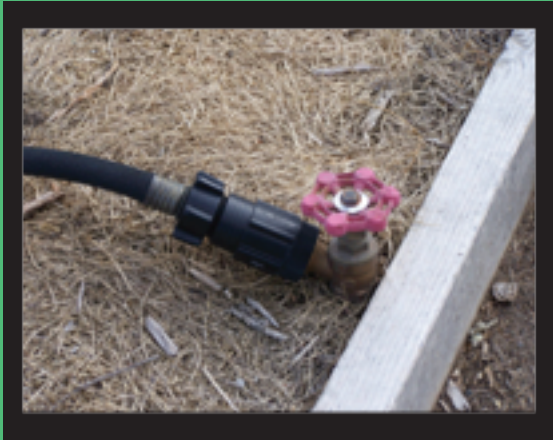
**13.) Managing walkways between beds:** Grass walkways allow students to work even after rains. If your school grounds manager prefers to not mow the walkways, wood/bark chips or pine needles to a depth of 3-4 inches minimize compaction due to foot traffic and slow weed growth. Periodic additions of the chips or pine needles are required to maintain the 4-inch depth.

**14.) Water requirements:** Vegetables use around  $\frac{1}{4}$  inch of water daily during typical summer weather. If you water the garden every 4 days, apply one inch of water per irrigation. Hot, windy weather increases water demand. When the top 2-4 inches of soil feel dry to the touch, it is time to water. Ideally you can add a water tap at the end of each box, especially if your plans include continuing the garden project during summer months. Soaker hoses and soaker tubing emit water along the entire length of the hose (water seeps evenly). If adding a water tap in each box is not possible, connect the soakers by manually connecting a garden hose to each line. For uniform water delivery, keep the runs short, 25 feet or less and move your soaker hose as needed to reach all plants.

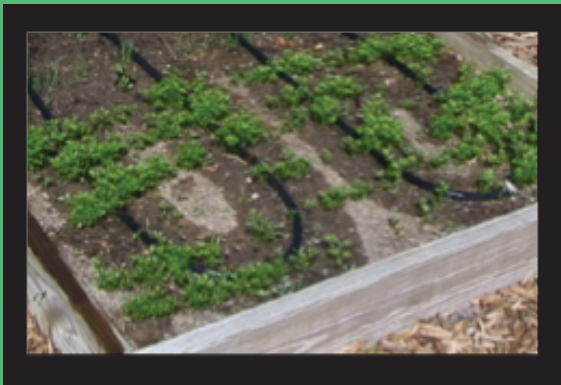




# HOW TO CONSTRUCT A RAISED BED



With irrigation pipe, it is easy to plumb a tap at each raised bed box. Here a pressure regulator with hose-end fittings reduces the pressure to 25 psi. A 1/2 inch soaker hose is attached.



A four-foot-wide raised bed with soaker hose on 12 inch spacing.

**15.) Floating row covers:** Floating row covers like Remay<sup>®</sup> (many brands and fabric types are available) are lightweight fabrics that lay on top of your crops to give 2-4 F of frost protection on cold nights, cut wind on tender plants, and screen out some insects. Clear plastic (at least 4 mil) works very well. On insect pollinated plants, covers must be removed to allow for pollination to occur. The covers transmit light so they provide crop protection as long as needed.

# HOW TO CONSTRUCT A RAISED BED

**Floating row cover may be held in place with tubing filled with sand and laid entire length (conforms to uneven soil and seals fabric against soil surface), soil, rocks, lumber, ground anchors (make your own from clothes hangers). A 4-foot wide bed planted with broccoli would require an 8-foot wide piece of floating row cover placed loosely.**



# SPACINGS FOR GARDEN VEGETABLES:

Start with wide spacings; reduce spacings as soil improves in fertility and tilth. For spring or fall garden, use these spacings for block planting:

<b>Beets:</b>	<b>4-6" by 4-6"</b>
<b>Carrots:</b>	<b>2-3" by 2-3"</b>
<b>Celery:</b>	<b>7-9" by 7-9"</b>
<b>Garlic:</b>	<b>4-6" by 4-6"</b>
<b>Kohlrabi:</b>	<b>7-9" by 7-9"</b>
<b>Leeks:</b>	<b>4-6" by 4-6"</b>
<b>Lettuce, head:</b>	<b>10-12" by 10-12"</b>
<b>Lettuce, leaf:</b>	<b>7-9" by 7-9"</b>
<b>Onions, bunch:</b>	<b>2-3" by 2-3"</b>
<b>Onions, dry:</b>	<b>4-6" by 4-6"</b>
<b>Parsnips:</b>	<b>5-6" by 5-6"</b>
<b>Radishes:</b>	<b>2-3" by 2-3"</b>
<b>Spinach:</b>	<b>4-6" by 4-6"</b>
<b>Swiss chard:</b>	<b>7-9" by 7-9"</b>
<b>Turnips:</b>	<b>4-6" by 4-6"</b>



# NO PLACE FOR A RAISED BED?

## HOW ABOUT A CONTAINER GARDEN

Growing vegetables in containers can be successful when container soil provides a constant supply of water and nutrients. Without regular watering, vegetables are unforgiving and become stringy, strong-flavored and tough. The larger the container, the better: 25-30-gallon containers provide adequate rooting area for successful production of edible plants. Greenhouse soilless media like Pro-Mix® contain slow-release fertilizer, but generous additions of more fertilizer added to the media (i.e. one cup of Osmocote® or other pelletized material) before seeding or transplanting will last around two months. Containers must have drainage holes in the bottom; adding rocks in bottom “for good drainage” is unnecessary. Be sure to put blocks or bricks under the container (give your container “feet”) to hold it off the ground for drainage. Place the containers where they will get 6-8 hours of full sun and where water is accessible. Cool-season vegetables offer opportunities for students to grow a spring and/or fall garden during the regular school year. Use the following chart to help you get started. Choose cultivars with the shortest growing season requirement. For example ‘Candid Charm’ cauliflower is a good choice--it requires 65 growing days from time of transplanting; others require 75-87 growing days. ‘Windsor’ broccoli requires 85 days to mature; others up to 100 days. The two-week advantage is significant for children to witness harvest. In Kentucky, the earliest planting time for cauliflower and broccoli is March 20-April 1.



# VEGETABLE CHART:

VEGETABLE	CONTAINER SIZE	REMARKS
BEETS	8" Deep	To give space for root development, thin greens to 3", 6" for root development.
BROCCOLI CABBAGE CAULIFLOWER COLLARDS KALE	10" Deep, 4-5 Gallons per plant	Minimum spacing per plant is 18" by 18". Heavy feeders, requiring frequent light fertilization.
CARROTS	8"-12" Deep	Use short -root cultivars ('Short & Sweet' or 'Scarlet Nantes').
CHARD	8" Deep	Space to 6" between plants. Harvest outer leaves for "cut and grow again" crop.
Cilantro (CORIANDER)	6" Deep	Space plants 4" apart. Harvest leaves for salsa and add to vegetable dish.
CHIVES	6"	Harvest outer leaves and use fresh leaves and use fresh for best flavor and as an attractive garnish.
DILL	8" Deep	Enjoy cut leaves and use fresh since they lose flavor and aroma when cooked.
KOHLRABI	8" Deep	Kohlrabi is a heavy feeder, requiring frequent light fertilization.
LEAF LETTUCE	8" Deep	Use softhead of leaf types. As the young crop grows, this 9" spacing.
GREEN ONIONS	6" Deep	Thin the crop by harvesting young plants.
PARSLEY	6" Deep	Buy transplants since seeds germinate slowly.
RADISH	8" Deep	Among quickest to germinate when direct seeded.
SPINACH	8" Deep	Harvest outer leaves to encourage continued growth. Plants bolt (produce flower heads) when temperature becomes hot.
TURNIPS	8" Deep	When large enough to make greens, thin to 4" allowing for root development.

# VEGETABLES:



Leaf Lettuce



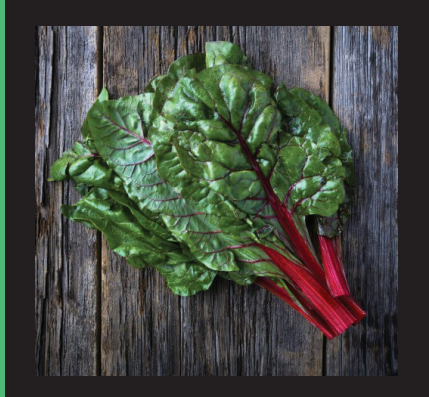
Green Onions



Collards



Parsley



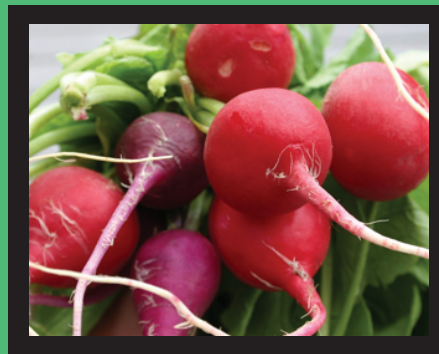
Chard



Cauliflower



Kale



Radish



# VEGETABLES:



**Spinach**



**Broccoli**



**Carrots**



**Cilantro**



**Kohlrabi**



**Beets**



**Tunips**



**Chives**

# VEGETABLES:



Dill



Cabbage



# PRODUCTS AND RESOURCES:

The Home Depot



Lowe's  
Home Improvement



Let's Build Something Together™

Most of these products can be found at  
The Home Depot or Lowe's Home Improvement  
at the store or found online.

Websites: <https://www.lowes.com>

<http://www.homedepot.com>

The Home Depot: 1-800-466-3337

Lowe's: 1-800-445-6937

Local Resource: Fayette County Cooperative  
Extension Service, 1140 Red Mile Place,  
Lexington KY 40504-1172. 859-257-5582

Adapted from KY Farm Bureau by Eric Graham (UK College of Ag) in partnership with Tresine Logsdon,  
Fayette Co Public Schools

(Carrie Johnson, Executive Director, Fayette County  
Farm Bureau).

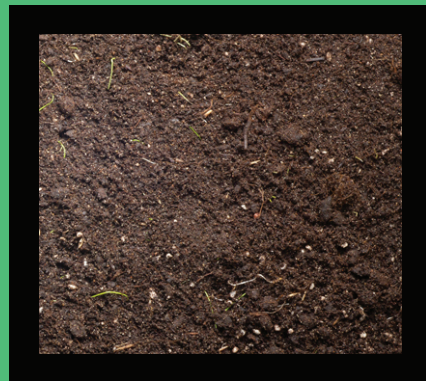
Many products seen below are suggested in the text under (HOW TO CONSTRUCT A  
RAISED BED and NO PLACE FOR A RAISED BED? HOW ABOUT A CONTAINERGARDEN).

-Sunset.com: "How to Build a Raised Bed for your garden."

-Garden Notes: [www.cmg.colstate.edu](http://www.cmg.colstate.edu); and experienced Master Gardeners from  
Fayette Co. KY Extension.



PVC PIPE A FRENCH DRAIN



TOPSOIL OR PLANTING SOIL



MIRACLEGRO



OSMOCOTE



REMAF FLOATING ROW COVERS



PRO MIX