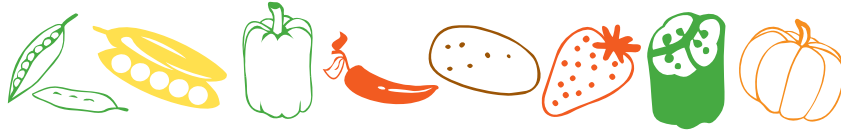


A Planning Guide for Edible School Gardens



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Project Partners

Kerr Center for Sustainable Agriculture
USDA Cooperative State Research, Education and Extension Service
OSU Cooperative Extension Service - Horticultural Science
Oklahoma Department of Environmental Quality - Land Protection Division

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Introduction

As children's lives become more and more filled with activities, electronics and meals on the fly, schools have the opportunity to offer a place where students, teachers and parents can slow down for a few minutes and enjoy the simple pleasures of life. School gardens provide the setting for a diverse array of uses and benefits such as cross-curricular lessons and activities to engage students' interest; hands-on nutrition education for instilling healthy eating habits; and an outdoor physical activity with a tangible purpose.

Successful schools and gardens have much in common. They are both places where seeds are planted, growth is nurtured, and with some love and patience, bountiful harvests are possible. To ensure the greatest possible yields, both require sufficient planning, consistent work, and good leadership.

As with students learning new concepts, the thought of "putting-in" an edible school garden might seem insurmountable to teachers, parents and others who are interested. Or perhaps the initial idea of a school garden seems very straightforward, until one begins looking into the possibilities and considerations for starting and running a garden project.

This publication is therefore intended to supply garden leaders with a collection of useful tools and information for planning and implementing a successful school garden project featuring edible plants. Fortunately, many resources are currently available which address gardening with children. This guide includes some good ones focusing primarily on vegetables, fruits, herbs and other edible plants. Also included are references and links to many other helpful resources on these topics.

While school gardens are not prohibited from using synthetic chemicals for growing food crops, this publication strongly encourages the use of methods which don't rely on applying potentially toxic substances to plants and soil. Organic and sustainable practices such as using compost for fertilizer, mulches for weed control, and hand-picking of insect pests teach children and adults that gardening is more about working with nature than against it.

It should be noted that this resource guide is a working publication which will evolve over time to best reflect the needs and requests of those who come to use it. Please send comments and suggestions for inclusion in future revisions to:

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Happy Gardening! 

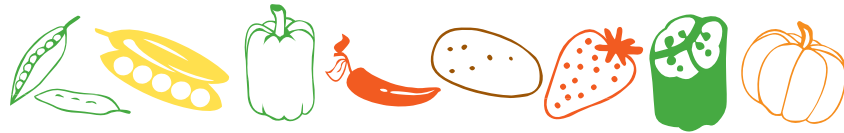
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To order a copy of this guide on CD, contact Susie Shields
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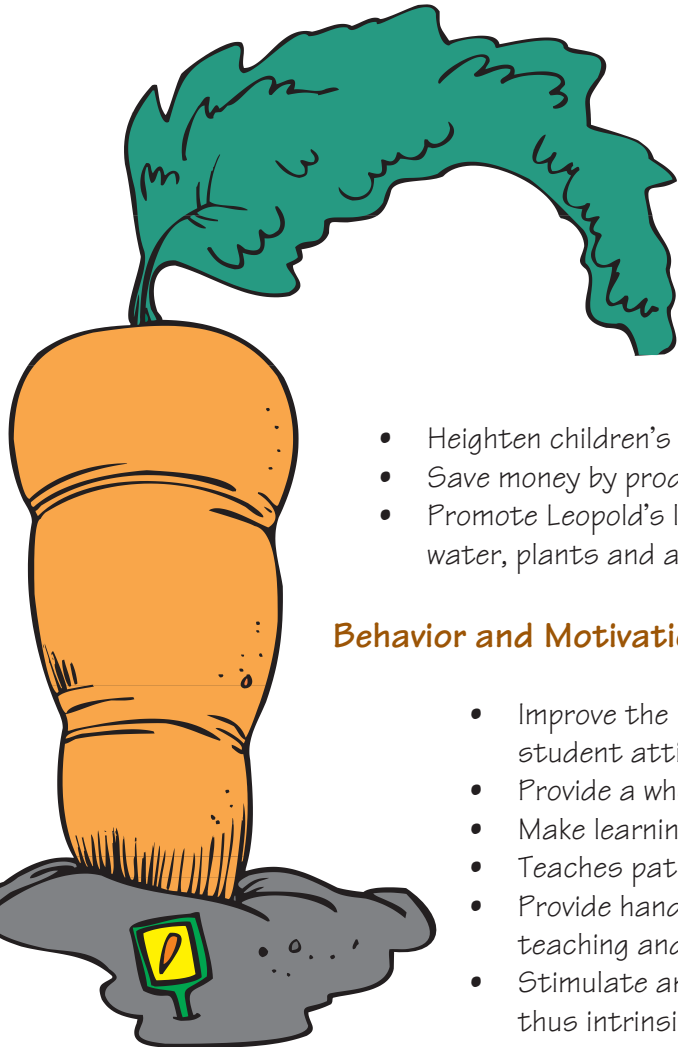


Menu of Rationale for Edible School Gardens


A Menu of Rationale for School Vegetable Gardens

(Some points are duplicative, but provide ideas for different verbiage to use in your proposal to acquire administrative and funding support. These points have been adapted from the resources listed below.*)


Ethics, Responsibility and Stewardship

- 
- Develop a strong work ethic and sense of responsibility among students
 - Encourage sharing and community involvement by planting a row for the hungry
 - Encourage community-building by engaging parents and nearby residents
 - Instill a sense of ownership, pride and stewardship among students
 - Heighten children's environmental awareness
 - Save money by producing food for the school lunch program
 - Promote Leopold's land ethic extending the community to include the soil, water, plants and animals

Behavior and Motivation

- 
- Improve the behavior and outlook of young people, replacing poor student attitudes with enthusiasm and excitement
 - Provide a wholesome activity that keeps all students engaged
 - Make learning fun, personal and memorable
 - Teaches patience
 - Provide hands-on, inquiry-based opportunities for more effective teaching and make learning come alive
 - Stimulate and capitalize on the interest of students in living things, thus intrinsically motivating them to learn
 - Combine effective elements of traditional and non-traditional teaching methods, thus appealing to different learning styles and supporting positive interpersonal relations
 - Provide powerful hands-on learning experiences for non-traditional learners.

Academic and Life Skills

- 
- Foster literacy in science
 - Provide life skills for students with food production and preparation
 - Engages students in hands-on learning that provides physical, psychosocial and intellectual challenges

Continued on next page...

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- Provide a real-world connection to content in a variety of disciplines
- Make valuable connections between disciplines or subject matter areas such as science, math and social studies linked to the required core curricular standards
- Create opportunities to exercise multiple intelligences of the learners
- Give children a better sense of what real, whole food is. Too many of us are disconnected from where our food comes from.

Health



- Offers a purposeful physical activity for students of all abilities.
- Institutes a source of positive memories about nutritious foods that can affect life-long eating habits.
- Provides children an opportunity to sample new and different foods in a friendly setting.
- Provides students with fresh air, exercise, sunshine, knowledge, mental therapy, fresh food rich in vitamins and minerals
- Encourage a healthy diet in students by connecting children to the source of their food and fostering an appreciation of the flavors and benefits of vegetables

Bibliography for Rationale

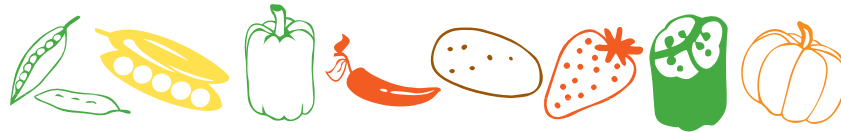


“The Chicago School Garden Initiative: A Collaborative Model for Developing School Gardens that Work,” by Katherine Johnson and Marti Ross Bjornson (www.kidsgardening.com)

“Sowing the Seeds of Success: How to Start and Sustain A Kids’ Gardening Project in Your Community,” by Marcia Eames-Sheavly and the National Gardening Association (www.garden.org/edu)

“Planning Sustainable School Gardens,” by Rory Klick (www.kidsgardening.com)

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OSU Cooperative Extension's "Children's Gardens
in Which to Lear and Grow"

Gardening with Kids: Classroom Activities in Horticultural Science OSU - Oklahoma Cooperative Extension Service

Children's Gardens in Which to Learn and Grow A Guide to Planning, Designing, and Building an Outdoor Garden Classroom

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Throughout the U.S., schools are discovering the benefits of outdoor classrooms, where their students can explore the environment through native and/or created habitats for various plant and animal life. Although some schools border native prairies, woodlands, or other wild areas that can be easily adapted for outdoor classrooms, many urban schools have little space to create an outdoor garden classroom. This publication along, with videotape VT882 available through the Oklahoma

Cooperative Extension Service (OCES), will serve as a guide to planning, designing, building, and maintaining an outdoor garden classroom. Bear in mind that an outdoor garden classroom does not need to be large to accomplish its goals; it may be as small as a single, raised bed or even an array of pots or planter boxes. Following the framework below will ensure that an outdoor garden classroom develops into a functional space that is utilized year-round.

Step 1—Form a Garden Committee

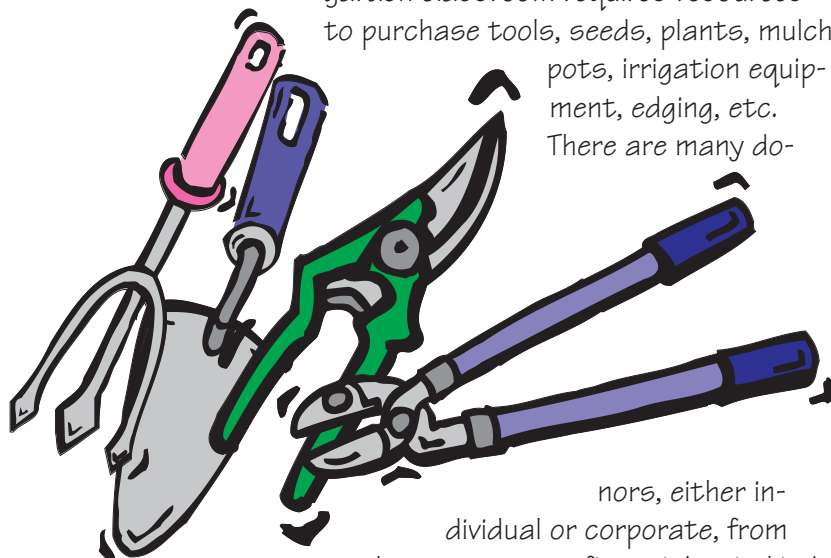
If the project is more than a grouping of potted plants, it is important that the person initiating the project has a committee of individuals to assist with fund raising, scheduling, volunteer training, curriculum development, etc. as well as designing, installing, and maintaining the garden. Teachers will most likely initiate the outdoor garden classroom project for a school and, thus, will want to identify responsible, knowledgeable people with expertise in these various areas, who are committed to the success and longevity of the project. Parents, members of local

garden clubs, Master Gardeners, and faculty or staff are potential sources of volunteers to serve on a garden committee. A successful garden is typically the result of several teachers' sharing their common goals, ideas, and dedication to the project. It is imperative to collaborate with other teachers.

For large outdoor garden classroom projects, consider having subcommittees address and coordinate areas such as financial support, garden maintenance, curriculum development, etc., each chaired by a member of the garden committee. *continued on next page...*

Step 2—Garner Funds and In-kind Gifts

Regardless of its size, an outdoor garden classroom requires resources to purchase tools, seeds, plants, mulch, pots, irrigation equipment, edging, etc. There are many do-



nors, either individual or corporate, from whom to request financial or in-kind support. Donors may include granting agencies, private foundations, corpo-

rate partners, local businesses, and individuals. Before soliciting gifts, consider the project's short- and long-term needs. One-time gifts are great for getting started; however, continued growth and development of the project will require sustained solicitation of gifts.

Remember, all gifts are made by people, even if not from their own money. When soliciting support bear in mind why donors will give to a project: the donor 1) believes in the community and its school system and takes pride in association with them, 2) believes that your goals and curricula support the need for the project, 3) has a respect for the teaching profession, and 4) considers the tax benefit of the gift.

Granting Agencies

Grants are available from many sources and typically require an application specific to the granting agency. Although grant writing can be a time-consuming process, the successful pro-

posal often leads to subsequent grants from the same and other granting agencies. (See Funding Opportunities

ties in Resources section of this guide for specifics.)

There will be many opportunities during the project to recognize donors. Some of these include: upon making the gift and/or anniversary of the gift; upon ground breaking, ribbon cutting, and/or dedication of the garden; at year's end; and at campaign's end. "Thank You" notes from teachers, students, and committee members, as well as a printed list of donors and/or plaques recognizing donors are ways to express appreciation for their financial and in-kind gifts.



Work Committee with thier tools.

Step 3—Define the Purpose and Objectives for the Garden

Work with a committee to define a purpose and to list objec-

tives for the school's outdoor garden classroom. A school's project may be similar to another outdoor classroom, but it will be unique because it is in a different environmental location and is the result of the commitment of a different group of people. Consult the section "What to Plant" later in this fact sheet to help focus the purpose and objectives of the project. Is the

garden going to emphasize environmental issues; habitat; human health; food; or associations with literature, art, geography, history; etc.? Addressing needs will help develop a focus on how to build an outdoor garden classroom.

In addition to academic needs, the garden may provide personal development opportunities. Projects that grow food crops in the garden might

include donating the produce to a food bank or selling it for fund-raising. Such activities extend lessons learned in the classroom and introduce students to other skills such as critical thinking, communication, teamwork, civic responsibility, mathematical reasoning, problem solving, public speaking, vocational training, computer skills, scientific method, research skills, and analysis.

Step 4—Layout Students' Gardening Activities

After identifying a list of objectives, develop lesson plans to coordinate with activities in the garden. Students might participate in many of the garden care activities such as watering the plants, weeding the garden, making soil improvements, planting cover crops for fallow periods, protecting plants when weather threatens to damage them, mulching the garden, cleaning up, and planting. Adult volunteers can help with these activities during the school year, and they become especially valuable during the summer months when school is out. Utilize a garden committee to

schedule which groups of students will be doing what and when and determine how garden space will be allocated. This is a teacher's opportunity to schedule specific activities at specific times or assign certain tasks to volunteers.

Consider establishing a service-learning relationship with the community's high school FFA, art, and/or horticulture programs. Students in these classes could assist with design of the garden space, selection of plants to be grown in the garden, and production of transplants from seeds and cuttings.

Step 5—Define a Year-round Garden Plan

As spring approaches, it is easy to get excited about planting a garden; however, an outdoor garden classroom is a year-round project. The garden

committee can develop strategies to ensure the garden is fully utilized throughout the academic year.



Fall

Fall is the time to plant winter-flowering annuals such as pansies, flowering cabbage, and flowering kale. It is also one of the best times to plant a tree in or near the garden. Spring-flowering bulbs, such as tulips, hyacinths, daffodils, and crocuses should be planted in the fall so their root systems can grow prior to the onset of winter. A crop of cool season vegetables can also be planted and harvested during the fall. Start a composting program to return valuable organic matter and nutrients to the garden soil. Discuss microbial decomposition of organic matter. Notice the color of fall foliage and discuss what accounts for this change from green to vibrant yellows, bronzes, deep reds, and purples. *continued on next page...*

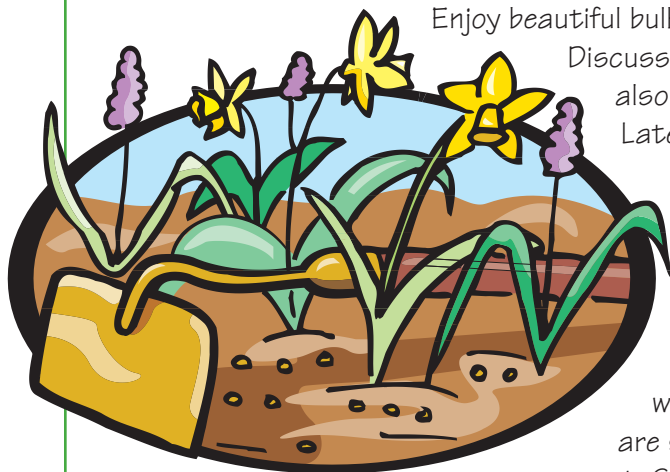
Winter



Winter is the time to discover what creatures are resting in the garden. Dig up samples of soil and look for dormant insects and seeds. Discuss the benefits of freezing and thawing on soil structure, how plants prepare for winter, and what prevents overwintering buds on trees from opening until spring. Winter is also a good time to examine and sketch the structure of trees. In late winter, start seeds of plants to be transplanted into the garden once spring arrives. Seeds need to be started in a sunny windowsill or under a bank of fluorescent lights. See Extension Fact Sheet F-6401, “Growing Under Lights” for additional information.

Spring

Spring is the time of rejuvenation. In early spring, plant cool season vegetables, e.g. peas, broccoli, lettuce, cauliflower, etc. from seed or transplants. Enjoy beautiful bulb flowers and discuss their growth and development.



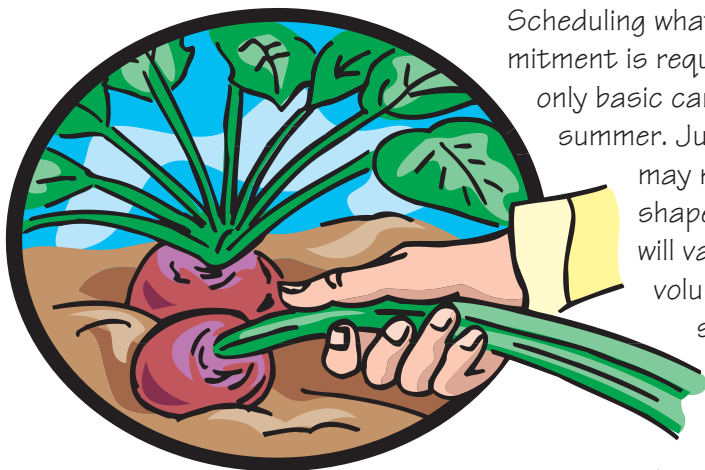
Discuss methods of pollination—wind and insect. Spring is also a good time to plant a tree in or near the garden.

Late spring is a good time to establish bermudagrass or zoysiagrass turf within a classroom garden.

Bermudagrass requires nearly full sun and is very wear tolerant; however, it is invasive. Zoysiagrass requires full sun or bright shade, is also very wear tolerant, and less invasive than bermudagrass. If the garden is somewhat shaded, tall fescue turfgrass would be a better choice. Be sure that the garden beds are secured with edging to prevent turfgrass’ encroachment. Spring is also the perfect opportunity to study animal reproductive life, whether it is the tadpoles in the pond, the eggs in the bird nest, or the clutch of bunnies beneath the garden gate.

Summer

Unless employed by a year-round school, an educator’s main question is probably, “Who is going to maintain this garden until school starts?” Most communities are well equipped with dedicated and enthusiastic parents and a number of volunteer and civic groups. A good place to begin is with the PTA or parents of the children in the classes involved. They have a sense of ownership in school projects and facilities and will be willing to put some effort into the garden in order to make it successful. Other resources might include volunteer organizations, civic groups and clubs or just an avid gardener in the community. Groups noted for their community services include Master Gardeners, Boy Scouts and Girl Scouts, civic clubs (Lions, Elk’s, Moose Lodge, Jaycees, Rotary, etc.), societies (Audubon, Wildlife, Horticulture, etc.), local garden clubs, fraternities and sororities, other university/college clubs, high school clubs (FFA), 4-H clubs, church youth groups, etc.



Scheduling what activities need to be done and what time commitment is required by each volunteer is the next step. Typically only basic care, weeding, and watering is needed during the summer. Just prior to school starting, other assignments may need to be made to make sure the garden is in shape for the first day of school. Time commitments will vary from one situation to the next. One dedicated volunteer might be willing to manage the garden all summer. However, more than likely a schedule for several people willing to take care of the garden will be needed. Consider requesting one family per week during the summer break to volunteer in the garden. That way one single person or family is not committed for the whole summer, which could interfere with family vacation plans.

Step 6—Choose a Permanent Garden Site and Design the Garden

Site selection is extremely important, but one is often limited to a site that may be less than ideal. Several things need to be considered when choosing the right site. Evaluate the soil texture, depth, fertility, drainage, slope, as well as sunlight and air movement within the garden site.

Any adjustments that could lessen a potential problem should be considered.

Most plants prefer moist, well-drained, loamy soils. Too much sand leads to increased moisture stress and increased irrigation costs. Too much clay leads to drainage problems and greatly limits crops that can be planted on a particular site. Added nutrients and/or amendments may be necessary to improve soil tilth and are best added before

planting begins. A soil test can be conducted through the Cooperative Extension Service to help determine what

nutrients or amendments, if any might be needed. (See improving soils below.)

The area should have good drainage. A slope between 1% and 10% is acceptable. Slopes greater than 10% can lead to excessive runoff, erosion, and special management. If drainage is poor because of soil type or low pockets in the grade, care should be taken to correct these problems before beginning the garden's construction. If soil type is heavy clay or the area is low in grade, consider bringing in additional soil to raise the area, or build raised beds. Compacted soils may also drain poorly and should be tilled thoroughly to improve drainage. Simple drainage systems can also be installed to help divert or drain water away from the gardening area. Avoid constructing a garden in areas where large volumes of water are diverted from buildings.

Some air movement is desirable in the garden. Too little air movement can promote insect and disease development. Too much air movement and plants will tend to dry out faster or may be blown over and damaged. Thus protection from prevailing wind patterns with fences, barriers, covers, etc. should be considered when selecting the garden site.

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Students watering plants

The garden site should be in an area that receives plenty of sunlight, at least 6 to 8 hours a day. There are many plants that will tolerate less than six hours, but most prefer at least six. Sometimes very little can be done to increase the amount of sunlight that a garden site receives. If there is no way to provide additional sunlight, consider growing only plants that are shade tolerant. The types of plants educators wish to grow may determine where the garden is located or vice-versa.

Additional considerations should include availability of water and electricity, accessibility, and size of the desired garden. Be sure to locate the garden in close proximity of water. If water is not easily accessible, plants tend to be neglected and suffer during dry, hot periods. If there is no water source near the garden area, then installation of a water line to the garden site may be necessary. If the garden is small,

hand watering may be sufficient; however, if it is too large for one person to water by hand in a short amount of time, consider drip irrigation,

soaker hoses, or conventional irrigation systems. All can be set up on timers for ease of watering but should still be monitored and reset based on weather conditions. Drip and soaker hoses are the most efficient and cost effective irrigation methods. Be sure to locate the garden near an electrical source to handle electrical needs.

The garden should also be located where it is accessible to students, volunteers, and teachers. The size of the area needed will also play a roll in choosing the site. Based on the needs and activities identified earlier in the planning process, the size of the garden can be determined. The site should have enough room for a garden, tool storage, and students. Maintaining a large garden is very time-consuming, so select a relatively small area and allow it to “grow” as time and resources permit. Consider locating the garden in an area that will allow for future expansion. The demonstration Children’s Garden at the Oklahoma Botanical Garden and Arboretum in Stillwater, Oklahoma, measures about 20’ x 40’ and is actually made up of several smaller gardens (Fig. 1), a vegetable and fruit garden, butterfly garden, water garden, and potting garden. The size selected for a garden will be determined by the overall objectives of the teaching program, the number of students that will use the garden at one time, and the amount of support and volunteers involved.



Students designing their garden

Garden Design

There are four steps to follow in designing a garden.

These steps help guide the design process, especially when large groups

of people are to be involved in the process.

The first step is to inventory and analyze the garden site. Note where existing elements, such as trees and shrubs are located along with views and access to the garden. Find out how much sunlight the garden will receive.

Are there elements that need to be removed or changed before a garden can be installed? Determine if the area has proper drainage. Also consider possible liability issues that the site may impose. Physical hazards for students and visitors should be considered as well as the possibility of vandalism. In such cases, lighting or fencing may be needed. A garden site in a secluded area on campus, such as an enclosed courtyard, may also be an effective deterrent to vandalism.

The second step is to decide what should be included in the garden. It is a good idea to draw the garden on paper or with the aid of a computer drawing program to plan for proposed locations of elements. Starting with a list of elements to include in the garden (bird houses, water features, potting benches, trees, shrubs, planting beds, etc.), consider how they will be used to form a theme. Once the theme for the garden is set, it becomes easier to add other ideas.

The next step is to strategically place elements in the garden. Examples: place bird nest boxes in an area that will not be constantly disturbed; locate the garden entry in a highly visible location; place vegetable gardens in an area that will allow for planting and maintenance. Some activities will be passive in nature,

such as observation assignments and others will be active, such as potting plants, so group like activities together. Some of the proposed elements will need to have room to accommodate large groups or several classes at one time, so take this into consideration. When proposing plant material consider future growth and seasonal changes. Since safety is an important concern, especially when children are involved, sharp objects and poisonous plants should be avoided. Keep the garden simple so yearly maintenance requirements are kept to a minimum.

The final step is to draw the plan to scale and add notes for where programmed activities will take place. Note on the plan what elements and materials will be needed to construct the garden. The plan of the garden will help others visualize the layout, aid in the installation, and provide a checklist for supplies. Type of materials needed and their cost should be considered during this step. Sturdier materials often cost more initially but will last much longer than cheaply constructed materials. Pathways can be constructed from permanent materials such as bricks or pavers if the budget allows, or cheap, readily available materials such as clean hay or straw, wood chips from a local pruning company, grass clippings, etc. If some elements will be added over time, show on the initial plan with a note what will be added in the future. This allows for an understanding of how the plan will come together.



Deciding what to plant

What to Plant

As plant material is chosen for the garden, the life cycle, mature size, and cultural requirements should be considered. Plant mate-

rial is often classified as herbaceous (annual or perennial) and woody (shrubs and trees). A true annual will complete its life cycle in one year and will need to be replaced the following year. If

continued on next page...

the whole garden is made up of annual plants, the cost of replacing them may become a burden. Therefore, herbaceous perennial plants (flowers or groundcovers that last three or more years) and woody plants should be utilized along with some annuals. By incorporating many plant types into the garden, visual interest as well as utilization of the garden becomes year-round.

Select plants that are adapted to the region to ensure success. Consider the temperature tolerance, soil type tolerance, moisture requirements, etc. of plants selected. Trying to grow plants that are not adapted to an area can result in disappointing failure. It is also necessary to know the ma-

ture sizes of the plants chosen for the garden. Spacing of plants and garden placement will be determined by their mature height and width. Avoid overcrowding plants because this can result in problems such as increased disease or insect incidence. Place taller plants toward the back or middle of the garden and shorter plants in front.

Class curricula and planned activities will also play a roll in the overall design of the garden and plant selection. By using class curricula, ideas for theme, concept, or topic gardens can be identified. Plant material to be used in these gardens should then be determined based on the overall theme, concept, or topic. The following list of ideas may be helpful.

Theme gardens

Persian Carpet Garden	Friend's Name Garden
Butterfly Garden	Dinosaur Garden
Water Garden	Alphabet Garden
Imagination Garden	Sunflower House Garden
Sundial Garden	Herb/Scent Garden
Fiber Garden	Prairie Garden
Native American Garden	Peter Rabbit's Garden
Barneyard Garden	Teeny Tiny Garden
Companion Garden	Literature Garden
Root Garden	Giant Garden
Pizza Garden	Tall & Short Garden
Safari Garden	Chocolate Garden
Lemon Garden	Native Plant Garden
Color Garden	

Topics

Seeds (monocot/dicot)	Roots	Soils
Beneficial Insects	Leaves	Drought-resistance
History	Literature	Mathematics

Concepts

Plant Life Cycles	Plant Form & Function	Adaptation
Food Production in Plants	Regeneration of Plants	Biodiversity
Seasonal Cycles	Wildlife	Habitat

As indicated previously, our Children's Garden is divided into four sections, each having a different theme or garden type (Fig. 1). One side of the garden is divided between a vegetable garden in one corner and a bird/butterfly garden in the other corner. The other side of the garden has a water garden/reflection area in one corner and a potting

area in the other corner. The potting area contains plants that root easily and a potting bench. The center of the garden is open and contains a to-scale concrete map of the state of Oklahoma. This map can be used for any number of lessons including geography, math, history, etc. (See Extension Fact Sheet WF-6405.) The open area in the center of the garden also ensures that groups of children can be in the garden without trampling the plants in the theme garden areas.



Quick results

Vegetables

Vegetables are commonly used in children's gardens since they afford children hands on time in the garden. It is important to choose vegetables that will give quick results, so the children will not lose interest in the

garden. Problems with a vegetable garden include crops that mature in the summer after the children are out of school and not having a site with enough sun to grow vegetables. The following tables offer vegetable suggestions that should alleviate these problems.

Quick-growing Vegetables

Vegetable	Approximate Days to Maturity
-----------	------------------------------

Beet	50
Broccoli (transplants)	50
Bush Bean	50
Leaf Lettuce	45
Radish	25
Spinach	50

(note: The number of days to maturity may vary with variety. Check the seed packet for each individual variety.)

Vegetables That Can Be Planted in the Spring to Mature Before School Is Out

Vegetable Spring Planting Dates for Oklahoma	Approximate Days to Maturity
--	------------------------------

Cabbage (transplants)	Feb. 15 – March 10	60 – 90
Leaf Lettuce	Feb. 15 – March 10	40 – 70
Radish	March 1 – April 15	25 – 40
Spinach	Feb. 15 – March 10	50 – 70
Swiss Chard	Feb. 15 – March 10	50 – 70
Turnip	Feb. 15 – March 10	50 – 60

continued on next page...

Vegetables That Can Be Planted in the Fall to Mature Before a Killing Frost
Vegetable Fall Planting Dates **Approximate Days**
for Oklahoma **to Maturity**

Bush Bean	Aug. 10 – 20	50
Cucumber	Aug. 10 – 20	60 – 70
Cabbage (transplants)	Aug. 1 – 25	75 – 90
Mustard	Sept. 10 – Oct. 10	40 – 50
Radish	Aug. 15 – Oct. 10	20 – 40
Spinach	Sept. 5 – 25	0 – 60
Summer Squash	July 15 – Sept. 1	40 – 50
Swiss Chard	Aug. 1 – Sept. 15	50 – 60

For additional information on planting a spring or fall vegetable garden, see Extension Fact Sheets F-6004, “Oklahoma Garden Planning Guide;” F-6009, “Fall Gardening;” and F-6032, “Vegetable Varieties for the Home Garden in Oklahoma.”

Most vegetables grow best in full sun; however, a nice vegetable garden can be grown even if an area receives less than six hours of sun a day. Keep in mind that those vegetables that bloom and bear fruit (corn, tomatoes,

okra, etc.) take the most sun and will require at least 8 hours a day. Root crops require less sun and leafy crops require the least amount. Some of the vegetables that will work in a garden area with 6 hours of sun or less include beets, carrots, green onions, radishes, and turnips. Leafy vegetables that can be grown in a shady area include arugula, leaf lettuce, and spinach. Growing vegetables in containers is another way to take advantage of sunny spots in the garden.

Schoolyard Ecosystems and Habitat

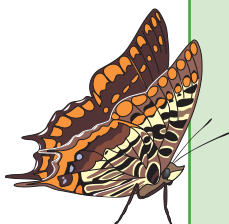
When considering overall goals of the garden, assess the local flora and fauna and the natural habitats in the area. Fountains, pools, birdhouses, and feeders are additions to the garden that provide character as well as learning opportunities. Different wildlife will be attracted to the garden depending

on the plant material used.

Water features in a garden can also be a valuable learning arena. Here, students can observe plant and animal life in relation to aquatic environments. Avoid large, deep ponds or pools for reasons of liability.

A butterfly garden is one of the easiest ways to attract wildlife to the garden. A successful butterfly garden will have:

- A mixture of perennials and annuals, including native plants.
- Nectar plants (such as marigolds, pentas, and petunias)
- Plants for larvae (such as parsley and other herbs, tomatoes, and milkweed)
- A sunny location
- Shelter from the wind
- Other features such as mud puddles or fruit
- Few insecticides and no bug zappers



Nectar plants are the primary source of food for adult butterflies and should be planted in large groups according to color. Also, select nectar plants that bloom over several seasons. Larvae plants are those used by larvae (caterpillars) as food. Most

larvae don't feed on the same plants as adults. Following is a list of some of the plants that will work for a butterfly garden. For more information and a large selection of plants, see Extension Fact Sheet F-6430, "Landscaping to Attract Butterflies, Moths, & Skippers."

Nectar Trees & Shrubs

Azalea, Butterfly Bush, Eastern Redbud, Glossy Abelia

Nectar Perennials

Columbine, Aster, Butterfly Weed, Cornflower, Coreopsis, Daffodil, Gaillardia (Blanket Flower or Indian Blanket), Liatris (Gayfeather), Goldenrod

Nectar Annuals

Aster, Rudbeckia (Black-eyed Susan), Cosmos, Marigold, Pentas, Petunia, Spider Flower, Sunflower, Verbena, Zinnia

Larval Food Plants

Dill, Parsley, Milkweed, Passion Vine

Step 7—Build the Garden According to Plan

This is the big moment when teachers, volunteers, students, and parents pool their resources and build this permanent addition to the school. Begin by



Students planning their garden



marking the area to be used. Spray paint can be used to mark the boundaries of the garden. Use string as a straightedge. Here is an excellent opportunity to put geometry

to practical use. If the garden is to be square or rectangular, calculate the hypotenuse of each corner to be sure that the corners are 90° angles. (Remember the Pythagorean theorem for a right triangle... $a^2 + b^2 = c^2$. For example,

if side "a" equals 3' and side "b" equals 4' and the corner is to be a right angle, then the hypotenuse "c" equals the square root of 9+16, which is 5'.) Once the area is defined then preparation begins. It is a good idea to distribute the garden plan to all involved at this time. This allows all to see what will be built and enables one to assign responsibilities.

Site preparation is probably the most important step in establishing a garden. Start by removing all trash, rocks, and debris. If working in an area with existing turfgrass or perennial weeds, begin by killing the grass and weeds with a product containing glyphosate. Several applications may be required before all the grass/weeds are dead. When working with Bermudagrass, common in most of Oklahoma, it is suggested that the dead sod be removed before tilling the area. Bermudagrass

continued on next page...

forms long runners, which can become entangled in the tines of a tiller. Sod may be removed by hand using a small spade or sod lifter or, if working with large areas, a gas powered sod cutter. It is important to begin with a weed-free area because weeds will compete for water, light, and nutrients.

After the site has been cleared of debris, grass, and weeds, mark pathways and planting areas. If working with a large area containing pathways, then

till only the planting areas.

It is important to make sure adequate soil is available for growing the plants chosen. Poor soils are one of the most common causes for failure of plants to grow vigorously. Natural topsoil varies greatly from one location to another. The ability to grow plants can vary even within a garden where underlying rock may prevent water percolation, or a nearby sidewalk or driveway may adversely affect the pH.

Tools and Equipment

In planning a garden, don't forget to include tools and equipment required to install and maintain the garden. If

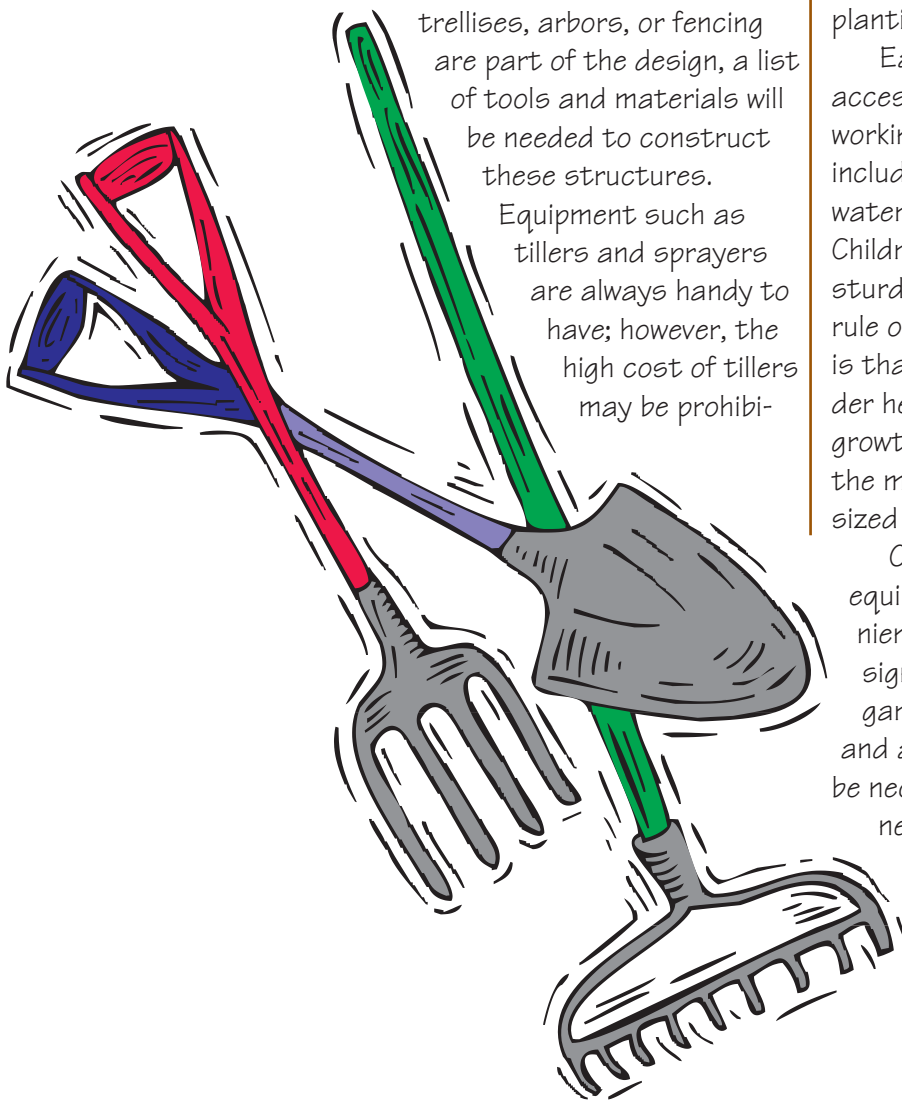
trellises, arbors, or fencing are part of the design, a list of tools and materials will be needed to construct these structures.

Equipment such as tillers and sprayers are always handy to have; however, the high cost of tillers may be prohibi-

tive. Tillers are most likely to be used when establishing a garden, and they can be rented or perhaps borrowed at planting time.

Each child or volunteer should have access to the required equipment when working in the garden. Items needed include spades, rakes, trowels, buckets, watering cans, water hoses, and gloves. Children's gardening tools should be sturdy and sized to fit them. A general rule of thumb for sizing garden tools is that the handle should be at shoulder height to 1 foot above to allow for growth of the child. For older kids, try the mid-sized tools labeled as lady-sized or patio tools.

Of course, all gardening tools and equipment will need a sturdy convenient place to be stored. When designing or choosing the site for the garden, consider storage facilities and access to these facilities. It may be necessary to construct a tool shed near the garden area to house tools and equipment.



Improving Soils



Improving soils for better product

The garden will be in place for many years, thus it is important to get the soil well prepared before planting.

Dark color and crumbly texture may indicate good soil but do not guarantee that the soil contains all the necessary nutrients. Have soil tested before the soil is prepared so fertilizer deficiencies may be corrected as well as pH. After the soil test results have been returned, work any recommended materials into the upper 6" of soil. County Extension Educators can help with submitting a soil test and, then, providing recommendations based on the soil test. For more information, see Extension Leaflet L-249, "Soil Testing...The 1st Right Step."

Organic matter is very important to successful plant growth. Most garden plants will thrive in a soil with about 5% organic matter. To add organic matter, spread 1"- 6" of peat moss, compost, or well-rotted manure over the soil. Work amendments into the top 6" of existing soil. Surface applications of organic matter do not provide the soil aeration, moisture regulation, and deep root penetration that is possible when organic matter is mixed into the soil.

Many kinds of materials are available for soil improvement. Thorough blending of these amendments with the soil is very important. Plant roots may not cross a boundary between distinctly different types or textures of soil or soil amendment materials.

Heavy top-dressing, poor mixing or other practices that cause distinct layering should be avoided. For additional information on soil improvements see Extension Fact Sheet F-6007, "Improving Garden Soil Fertility" and F-6436, "Earth-Kind Gardening Series—Healthy Garden Soils."

Irrigation and Planting

Install an irrigation system before planting. After the irrigation system is in place, fill the pathways, if any, with the chosen material to make planting a little easier. Now, planting can begin.

Proper planting is important for plant success. Generally, most plants should be placed in the ground at the same level as they were growing in the pot or field. Planting too deeply can lead to plant decline because of a lack of air exchange in the root area. Plants should

also be watered immediately following planting. Water needs of shrubs, trees, and perennials should be monitored closely the first year after planting.

Seeds should be planted at a depth that is about two times their diameter. Check seed packages for proper planting depths for each variety. Seedlings should be watched closely for water needs when first emerging from the soil, as this is a critical time for the plant.

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Step 8—Maintenance

Maintenance is as important to the garden's success as proper installation. Watering and weeding are the two biggest maintenance demands; however, mulching, fertilizing, and, in the case of a vegetable garden, harvesting are also important to a garden's suc-

cess.

Water needs of each plant will vary as will water needs at different times of the year. While a newly seeded vegetable garden will require fre-

quent "misting" or small amounts of water, an established garden will be better served by deeper, less frequent waterings. Newly planted trees and shrubs will also require close monitoring for water requirements until their roots have a chance to grow into the surrounding soil.

The garden area should be kept as weed-free as possible. Weeds compete with garden plants for needed moisture, nutrients, and sunlight. Weeds can be eliminated through manual weeding or hoeing, or through the use of mulches or herbicides. It is probably best not to use too many herbicides in a school garden setting, and if the proper measures are taken and weeds are controlled before reaching an overwhelming point, they are not needed.

Mulches can go a long way in the ease of maintenance of a garden. A layer of organic mulch 1"-2" deep will help by shading out weed seeds, eliminating

the need for cultivation and the resulting damage to plant roots, reducing moisture evaporation, increasing water absorption and retention, decreasing runoff and soil erosion, and regulating soil temperatures. Other benefits include cleaner, more easily harvested crops; the reduction of disease; and easier movement through the garden during very wet periods. For more information on mulches, see Extension Fact Sheet F-6005, "Mulching Garden Soils."

A healthy garden is the best defense against pests and if the garden is maintained well, the number of insect/disease pests in the garden may not be plentiful enough to warrant the use of pesticides. Maintaining a garden without the use of pesticides may be the best and easiest choice for a school-yard setting. Sometimes, however, pest populations may be so high that it may be necessary to use pesticides to control them before they seriously damage the garden. Check with the local County Extension Office for the best method of control. Be sure to read and follow pesticide labels for rates, proper protective equipment, re-entry times, and interval before harvest.

If planning to use compost in a garden, consider adding a composting station to the garden. Composting is the process by which organic matter is broken down by organisms into a rich compost material that can then be utilized in the garden. A composting station can provide a valuable teaching aid in the investigation of the breakdown of organic matter and life cycles. It is also a great way to recycle plant material from the garden at the end of the season. For more information on making a compost pile, see Extension Fact Sheet F-6014, "Making a Compost Pile."



Everyone helps with the maintenance of the garden

Conclusion

An outdoor garden classroom empowers teachers and their students to utilize non-traditional classroom space to supplement their educational curricula in areas including but not limited to science, history, economics, agriculture, literature, geography, art, and math. The depth and breadth of lessons that can be incorporated into the outdoor classroom setting are limitless. The garden also serves as a tool to unite a community by providing opportunities not only for students

to grow plants, but also for them to develop their relationships with classmates, teachers, parents, and garden volunteers. It is critical that a school's students develop a sense of ownership of the garden. This attitude and its resulting enthusiasm will be carried forward as the children advance through their grade levels, and it will be passed down to younger siblings and neighborhood children who are just starting their schooling.

For additional information, consult these fact sheets, which are available at local County Extension Offices or visit: For a complete listing of Extension Publications, go to: <http://pods.dasnr.okstate.edu/docushare/dsweb/HomePage>.

F-1743	Vermicomposting – Composting with Worms
F-1744	Backyard Composting in Oklahoma
F-6004	Oklahoma Garden Planning Guide
F-6005	Mulching Vegetable Garden Soils
F-6007	Improving Garden Soil Fertility
F-6009	Fall Gardening
F-6012	Growing Tomatoes in the Home Garden
F-6013	Summer Care of the Home Vegetable Garden
F-6020	Growing Vegetable Transplants
F-6032	Vegetable Varieties for the Home Garden in Oklahoma
F-6033	Raised Bed Gardening
F-6211	Propagation of Fruit and Nuts by Seed
F-6214	Growing Strawberries in the Home Garden
F-6215	Blackberry and Raspberry Culture for the Home Garden
F-6218	Peanuts in the Home Garden
F-6222	Home Fruit Planting Guide
F-6246	Growing Grapes in the Home Garden
F-6248	Blueberry Production for the Home Garden
F-6401	Gardening With Kids — Classroom Activities in Horticultural Science, Growing Under Lights
F-6403	Roses in Oklahoma
F-6404	Winter Protection of Landscape Plants
WF-6405	Gardening With Kids — Classroom Activities in Horticultural Science, Oklahoma Map Garden
F-6408	Landscape Maintenance Schedule
F-6409	Pruning Ornamental Trees, Shrubs and Vines
F-6410	Perennial Flowers for Specific Uses in Oklahoma
F-6411	House Plant Care

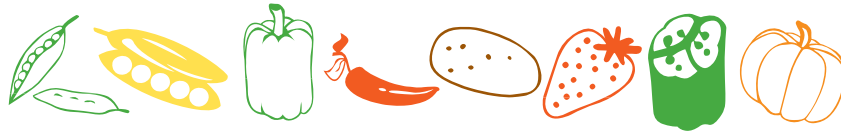
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A Planning Guide for Edible School Gardens

F-6412	Fertilizing Shade and Ornamental Trees and Shrubs
F-6414	Planting Trees and Shrubs
F-6415	Training Young Shade and Ornamental Trees
F-6417	Landscaping for Energy Conservation
F-6419	Establishing a Lawn in Oklahoma
F-6420	Lawn Management in Oklahoma
F-6425	Annual Flowers for Specific Uses in Oklahoma
F-6430	Landscaping to Attract Butterflies, Moths, and Skippers
F-6431	Earth-Kind Gardening: Cultural Control Practices
F-6432	Earth-Kind Gardening: Mechanical Pest Controls
F-6432	Earth-Kind Gardening: Botanical Pest Controls
F-6434	Earth-Kind Gardening: Biological Pest Controls
F-6435	Landscaping and Gardening for Birds
F-6436	Earth-Kind Gardening: Healthy Garden Soils
F-6705	The Hobby Greenhouse
F-7307	Beneficial Insects
F-7313	Home Garden Insect Control
F-7640	Solar Heating (Solarization) of Soil in Garden Plots for Control of Soil-borne Plant Diseases

A Planning Guide for Edible School Gardens



Planning Matrix for Edible Garden
(CD Included)

Edible School Garden Planning Matrix

(This matrix is available on CD for your convenience.)

Goal I: Organize Planning Committee			
Objective	Target Date	Date Done	Responsible Party (or Parties)
Informally determine if adequate interest exists in implementing a school garden (Don't forget to collect names and e-mails of interested parties.)			
Organize a general meeting of interested participants			
• teachers			
• parents			
• students			
• maintenance staff			
• 4-H leaders			
• master gardeners/garden club members			
• schoolground neighbors			
• other			
Define specific knowledge, skills and experience needed			
• site selection and preparation			
• designing the garden & plant selection			
• installation work schedules			
• maintenance work schedules			
• curriculum development			
• financial support (partnerships/fundraising)			
• school ground neighbors			
• other			
Solicit committed, responsible, knowledgeable and/or enthusiastic committee members to meet identified criteria			
Determine how leaders will be chosen and decisions will be made			
Select point persons (sub-committee chairs) for each work area			
Define how will rules be developed and enforced			
Decide how finances will be managed			
Goal II: Develop a Plan for Edible Garden			
Objective	Target Date	Done Date	Responsible Party
Develop collective vision for garden usage (see page ____)			
Define rationale for garden development (see page ____)			
Garner support from administration (will likely need plan)			
Prepare list of potential partners/funders (see page ____)			
• Grants			
• Private foundations			
• Corporate partners			
• Non-profit partners			
• Government partners			
• PTSA			
• Individual donations			
• School fundraising projects			

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A Planning Guide for Edible School Gardens

Objective	Target Date	Done Date	Responsible Party
Develop budget (include tools, materials, seeds & plants)			
Don't forget to include in-kind labor contributions!			
Identify (and price) tools and materials needed			
• tools			
(hoe, rake, shovel, multiple hand trowels, 3-pronged hand cultivators)			
• seeds/plants			
• pots			
• soaker hoses & watering can			
• edging/raised bed framework			
• garden cart/wheelbarrow			
• garden stakes/row markers			
• string & tape measure			
• compost			
• mulch			
• pH soil test kits (see soil test information in Managing an Organic Garden)			
• tool shed			
• greenhouse			
• rainproof bulletin board			
• benches for classroom activities			
Develop garden design. Will it include . . . ? (See Step 3 in OSU School Garden Guide.)			
• individual class beds?			
• theme gardens (see page ____)			
• raised beds			
• compost area			
• greenhouse			
• shady area for classroom activities			
• beanstalk fort (see directions in Appendix ____)			
• rainwater catchment (see Raingarden/Rain Barrels in Appendix)			
• green roof (see Green Roofs in Appendix)			
Determine edible plants for garden - suggestions include: (depends upon planting season desired)			
• asparagus			
• basil			
• bean			
• bell/sweet pepper			
• broccoli			
• cantaloupe			
• carrot			
• corn			

Objective	Target Date	Done Date	Responsible Party
• cucumber			
• eggplant			
• garlic			
• leek			
• lettuce			
• okra			
• onions			
• pea			
• peppers			
• pumpkin			
• radishes			
• spinach			
• squash			
• strawberries			
• sweet corn			
• tomato			
• turnip			
• watermelon			
Organize a student site analysis.			
• How many hours of sunlight does it have daily? (needs 6-8 hrs.)			
• Proximity to an adequate water source? Where is the spigot?			
• Do soil tests determine adequate nutrients and/or potential heavy metal content?			
• Do underground utilities exist in this area?			
• Does area have an adequate surface area (Is it flat or sloped?)			
• Is there adequate accessibility for gardeners to work?			
• Will there be shade for classroom activities? What time of day?			
• How is area used now? Is it near a play area or other high traffic zone?			
• Is there adequate drainage? (Are there standing puddles?)			
Determine how maintenance will be handled			
• Determine who will oversee this important area			
• Sign-up people who will participate			
• List particular tasks to be accomplished (clean-up, watering, weeding, harvesting, etc.)			
• Provide year-round schedule			
• Send reminders for work days			
• Provide appreciation for workers			

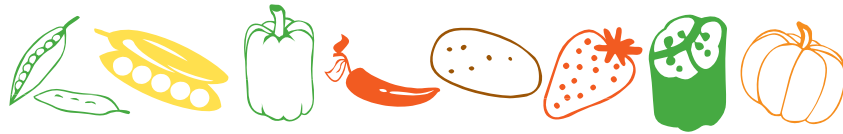
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Goal III: Implementation of Edible Garden Plan

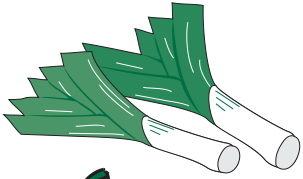
Objective	Target Date	Done Date	Responsible Party
Solicit and acquire funding (Assign point persons to list in Goal II)			
Purchase tools, materials and seeds/plants			
Analyze soil for:			
• Potential remediation for contamination			
• Erosion problems			
• Water puddles on surface			
• Lack of adequate nutrients			
Prepare site			
• Plan work day & assign volunteers to duties			
• Clean-up and remediation (remove items such as trash, weeds, shrubs, cement, brush, rocks, posts, etc.)			
• Determine amount of sunlight available for garden areas			
• Measure and layout garden areas			
• Work soil & apply organic soil amendment			
• Add to or reduce slope			
Sowing or transplanting			
• Know your average last-frost date (specific to your location)			
• Determine your soil's temperature			
• Test soil moisture			
• Know your crops			
• Add organic matter (see Managing an Organic Garden)			
Maintenance			
Determine who will handle summer vacation up keep and what will be considered weeds			
Focus on weed prevention (see Managing an Organic Garden)			
• Stop the seed ("One year's seeding makes seven years weeding")			
• Grow plants close together			
• Hoe them before they get established			
• Yank them young			
• Mulch			
• Plant densely			
• Use plastic sheeting, newspaper or weed-barrier cloth over planting areas with holes for plants to grow through			
Weed removal			
• Pull, don't yank, perennial weeds or use a shovel to dig out persistent ones (get as much of root & runners as possible)			
• Use hoe to scrape off top layer of annuals (don't dig deeper than 1 inch)			
Discourage Vandalism			
• Make a sign for the garden so people know it is a school project.			

Objective	Target Date	Done Date	Responsible Party
<ul style="list-style-type: none"> If using a fence, plant raspberries, roses or other thorny plants along a fence to act as a barrier to fence climbers 			
<ul style="list-style-type: none"> Include children in the garden development. They can often be the garden's best protectors 			
<ul style="list-style-type: none"> Ask neighboring residents to keep a protective eye on it. 			
<ul style="list-style-type: none"> Harvest all ripe fruit and vegetables on a daily basis. Produce falling off the vine invite trouble. 			
<ul style="list-style-type: none"> Plant potatoes, other root crops or less popular vegetables such as kohlrabi along the sidewalk or the fence. Plant purple varieties of cauliflower, beans or white eggplant to confuse a vandal. 			
<ul style="list-style-type: none"> At the entrance to the garden, plant a sharing garden w/sign: "If you must pick, please take it from here." 			
Goal IV: Follow-up			
Send thank yous to donors upon . . .			
<ul style="list-style-type: none"> Presentation of gift 			
<ul style="list-style-type: none"> Ground-breaking, ribbon-cutting or dedication ceremony 			
<ul style="list-style-type: none"> Anniversary of gift 			
<ul style="list-style-type: none"> Year's end 			
<ul style="list-style-type: none"> Campaign's end 			
Evaluate			
<ul style="list-style-type: none"> success of maintenance plan 			
<ul style="list-style-type: none"> success of crops (for selection of next year's plants) 			
<ul style="list-style-type: none"> appropriateness of site selection 			
<ul style="list-style-type: none"> size and reliability/potential continuance volunteer base 			
<ul style="list-style-type: none"> sufficiency/potential continuance of funding 			

A Planning Guide for Edible School Gardens



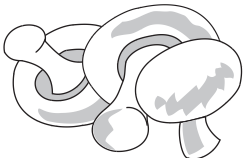
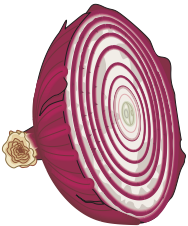
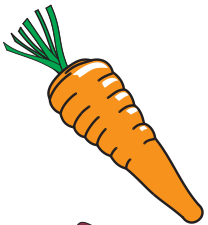
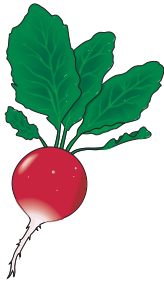
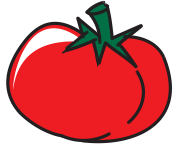
Working with Children in the Garden



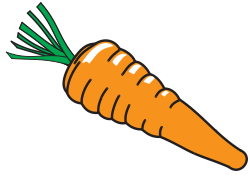
Working with Children in the Garden

by Denise Ellsworth, Stark/Summit County Extension Agent

Reprinted with permission from *Gardening with Children and Youth* from the Ohio Master Gardeners Resource Guide



- Leave behind adult ideas about gardening. Straight rows of tomatoes, peppers and corn may be your idea of the perfect garden, but may be far from what a child finds inviting. Why not a circular garden, full of flowers in every hue of the rainbow, or popcorn and peanuts for a “Cracker Jack” garden?
- Give children a separate space to garden, and let them plant and tend it in their own way.
- Start small, so the garden isn’t overwhelming.
- Involve children in the planning, then follow the child. If she’d rather play in the dirt or look at bugs than pull weeds, it’s OK! She’s still learning.
- Help children to succeed by sharing your garden know-how. Test the soil, choose a well-drained, sunny site, add lots of soil amendments, and mulch to keep down weeds.
- Keep an emphasis on fun and creativity with kid-created art, water elements, journaling, cooking, crafts and more!
- When gardening with children, look for the “teachable moment.” You were planning to teach about plant parts, but the kids found a praying mantis? Don’t fight their enthusiasm for the moment. Instead, explore and learn together about the wonders you find.
- Keep chore sessions short. Make a game of weeding, or limit it to 5 minutes. Gardening should be fun!
- Plan a play area for younger children. A preschooler may want to plant and re-plant, dig and explore. Give him a space to do this, full of containers with pebbles, bark, seeds, small tools, and other garden-related items to explore.
- Use kid-sized tools for planting and digging. Even spoons will work well when held in small hands.
- Keep safety in mind: consider soil contaminants and poisonous plants before a problem arises.



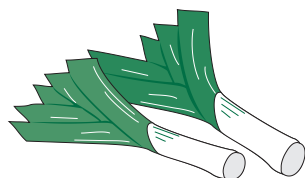
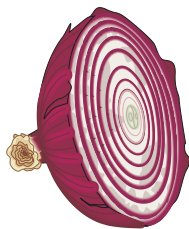
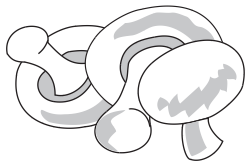
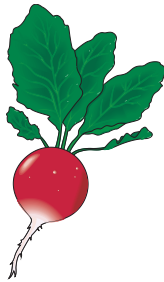
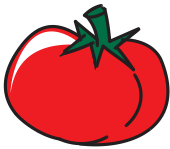
Lilliputs and Pollywogs: Children in the Garden

by Catherine Eberbach, Longwood Graduate Program Fellow

Reprinted with permission from *Gardening with Children and Youth* from the Ohio Master Gardeners Resource Guide



Catherine Eberbach researched the way children interact with ornamental gardens. The Children's Garden at the Longwood Gardens indoor conservatory is based on her research. Following is a list of design recommendations she developed:



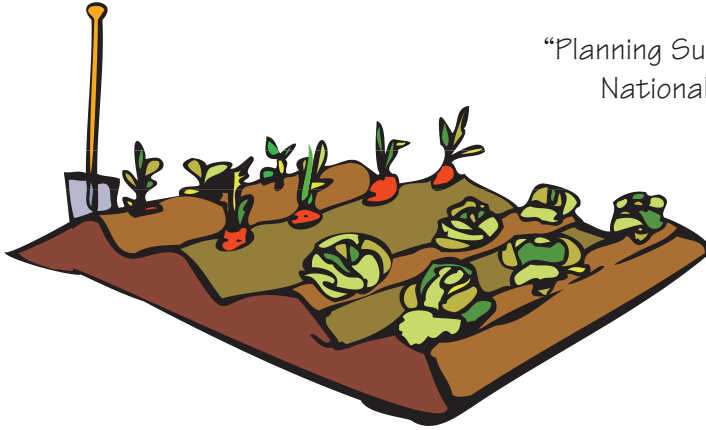
- **Developmental Level:** children at different levels of development will experience environments differently. This should be considered in any design.
- **Scale:** children prefer small, cozy spaces where they can hide. Orient items of interest close to the ground, where their visual attention is normally focused.
- **Child Possession:** Children should feel free to touch and play with the elements in a garden. Minimize rules and regulations, and provide opportunities for kids to engage in activities unavailable to adults.
- **Aesthetics:** Children prefer gardens that are pretty. Incorporate garden features that are attractive to children.
- **Color:** Kids like lots of color, and especially bright colors. Red, orange, and yellow are among their favorites.
- **Landscape Elements:** elements such as animals and water appeal to children. All elements, including plants, should encourage activity and participation.
- **Privacy:** kids like garden spaces where they can do what they want apart from adults.
- **Accessibility:** the garden should maintain the least restrictive environment as possible. However, issues such as potential for vandalism by unsupervised children must be addressed.
- **Place for Adults:** Since adults are likely to accompany children to the garden, incorporate items of interest for adults. This may be as simple as providing a seating area where they can supervise children.

A Planning Guide for Edible School Gardens



Edible School Garden Tips

Edible School Garden Tips



“Planning Sustainable School Gardens” by Rory Klick

National Gardening Association www.kidsgardening.com

- Gardens must be practical places and tend to be most successful when designed for clear, functional goals--not aesthetics. The greatest priority of a school garden is education.
- School gardens are not just place for plant science and ecology; they are places for art, music, math, creative writing, learning to share, teamwork and the interconnected web of life.
- The kids have to own it! No school garden should be developed without active participation from as many students as possible. If kids don't own it, they will lack a sense of stewardship.
- Consider life lessons of the school garden at the same level of basic educational necessity as reading and computer literacy.
- Conducting visioning exercises with those involved in the garden project can help the group set the goals and mission. Find out how teachers will use it, how students will actively participate and how the community will be welcomed. Visioning sessions can be held in individual classrooms or in an open forum such as an after-school meeting.
- When creating a design plan, try developing a base map with different garden zones and use tracing paper layovers for details.
- Try visioning in 3-D, with students developing models of their garden vision in small groups. Assemble small containers of soil, fine gravel and mulch. Ask students to gather small twigs, leaves and various plant parts to use as vegetation models. Use popsicle sticks, straws, cardboard, construction paper and clay for additional features.
- Be practical about pathway materials. An inexpensive path of wood chips will likely work as well as expensive stone. Spread layers of newspaper or breathable landscape on the path before applying mulch to prevent weeds.
- Do not skimp on soil preparation! Most garden soils need some amendment with organic material to increase fertility and balance drainage and moisture retention. A good general rule is to add a 3-to-4 inch layer of good compost or humus over the beds and dig and till it into the top 8 to 10 inches of soil. Let children haul compost in a “bucket brigade” to get more of them involved.
- Be sure to keep records so if something doesn't work, you'll know to try a different option next season.

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PennState Agricultural Information Services

<http://aginfo.psu.edu>

- Your soil should be tested annually for nutrient content and pH. Soil samples can be collected by pushing a soil sampler to the proper depth into soil shown on the soil sampler. However, a hand trowel may be used if a soil sampler is unavailable. Most plants grow best in soils with a pH between 6.0 and 7.0.
- The best materials for raised bed gardens are stone, cinder blocks, bricks or untreated wood. Do NOT use treated railroad ties or treated wood. (Editor's note: Recycled plastic lumber or broken pieces of concrete work well, too.)
- Do not nail corners of wooden raised beds, as ends of boards may split. Secure them with wooden reinforcing blocks or metal braces and screws.
- Encourage lady bugs in your garden when possible, as they eat aphids, scale insects and other pests.

The Edible Schoolyard: www.edibleschoolyard.org

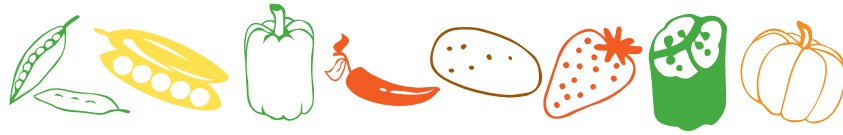
Martin Luther King, Jr. Middle School, Berkeley, California

- Build somewhere to meet. The Edible Schoolyard created a simple shade structure with hay bale seats in which to begin and end each class.
- Leave room to plant flowers - they add beauty to the garden, encourage beneficial insects and come in handy for special occasions, and some are edible!
- Trust your students to build and design the garden walls, beds and fences.
- The Edible Schoolyard has a "whole" school garden - instead of dividing the work into various beds for each class, they all collaborate on the garden's success as a whole.



- They have not put up a fence to "protect" the garden - signs serve as gentle reminders to the public that the students grow and eat the food there.
- Engage students in practical gardening or observational experiences, not paper and pencil activities.
- Plant the garden to encourage foraging - raspberries, carrots, peas - and make tasting (or smelling) part of each lesson.
- Make time for reflection - continue to learn from your mistakes and improve your work.

A Planning Guide for Edible School Gardens



Managing An Organic Garden

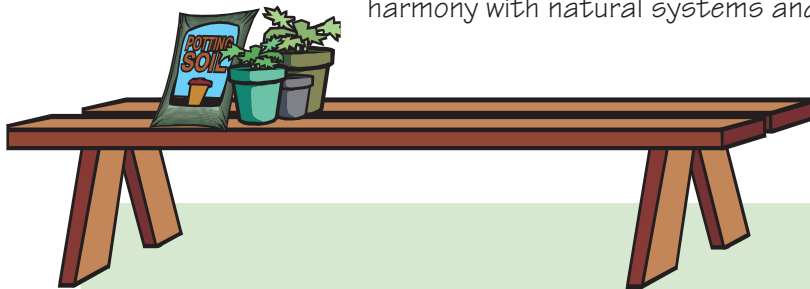
Managing An Organic Garden

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Many gardeners wonder what exactly organic gardening means. The simple answer is that organic gardeners don't use synthetic fertilizers or pesticides on their plants. But gardening organically is much more than what you don't do. When you garden organically, you think of your plants as part of a whole system within Nature that starts in the soil and includes the water supply, people, wildlife and even insects. An organic gardener strives to work in harmony with natural systems and to

minimize and continually replenish any resources the garden consumes. Organic gardening, then, begins with attention to the soil. You regularly add organic matter to the soil, using locally available resources wherever possible. And everyone has access to the raw ingredients of organic matter, because your lawn, garden and kitchen produce them everyday. Decaying plant wastes, such as grass clippings, fall leaves and vegetable scraps from your kitchen, are the building blocks of compost, the ideal organic matter for your garden soil. If you add compost to your soil, you're already well on your way to raising a beautiful, healthy garden organically.

The other key to growing organically is to choose plants suited to the site. Plants adapted to your climate and conditions are better able to grow without a lot of attention or input; on the other hand, when you try to grow a plant that is not right for your site, you will probably have to boost its natural defenses to keep it healthy and productive.



Create Healthy Soil for Healthy Plants

You could say building soil is the defining act of organic gardening. By regularly replenishing the nutrients your plants use, you keep the soil productive. By mixing organic matter (preferably compost) into the soil whenever possible, you mimic Nature's cycles of birth, decay, and rebirth. Ideal garden soil is dark-colored, smells kind of sweet, compresses into a loose lump in your hand when moist, and is full of earthworms.

Certain soils may need even more of a boost than a regular, liberal dose of compost can provide, but before you add anything else to your soil we urge you to get a soil test—you'll find a lab in your area where you can get a low cost test on our state-by-state (and province by province) listing of soil test laboratories. The results of your test will tell you the soil's pH and what nutrients are out of balance. With that information, you can choose amendments to bolster the soil. You can choose from many organic soil amendments, like bonemeal, greensand or rock phosphates, all derived from natural sources and each suited to particular need.

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Soil Tests - How to get an accurate soil test

One of the best deals a gardener can get is a soil test, which is available to most North Americans through local cooperative extension offices or similar agencies. Check the useful links at the bottom of this page for a list of soil testing labs in your state. In most areas, you can get a fairly comprehensive and informative test done for \$5 to \$10—less than you'd spend for a bag of fertilizer. And the soil test may tell you that you don't even need that fertilizer.

Get your soil tested as close to home as possible so that the recommendations you'll receive make sense for your climate and soil. Wherever you send your soil for testing, ask the lab to tailor any recommendations

for a garden. Lab recommendations for remedying soil deficiencies are typically designed to serve farmers and thus are given in terms of pounds of the proposed remedy per acre of land unless you request otherwise. (If you have to do that math yourself, just divide "pounds per acre" by 43 to convert the recommendation "pounds per 1,000 square foot.") Also note on the paperwork accompanying your soil sample that you would like any remedies proposed to be in the form of organic soil amendments, as opposed to agricultural chemicals. (Find out what labs test for on the www.organicgardening.com website.)

6 steps to a successful soil sample

1. Get a trowel and a bucket. Be sure neither is rusty or made of galvanized (zinc-coated) metal, which could skew your results.
2. Scrape mulch and leaf litter from the soil surface. Dig out a wedge of soil about 6 to 8 inches deep, and set this wedge aside.
3. Now dig out a half-inch piece of soil from the hole and pour it into your bucket.
4. Repeat steps 2 and 3 at least a half-dozen times in different parts of the garden so that the soil sample represents your whole garden when mixed.
5. Use your trowel to mix the soil together thoroughly.
6. Fill the soil sample bag or container with the mixed soil, complete the paperwork and mail it all off to the lab.

Healthy soil is important for healthy plants, so find out what your soil needs. Feed the soil and the plants will have everything they need. But what should you feed the soil in your garden? There's only one way to know: get a soil test. Here is a list of soil test labs in most

states and Canadian provinces. The technicians at the lab will tell you exactly what to do to set up the test and read the results, often in collaboration with the cooperative extension agent in your area. In Oklahoma, contact:

Oklahoma State University
Soil, Water & Forage Lab
048 Agricultural Hall
Stillwater, OK 74078
(405) 744-6630

<http://clay.agr.okstate.edu/extension/swfal/intro.htm>

This lab will refer you to your local extension office for soil testing information and a collection bag. The extension office will submit your sample to the lab. (Note: there is a soil collection kit available at some garden centers which can be sent to the lab with \$12 for a basic test.)

Fertilizing Your Garden

Organic gardeners work to build nutrient-rich soil by continually adding organic matter (particularly compost) to the soil rather than feeding plants directly. Mixing well-rotted farm animal manures (especially cow, horse and chicken manure) into the soil provides an abundant supply of nitrogen to your plants. Nitrogen is the key nutrient plants use for growing leaves. If you can add an inch or so of compost to

your garden each year, you probably don't need any additional fertilizers.

You'll see a lot of different

packaged organic fertilizers in garden centers and mail-order catalogs. Many derive their nitrogen boost from fish or feather meal in both cases, the ingredients typically are food processing waste. The best of these fertilizers are "slow-release" foods that nourish plants incrementally as they decompose in the soil. Though fertilizer made from municipal sludge (sometimes called "biosolids") is often sold as "organic," we discourage gardeners from using it because research has found that this sludge contains heavy metals that can build up in your soil.

To give your plants a more immediate boost or for feeding those growing in soil that is more difficult to amend (like plants in containers), you can use liquid fertilizers that are commonly made from fish processing waste combined with mineral-rich seaweed (often kelp). You'll find these liquid fertilizers as concentrates that you mix with water and apply directly to plants' leaves.



Control Insects without Pesticides - Simple organic solutions for pest problems

We certainly understand that many gardeners become anxious when they see pests on their plants and want to react decisively when they see their plants damaged. But we must remind you of the central principle of organic gardening: growing plants in harmony with Nature. And insects, even those that eat your plants, are a crucial part of that system. When you see insects in your garden, take some time to really watch what they're doing. Are they actually destroying the plant or just nibbling it a bit? Many plants can outgrow minor damage. Also, in many cases, insects attack stressed out plants. Do you have enough healthy plants to spare the sickly ones? Can you restore

sickly plants to robust health so they can resist insect attack? The best defenses against insect attack are preventative measures. Grow plants suited to the site and they'll be less stressed out. Don't let them be too wet, too dry or too shaded. Design a diverse garden, so that pests of a particular plant won't decimate an entire section of the garden.

Most importantly, encourage the natural predators of pest insects to hunt in your garden—beneficial insects (such as the common ladybug), birds, frogs and lizards control pests by eating them. You can make your garden hospitable for your natural allies by

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keeping a water source (just a dish-full, if that's all you've got) nearby for them and by not wiping out the entire pest population with a pesticide, sending the beneficials elsewhere in search of food. Also, grow plants with small blossoms like sweet alyssum and dill, which attract predatory insects who feed on flowers' nectar between attacks on pests.

Barriers such as row covers, netting and plant collars very effectively protect crops from pests. Sticky traps and pheromone lures are another way to minimize your pest problems without harming other living things in your garden. You'll find row covers (the best-known brand is Reemay) and other barriers, along with traps and the like at

your local garden center and in mail-order catalogs.

Finally, if you need to react quickly to an acute pest invasion you can choose from several natural products that affect specific insects, won't harm humans, pets or wildlife, and that degrade quickly in the environment. Among the best of those products is *Bacillus thuringiensis*, a naturally occurring bacteria that you apply to your plants to disrupt the digestion of caterpillars and other leaf-eaters. Be sure to identify the pest positively before you buy this product because each strain of Bt affects specific kinds of insects. Horticultural oils, insecticidal soaps and garlic and/or hot pepper sprays also work well against many pests.

(See ideas for dealing specific pests here:)

Preventing Plant Disease - Stop plant diseases before they start



The best way to avoid plant diseases is to choose varieties that resist them—look on the tags at the garden center or in catalog descriptions for disease resistant plants. Then be sure to put those plants in the conditions they thrive in, because stressed-out plants are more susceptible to disease. Many fungal diseases are encouraged by constant moisture and poor air circulation around plants. To remedy that, plan your garden with enough room to accommodate full-grown plants, because water evaporates more slowly and air doesn't circulate well among crowded plants. And water your garden beds deeply and then allow the top level of soil to dry out before watering again. If diseases do appear, remove afflicted leaves (or entire plants) from your garden as soon as possible to prevent the disease from spreading to healthy plants.

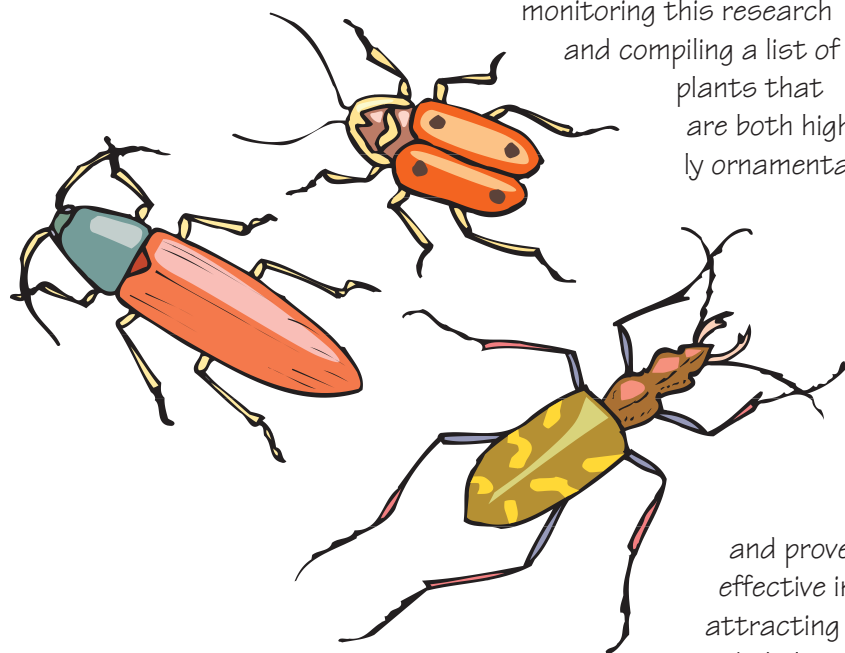
Beneficial Insects - Attack pests head on with their natural insect enemies



One of the best ways to control pests in your garden is to encourage their natural enemies. Planting pollen and nectar plants, and providing protection for these beneficial insects, is a basic tenet of organic gardening, and a way to further increase the ecological diversity of your yard. The most common beneficial insects: ladybugs, lacewings, hover flies, predatory bugs, ground beetles, hunting and parasitic wasps, spiders and tachnid flies. (See website: www.organicgardening.com for descriptions and tips on attracting them to your yard.)

Beneficial Borders - Control pests by planting flowers that lure beneficial insects

Ground-breaking research over the last decade is revealing how we can attract beneficial insects—the ladybugs, lacewings, ground beetles and other insects that feed on pests. We've been monitoring this research and compiling a list of plants that are both highly ornamental



and proven effective in attracting and sheltering beneficials.

Here's our exclusive special report on these beautiful and valuable plants.

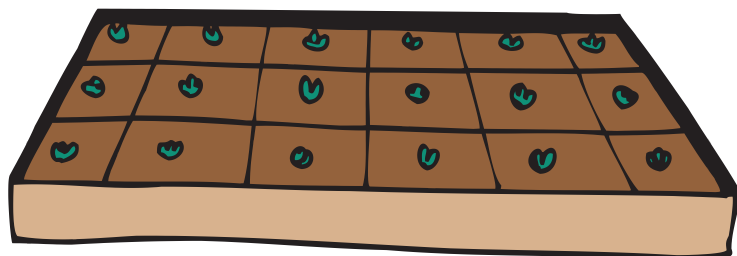
To get energy to search for their prey, or to reproduce, many beneficial

insects feed on nectar (for carbohydrates) and pollen (for protein) from flowering plants. Researchers are discovering that some flowers are much better sources of nectar and pollen to sustain beneficial insects than others. Studies are also revealing the best plants to grow for shelter to help good bugs thrive. And as an added bonus, many of the nectar sipping/pest-eating insects that are attracted to flower pollen will also pollinate your fruit and vegetable crops and increase your yields.

The 10 best plants for beneficial borders: Bachelor's Buttons or Cornflower (*Centaurea cyanus*), Sweet Alyssum (*Lobularia maritime*), Borage (*Borago officinalis*, Cup plant (*Silphium perfoliatum*), Anise Hyssop (*Agastache foeniculum* or *A. rugosa*, aka Korean mint), Golden marguerite (*Anthemis tinctoria*), Fennel (*Foeniculum vulgare*, Pussy willows (*Salix* species), Mountain mints (*Pycnanthemum virginianum* and *P. muticum*), Ornamental grasses, and Corn. All are very easy to grow and ideal choices even for new gardeners.

Create a flowering landscape with herbs

Who says herbs have to be just plain green? Many herbs can hold their own in any flower garden with bright blooms and beautiful foliage. As an added bonus, you can harvest your handsome herbs for cooking or crafts, so they're practical as well as pretty. Many of these attract beneficial insects, too.

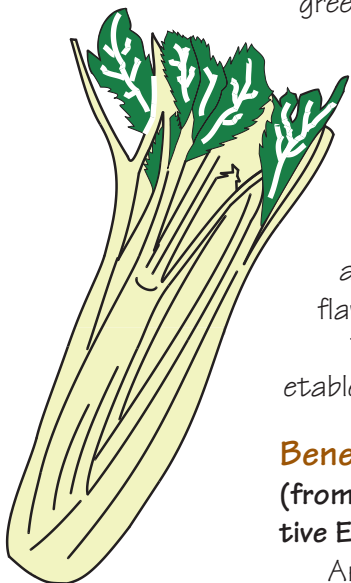


A flowering herbal border is a great compromise for gardeners with limited space because it does double-duty as an herb garden and a perennial border. The herbs described below are some of the most beautiful and easy plants you can grow for flowers and foliage. The colors are mostly in the pink, lavender and blue range, with silver, bronze or green leaves. White and yellow blooms add splashes of color off and on through the growing season. (See list of suggested plants at: www.organicgardening.com.) *continued on next page...*

How to Grow Great Greens: The trick to continuous salad green production is succession planting—sowing a new crop every two or three weeks. For cut and come again harvests, sow the greens in rows spaced several inches apart and harvest the greens at your favorite size. If you prefer more mature, individual plants, sow in clusters and thin out all but the healthiest seedlings. Keep planting right into the fall, as the cooler weather heightens the flavor of most greens.

The enthusiasm for “baby” vegetables tempts many growers to har-

vest their greens before they reach their flavor potential, says Frank Morton. Flavors develop in salad greens as they grow, so Morton allows his plants to grow to maturity. “This way, we can harvest the tender ribs from the center of each plant,” he says. For cut and come again harvests, continually sample the greens and then harvest them at the stage you find most tasty. “Most leaves are harvested to fit on a spoon,” says Debbie Leung, a market grower in Olympia, Washington. “I like mine to fit on the palm of my hand.” (See “Edibles” section of www.organicgardening.com website for tips on more edible garden plants.)



Benefits of Adding Organic Matter

(from document CIR375, Horticultural Sciences Department, Florida Cooperative Extension Service)

Anyone with a window box, patio urn, or strip of soil by the back door can grow an appealing salad mix. In fact, salad greens are among the most satisfying vegetables to grow, since they usually pop out of the ground less than a week after the seeds are sown and are ready to harvest in four to six weeks. We talked with four experienced growers to find out their tricks to growing gourmet-quality greens:

- Improves tilth, condition, and structure of soil.
- Improves ability of soil to hold water.
- Improves ability of soil to hold nutrients.
- Improves “buffering” capacity of soil; that is, keeps soil from “over-reacting”.
- Supports the soil’s microbiological activity (or the life of the soil).
- Contributes nutrients, both minor and major.
- Releases nutrients slowly.
- Acids arising from the decomposition of the organic matter help to convert insoluble natural additives such as ground rock into plant-usable forms.
- Helps vegetables survive stress, as from nematodes.
- Helps dispose of organic waste products.

Mulching Ruth Stout Style

(Excerpted from *How to Grow Vegetables and Fruits by the Organic Method* Edited by J.I. Rodale and Staff. Copyright 1961, by J.I. Rodale. Renewed 1999, Rodale Inc.)

Ruth Stout was all about mulch. Layers, piles, heaps, mounds, and more. She captured Organic Gardening readers’ attention with her passion for no-work

gardening. In this vintage entry from *How to Grow Vegetables and Fruits by the Organic Method*, Stout addressed readers’ FAQs about her approach to gardening. People are always asking Ruth Stout a great many questions about the year-round mulch method: what kind of mulch to use; how much; when to apply it. Here are some of her answers.

Kind: Hay, leaves, straw, seaweed, pine needles, sawdust, weeds, garbage—any vegetable matter which rots. Some people write me and complain the bales of “hay” they bought were all coarse stalks, weeds, etc. That is all good mulch.

All kinds of leaves? Yes.

Aren't oak leaves too sour? People say so. Put on a little more lime if your soil is acid.

Don't some leaves decay too slowly? Then they remain mulch just that much longer.

Don't leaves mat down? Somewhat but that makes no difference, since they are between the rows of growing things, not on top of them.

Can you use leaves without hay? Yes, but I prefer a combination of the two, if you can get it.

How much mulch do you need? The answer to that is: more than you would think. You should start with a good 8 inches of it.

How can tiny plants survive between 8-inch walls? And the answer to that is: the mulch is trampled on, rained on, and packed down by the time you are ready to plant; it doesn't stay 8 inches high.

How often do you put it on? Whenever you see a spot that needs it. If weeds begin to peep through, don't bother to pull them; just toss an armful of hay on them.

What time of year do you start to mulch? NOW, whatever the date may be.

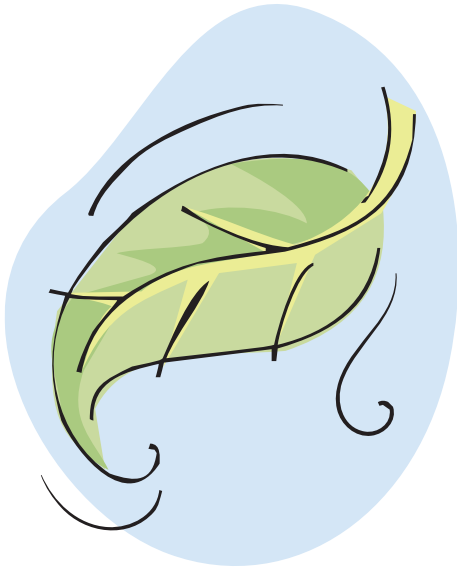
Would it be better to wait until the crop is up? No, for by that time the sun will have had a chance to bake the soil, and the weeds will be making progress.

Where do you get your mulch? That is difficult to answer but I can say this: if enough people in any community demand it, I believe that someone will be eager to supply it.

Use all your leaves. Clip your cornstalks into foot-length pieces and use them.

Utilize your garbage, tops of perennials, everything. In many localities the utility companies chop up branches which they cut when they clear their wires; you can probably get these for nothing if you can haul them away.

Now for the drawbacks. People have complained to me that mulching does not kill everything. I just got a letter from someone saying that it won't kill cockleburrs, morning glories, Johnson grass, nut grass. She left out witch grass. I know it won't kill that and neither will it pick your peas or plant your seeds. I am just saying (in a friendly, sarcastic way) that just because it does 100 things for you, should it be expected to do 101?



Build a Compost Pile - Here's what you need:

1. Carbon-rich “brown” materials, like fall leaves, straw, dead flowers from your garden and shredded newspaper.
2. Nitrogen-rich “green” materials, like grass clippings, plant-based kitchen waste (vegetable peelings and fruit rinds, but no meat scraps), or barnyard animal manure (even though its color is usually brown, manure is full of nitrogen like the other “green” stuff).
3. A shovelful or two of garden soil.
4. A site that's at least 3 feet long by 3 feet wide.

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Here's what to do:

Start by spreading a layer that is several inches thick of coarse, dry brown stuff, like straw or cornstalks or leaves, where you want to build your pile.

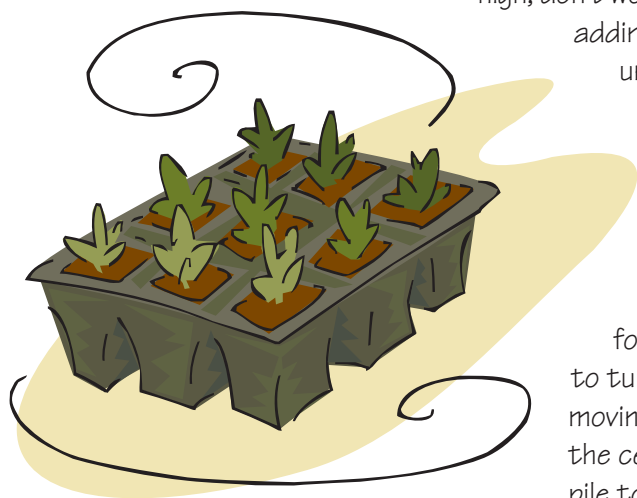
- Top that with several inches of green stuff.
- Add a thin layer of soil.
- Add a layer of brown stuff.
- Moisten the three layers.

Continue layering green stuff and brown stuff with a little soil mixed in until the pile is 3 feet high. Try to add stuff in a ratio of three parts brown to one part green. (If it takes awhile before you have enough material to build the pile that

high, don't worry. Just keep adding to the pile until it gets to at least 3 feet high.)

Every couple weeks, use a garden fork or shovel to turn the pile, moving the stuff at the center of the pile to the outside and working the

stuff on the outside to the center of the pile. Keep the pile moist, but not soggy.



When you first turn the pile, you may see steam rising from it. This is a sign that the pile is heating up as a result of the materials in it decomposing. If you turn the pile every couple weeks and keep it moist, you will begin to see earthworms throughout the pile and the center of the pile will turn into black, crumbly, sweet-smelling soil. When you have enough finished compost in the pile to use in your garden, shovel out the finished compost and start your next pile with any material that hadn't fully decomposed in the previous one.

You don't need a compost bin to make compost. You simply need a pile that is at least 3 by 3 by 3 feet. A pile this size will have enough mass to decompose without a bin. Many gardeners buy or build compost bins, however, because they keep the pile neat. Some are designed to make turning the compost easier or protect it from soaking rains.

Weeds - An Organic Strategy

Putting the pinch on pesky plants is partly a matter of perspective. Learning to live with a few weeds is a gardener's mark of maturity, not unlike that moment when you suddenly stop fretting about the fact that you're too tall or too short and simply decide to get on with life. Weeds compete with your desired, cultivated plants for water, nutrients, sunlight, and growing space. Left alone, they will overrun your garden. If you doubt this, observe an empty lot or untended garden for just one growing season and watch the weeds take over.

And yet the organic gardener is well served by cultivating a healthy tolerance for some weeds. Complete eradication is unnecessary unless something as insidiously invasive as Canada thistle (*Cirsium arvense*) or multiflora rose (*Rosa multiflora*) crops up in your backyard. By tolerating a few weeds, you will make your entire gardening experience more relaxed and enjoyable. And your garden will still be beautiful. There are as many shades of green in this world as there are of gray.

In the Eye of the Beholder

The concept of “weeds” is a human invention, a way to describe those plants that grow where we don’t want them. The mint grown by the last gardener who lived in my house is my idea of a weed. Yours may be volunteer tomato plants from last year’s crop that show up in your flower-



bed. One strategy for becoming more weed-tolerant is to rework your definition of a weed. A common gauge for weed tolerance is the relative difficulty of getting rid of the plant; perennials with spreading roots, such as quackgrass (*Agropyron repens*), or deep taproots, such as common pokeweed (*Phytolacca americana*), are the most persistent, so you will want to keep after them.

Many plants maligned as weeds, such as milkweeds (*Asclepias* spp.) and prostrate knotweed (*Polygonum aviculare*), are highly attractive to beneficial

insects that will help pollinate your plants and eat aphids, thrips, and mites. Others are actually delicious edibles. These include dandelion (*Taraxacum officinale*), common purslane (*Portulaca oleracea*), miner’s lettuce (*Montia perfoliata*), and common lamb’s-quarters (*Chenopodium album*). (Just be sure you have positively identified an edible weed before adding it to your salad mix.) Some serious invaders such as pampas grass (*Cortaderia selloana*) and Himalayan blackberry (*Rubus procerus*) were prized as ornamentals before they bolted beyond the backyard.

Because their seeds are typically amazingly mobile, weeds can take over quickly. They’re spread by birds, the wind, running water, and car tires. Trading plants with friends and neighbors often means trading weed seeds, too. In fact, anytime plants are brought into a new environment, they have the potential of bringing weeds with them.

An Ounce of Prevention

Even if you do embrace a more casual attitude toward weeds, you’ll want to control their growth by focusing on prevention as well as eradication. Weeds are opportunistic plants, popping up wherever conditions allow. With that in mind, think about all the things that you do to stimulate plant growth. Now, to suppress weeds, do the opposite.

Yank them young

Your first defense against weeds is to pull or hoe them before they get established. Learn to identify weeds as young seedlings and nab them as they emerge.

Stop the seed

If you don’t get them as babies, at least don’t let them go to seed. As the old gardening saw goes, “One year’s seeding makes seven years’ weeding.”

Mulch

Organic mulches include compost, shredded leaves, wood chips, bark, dried grass clippings, and other biodegradable material. A 2- to 3-inch layer will keep sunlight from reaching the weed seeds, preventing their germination. Apply mulch immediately after weeding or digging your soil. Take care to keep mulch an inch or two away from plant stems to prevent rot caused by moisture retained in the mulch. Your mulch material will also conserve water, keep roots cool, and nourish the soil as it decomposes.

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Plant densely

Grow plants close together, and they will consume the available space, nutrients, and sunlight, thereby bullying the weeds out of the way.

Pull

Remember not to yank perennial weeds. You'll break off the root, and another weed will appear. Use a long screwdriver or weed-pulling tool with a forked end. Hand-pulling becomes easier as your soil improves.

Pick your day

Weeding can be an absolute joy after a deep, soaking rain, but don't do it when the soil is soggy. You'll create clumps. And be careful where you walk and kneel: You don't want to compress your soil. Stay on paths and lean into your planting beds instead.

Dig

You may need to use a shovel to dig out persistent perennial weeds. Get as much of the root and runners as you can. It may take several diggings to eliminate something particularly tenacious, such as Canada thistle.

Hoe

Use a diamond-shaped or hula hoe to scrape off the top layer of annual weeds. To avoid harming the roots of your cultivated plants, don't dig deeper than 1 inch. Deep hoeing also exposes buried weed seed to sunlight, allowing it to sprout.

Cover

like covers. You lay the material over your planting areas and cut holes for your plants to grow through. This blocks out light and smothers young weeds. Other folks (like me) feel that non-organic mulches are somewhat out of place in the garden. Trying to achieve a weed-free yard is a demanding, unrealistic goal. By simply accepting a few weeds as part of the mix, you will encourage diversity, welcome tasty additions to the salad bowl, and find yourself with more time for valuable gardening experiences, such as afternoon naps in the hammock, something any civilized person can relate to.

A Planning Guide for Edible School Gardens



Additional Resources

(Please ignore page numbers throughout rest of document, because these were printed directly from existing documents with permission from the authors.)

