THE GARDEN AS YOUR CLASSROOM

Adapted from *Good Neighbor Gardens* and the *Full Option Science System* (FOSS) garden designs

Backyard Abundance

www.BackyardAbundance.org

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K-12 SCHOOL GARDEN

Designing Around Curriculum

Gardens are becoming more common on school campuses, but often struggle to be sustainable and valuable learning environments for students and teachers. The common cause of failure is lack of thoughtful design. For school gardens to succeed, much thought must be given to how classroom activities and students' seasonal schedules impact garden use and maintenance.

Schools often operate on limited budgets and rely on good-hearted teacher, student and parent volunteers for their vitality. Designing the garden so that it is just as valuable as a library or computer lab to support instruction means more energy can be harnessed to make it successful.

The purpose of this document is share ecological garden designs that address specific curriculum and educational goals. Readers are encouraged to replicate and customize these designs to meet educational needs. Educators are also encouraged to contact Backyard Abundance with questions or need help customizing designs in this document to their school's needs.

Figure 1. School of the Wild Garden
Overseen by University of Iowa Recreational Services, the School of the Wild program awakens an awareness of wildlife and natural ecosystems, develops an appreciation of the natural world, and encourages a balanced environmental ethic and caretaker attitude with respect for the earth. Learn more at recserv.uiowa.edu/sow
Photo by Fred Meyer

DESIGN PROCESS

Learning gardens must be designed around the educational outcomes and social design necessary to keep the garden engaging and well maintained. The following is an overview of the process used to design gardens on the following pages.

Recommended design steps:
1. Identify the Social Design and Curriculum Needs
2. Identify the Site
3. Draft a Concept Design
4. Host a Community/PTA Review
5. Design the Master Plan

Identify Social Design and Curriculum Needs

The social design is especially key for school gardens. Many people at school may want to use the garden, but for success, usage patterns must be placed in the context of core teaching standards, seasonal schedules, and everyone's limited, highly-structured time.

Documenting answers to these questions will give you a good start on the design:
- What is the primary intended use of the garden; e.g., to provide community produce or be a living classroom for teachers?
- What standardized curriculum used by teachers is most amendable to the garden? For example, some of the garden designs in this section are based around the Full Option Science System (FOSS) curriculum used heavily in Iowa. This curriculum already has "take it outside" activities integrated into the instructions.
- Who will maintain the garden, including summer months?
- How will children gather and sit near beds to hear instructions or be read a story?
- How will children with disabilities interact with the garden?
- What major events could harvested produce be timed to support? For example, a back-to-school night or fall celebratory festival?
- What are the school's policies on students eating out of the garden and using harvested produce in the cafeteria?
- What crops strongly support curriculum? For example are pollinators and prairie plants studied more than food plants?

Top Social Design Mistakes

Learn from these common social design mistakes at a school garden so you do not make them:
- The garden is "hidden" behind a building or sited far away from the school building. Or the garden is placed near a busy street or another area that is "off limits" for unsupervised students during the school day.
- Water is only accessible by carrying buckets or using long hoses.
- Gardens are not designed with standard maintenance procedures of grounds crew in mind. For example, a garden may be established with a chicken wire fence installed around it, but the standard weed control procedure of the grounds crew is to "chemically trim" fences which introduces a hazard to crops and participants.
- Large amounts of summer-bearing crops (e.g., tomatoes, peppers, beans, zucchini) are grown when a school summer program does not exist and nearby neighbors are not interested in the harvest.
- The garden is designed by good hearted-parent volunteers without in-depth conversations with teachers about how they want to teach parts of their standardized curriculum in the garden.

Identify the Site

It is important to meet early with facilities personnel to identify acceptable sites and possible future construction that could impact the garden. Considerations:
- A small, highly-visible garden near the school is better than a large, distant garden. Ideally, this learning space is right outside a door of the school.
- Place the garden in full sun to accommodate fast-yielding vegetables and herbs.
- Water access via an outdoor spigot is a necessity; long hoses increase maintenance chores.

Draft a Concept Design

Arrange and scale components in the garden based upon the site and the needs of teachers. Use the social design and site location to roughly sketch a design that identifies areas of the garden. Label these areas and document their uses; e.g., seating area, raised beds, entrance arbor, pollinator patch. Use designs included in this document and cut and paste relevant components together.

Do not get too detailed yet; only enough information is needed to convey intentions and rationale to engaged teachers and parents for their feedback. Continue refining the concept until you think it is ready for a broader audience.

Host a Community/PTA Review

Bring the concept design to a Parent Teacher Association (PTA/PTO) meeting for feedback and support. During the meeting outline the primary goals of the garden, its benefits to the school, major features, expected usage patterns and high-level costs.

Explore funding possibilities. While specific costs will not be known at this phase, estimates in this document can be referenced. Many community garden grants are available to help school gardens get started.

Design the Master Plan

After feedback and approval to move forward are granted, refine the concept design into a detailed plan. Identify path widths, fencing, edging and a planting plan for every growing season.

Hiring a local landscape designer or company to create the master plan can ensure professional expertise is considered, all measurements are precise, and plant and material estimates are accurate. Professional drawings can also bring credibility and realism to the project which may help acquire funding.

Before establishment, review the plan with all stakeholders, including grounds crew, PTA/PTO, involved teachers and volunteers.

SCHOOL OF THE WILD FOSS GARDEN

The School of the Wild Garden is located at the Macbride Nature Recreation Area. This large garden was designed around two primary needs:

1. Demonstrate a garden design that can support the K-6 Full Option Science System curriculum (FOSS). FOSS is the standardized science curriculum used by public school teachers in eastern Iowa region.
2. Support display and propagation of unique prairie species within the area.

Using the Curriculum

The chart on the opposite page lists prominent “take it outside” components of the curriculum that are suited to using the garden. For each curriculum, the investigation and page number are noted for quick reference. The most appropriate garden areas to conduct the activity are listed in reference to the School of the Wild garden.

For example, if a class is doing a seed hunt they are directed to the perennial prairie plants; if they want to transplant their sprawling potato cuttings, they use the raised annual beds. If students want to find sow bugs in nature, they are directed to the bed with decaying tree cookies to overturn.

By extending the learning outside of the plastic cup or Petri dish, students can have extended learning of how natural environments enhance the growth of their sprouting garlic bulbs or increase their understanding of earthworm habitat. This also gives a “home” for some of those plants taking up counter space in teachers’ indoor classrooms.

Garden Areas

1. Learning area and shady weather station: Comfortable shady seating where teachers give instructions. Weather station provides information about conditions in the shade.
2. Grazing gardens: Two small beds provide easy-to-grab, climbing vegetables; cherry tomatoes, beans, peas, cucumbers.
3. Storage: Small shed for tools and learning materials.
4. Compost: Two bins for composting plant debris.
5. Utility table: Table with a grid top provides a surface area for messy educational activities.
6. Soil sample beds: Examples of different soil types are used for examination and experiments.
7. Shady perennials: Variety of shade-loving native plants are grown for examination.
8. Sunny perennials: Variety of sun-loving native plants are grown for examination.
9. Tree cookies: Large round wood slices provide a path for exploration of the plants. Insects and other critters can be found under the slices.
10. Equipment access: Large equipment can enter here and materials can be temporarily placed here.
11. Veggies and herbs: Annual food plants are grown in four raised beds for observation and experiments.
12. Sunny perennial nursery: Native seedlings are nurtured in two raised beds for observation. They will be transplanted elsewhere as they reach maturity.
13. Three sisters planting: Corn, runner beans, and winter squash demonstrate mutualistic relationships between plants. Tall corn plants help shade the area from summer sun.
14. Tea garden: Annual and native perennial plants are grown for tea.
15. Sign and sunny weather station: Informational sign and weather station help visitors learn about the garden and current full-sun conditions.
16. Orientation area: Large entry allows visitors to pause and become aquainted with the garden.
17. Trees: A variety of evergreen and deciduous trees exist for study outside the garden.

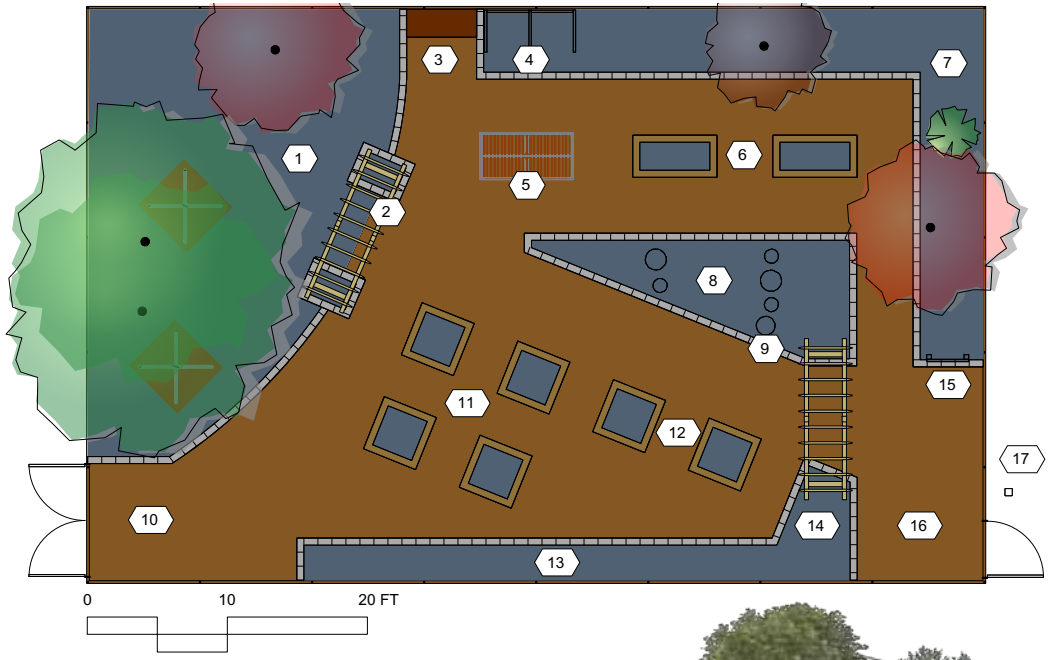


Figure 2. About FOSS

FOSS (Full Option Science System) is a research-based science curriculum for grades K-8 developed at the Lawrence Hall of Science, University of California, Berkeley and published and distributed by Delta Education. All FOSS modules referenced in this document are Second Edition. FOSS is Copyright © by The Regents of the University of California and is not affiliated with Backyard Abundance.

Unit	Investigation	Page	Garden Area	Using the Garden
Trees & Weather	1	52	8, 17	Provide tree rounds (tree cookies) in area 8 of the garden of varying diameter to show tree rings. Visit the different trees in area 17.
(Earth K)	2	78	1, 7, 17	Locate fruit trees inside the garden and other trees outside the garden to collect leaves from.
	2	101 & 114	17	Collect leaves from fruit trees inside the garden and other trees outside the garden. Use tree guide in shed to ID trees.
	3	149 & 153	15	Provide mounted thermometer and wind sock.
Animals 2 x 2	1	81	1	Include bird houses or other components to attract birds. Provide seating area to allow for quiet bird watching & spotting. Place garden near bird habitat (example: evergreen bushes).
(Life K)	2	116	6	Create and visit snail and slug habitat.
	3	145	6, 8	Create and visit worm habitat – inoculate with worms with compost and cardboard/carpet on top to keep in moisture. Look under tree cookies.
	4	181	8	Create pill/sow bug habitat. Tree cookies and dead logs are great place to find sow bugs.
Pebbles, Sand, Silt	1	69	5, 6	Have a variety of rocks available of sizes and types. Provide interesting rocks such as 'chalk rocks' and native Iowa rocks. Use table for observation.
(Earth 1st)	2	140	5, 6	Use table to sieve outside. Look in area 6 for sand/pebbles/etc.
	3	159	3,5,6	Making bricks using clay and straw. Use drying table for bricks.
	4	175	5,6	Provide place to mix soil outside on table. Compare to soil in the garden. Visit compost and clay areas to compare soil.
Plants and	1	86	All	Plant hunt throughout and outside the garden. Remember 'weeds' are interesting plants, too.
Animals	2	115 & 123	11	Plant potatoes outside (science extension) after concluding indoor observation. Plant cuttings outdoors and/or have a station that holds clear cups with cuttings to compare how plants grow indoors vs outdoors (does increased sunlight help?)
(Life 1st)				
	3	145	8,6	Include tree cookies and/or cardboard in gardens as a habitat for sow bugs. Use garden areas of leaf litter and compost to make habitat for sow bugs.
	4	188	11	Transfer bulbs outdoors (garlic) and see how they grow. Again, compared growth between outside and inside the classroom over same amount of time.
	4	199	All	Visit garden and area around to look for diverse kinds of plants.
	4	194	11	Place cutting of radishes and carrot outside to grow as well.
Insects and Plants	2	102 & 118	11	Plant Brassica Seeds outside to compare growth to inside. Another option: plant brassica that we might want to eat, like broccoli or kale.
(Life 2nd)	2	118	11	Planting marigold seedling. Marigolds are good companions for tomato plants. Share they go well with tomatoes to deter pests because of smell.
	2	128	7 (shade) 8, 13 (sun)	Seed pod search. Leave plants with seeds overwinter so students can find them. Leave flowering stems from last year's planting, to see if students can find seed heads.
	3	151	8	Plant milkweed in the school garden for habitat for milkweed bugs and monarch butterflies. If you have actively growing milkweed, they are pretty easy to find under blooms/pods. If there are dry seed heads, those can be interesting to look at, as well.
	3	169	1,7 (shade) 8,13	Insect Search. Identify habitats such as under tree cookies or rocks. Identify plants that often have insects. Do certain insects like food crops or prairie plants better?
	4	191	17, 8	Identify any mulberry trees in the area for silkworm habitat. Check for eggs under prairie plants.
	4	212	All	Visit area trees that might attract different kinds of insects for feeding and look for evidence.
	5	251	7,8	Butterflies/Flower Powder – have butterfly garden with flowering plants.
Structures of Life	2	127 & 130	7,13, paths	Identify 'weed' areas for collecting plants (clover, dandelion, grasses). Roots are compared to bean seed roots. Try to pick weeds with deep tap roots like plantain/dandelion vs more fibrous root systems like grasses. Discuss how these might serve different functions in the soil and with rainfall.
(Life 3rd)				
Soils, Rocks, and	1	93	All	Notice difference between soil is on pathways, annual beds (11, 13), perennial beds (8) and shady areas (1).
Landforms	2	136	All	Identify erosion areas, such as places where mulch is washed away or there are dips in the surface. Notice what different types of plants grow there.
(Earth 4th)	3	163	6	Identify area with various types of rocks to choose from. You may have to place rocks ahead of time around the garden.
	4	218	TBA (5)	Making Concrete outside is less messy – Use mesh table to mix concrete for stepping stones. Designate place in the garden for new creations.
Environments	1	95	4, 5	Leaf-Litter Critters – Go to the leaf litter area and look for critters. Also, check under trees around the garden with 'natural' leaf litter areas.
(Life 4th)	2	139	All	Population Simulation – Use Flags for identifying areas.
	4	241	All	Plant Patterns – Identify areas where different types of pants & weeds may go due to microclimates and other environmental factors (woodland, prairie, etc). Designate areas inside and outside the garden.
Living Systems	1	54	4,6	Recycling (Earthworm litter) – Visit the compost pile and the earthworm habitat.
(Life 5th)	2	120	11	Nutrient Systems – Have place outside to grow wheat grass and compare with ones grown with/without light in classroom. Do plants grow bigger/smaller outside? Why? (light or soil composition)
	3	156	7,8,13, 17	Plant Vascular Systems – identify leaves with parallel, pinnate and palmate branching. Look at herbaceous plants, shrubs and trees.
Weather on Earth	1	93	15	Local Weather – Establish instrument stations that provide area for wind vane, thermometer, hygrometer, barometer, wind meter (anemometer).
(Earth 6th)	2	157	1,15	Heating Earth Materials – identify sunny and shady spot for weather testing.
Diversity of Life	1	1	11	Plant radish seeds in the garden to see how fast they grow & compare to ones inside.
(Life 6th)	1	78	6	Create mini-habitat for studying organisms.
	5	310	1, 5, 7, 8,13	Plants: The vascular system – identify any cuttings for water passing through. Use the bag and method to test for water.
	6	343 & 346	13, all	Use the lima beans from the three sisters area, if avialable (13). Seed hunt – Leave plants up for winter that have seed heads, such as butterfly plants and bean plants.
	6	356	11	Compare sowing radishes, peas, barely and winter rye. (Corn only germinates at higher temp and is not recommend).
	8	426	All	Bioblitz – Full study of plants and animals. Use inside and outside the garden and visit all the micro-zones of sun/shade, drier/moister, etc.

SCHOOL CAMPUS FOSS GARDEN

This small garden is only 170 square feet but contains many of the same enhanced learning components of the larger garden.

A. Perennial Plants: A wide variety of perennial flowers offer habitat for butterflies and birds, as well as an opportunity to study different flower, seed and plant structures.

B. Soil Beds: Different mixes of soil, sand and clay can help students learn about the needed growing conditions for healthy plants.

C. Habitat Beds: A variety of micro-habitats such as leaf litter, compost, sand and other materials can be created to discover the small animals and insects that are attracted.

D. Tree Cookie Walkway: Sliced logs provide habitat for worms and insects.

E. Planting Beds: Small beds offer opportunities to grow a wide variety of tasty vegetables, sensory herbs, and diverse flowers.

F. Sign and Weather Calendar: An inviting sign and a weather station with a calendar immediately conveys the purpose of the learning area.

Figure 3. Ornamental School Garden
Gardens at schools are often designed only for beauty. Redesigning them to offer diverse learning opportunities takes education outside building walls into the engaging realm of nature.
Photo by Fred Meyer

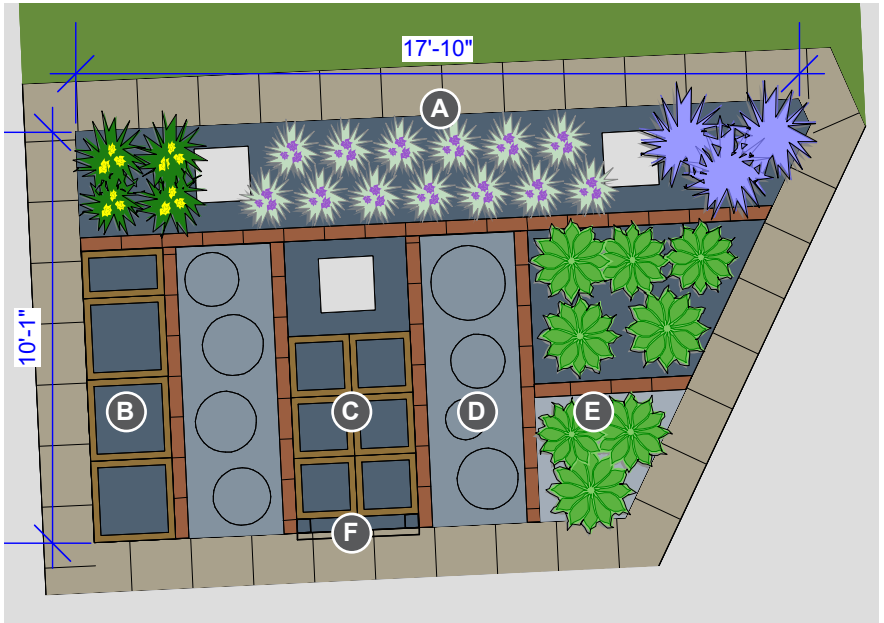


Figure 4. FOSS Curriculum Garden Design
Gardens can be designed to support the curriculum of teachers through hands-on, engaging activities that increase learning, curiosity and engagement.

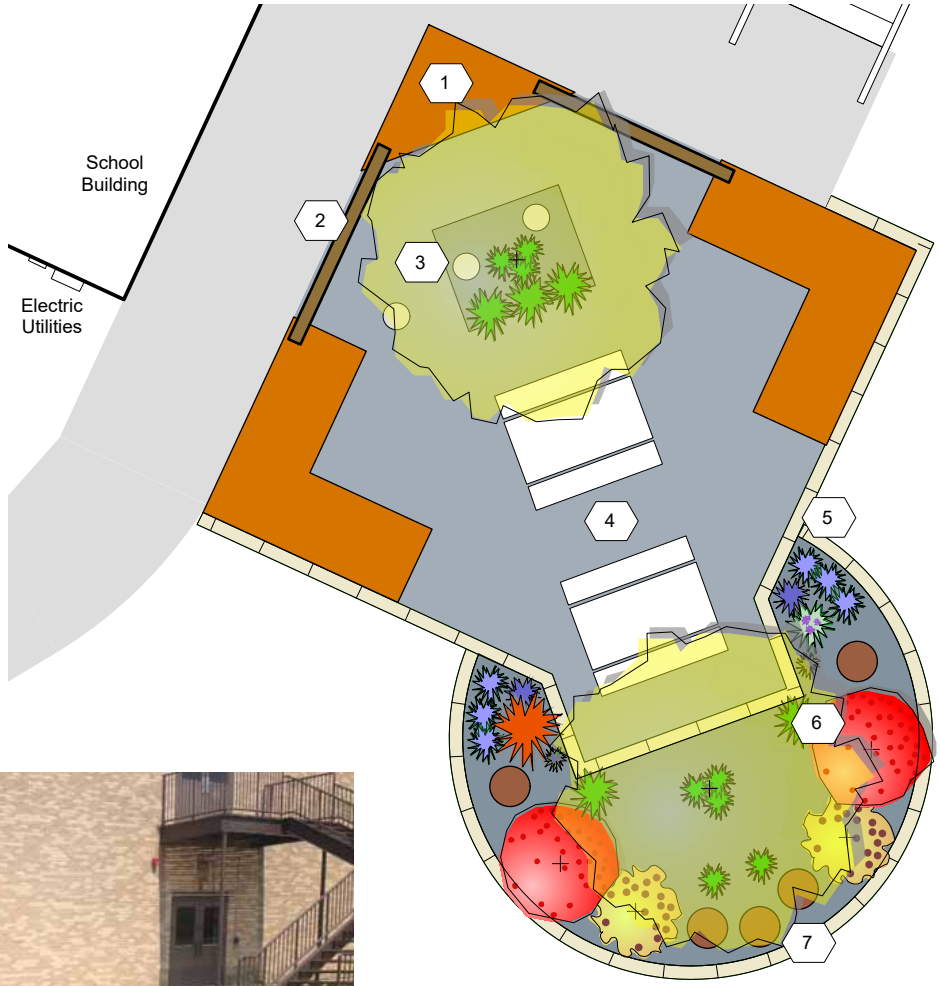
Materials

Material costs will vary greatly depending upon the needed infrastructure and plants that directly support curriculum. Costs are general estimates.

Item	Count	Units	Cost / Unit	Item Total	Comments
Annual Plants					A wide variety of herbs and vegetables are available to support specific curriculum; these are just a few examples.
Kale (or other brassicas)	3	4" pot	$ 4	$ 12	Deer-resistant.
Dill	1	seed packet	$ 4	$ 4	Great for nibbling and readily re-seeds itself. Host plant for black swallowtail butterfly.
Garlic	6	bulb	$ 1	$ 6	Plant in fall and harvest in late spring.
Potato	2	tuber	$ 1	$ 2	Plant in spring and harvest in fall.
Spring Greens	1	seed packet	$ 4	$ 4	Harvest lettuce, spinach, bok choy and other greens in spring then re-seed in fall.
Plants Total				**$ 28**	
Perennial Plants					A wide variety of perennial flowers and herbs are available to support specific curriculum. Choose plants based upon desired bloom time
Aster, Sky Blue	4	4" pot	$ 4	$ 16	Blooms Aug - Oct
Black-Eyed Susan	4	4" pot	$ 4	$ 16	Blooms Jun - Sep
Butterfly Weed	4	4" pot	$ 4	$ 16	Blooms Jun - Aug
Columbine, Wild	4	4" pot	$ 4	$ 16	Blooms Apr - May
Hyssop, Anise	4	4" pot	$ 4	$ 16	Blooms Jul - Sep
Milkweed, Common	4	4" pot	$ 4	$ 16	Blooms Jun - Aug
Purple Coneflower	4	4" pot	$ 4	$ 16	Blooms Jul - Sep
Perennial Plants Total				**$ 112**	
Materials					
Edging	48	linear feet	$ 2	$ 96	
Landscape Fabric	1	roll	$ 15	$ 15	Place fabric under tree cookies and mulch to suppress weeds. Pull it up each spring and re-mulch.
Sign and Weather Station	1	sign	$ 100	$ 100	The cost of a weather station will vary greatly depending upon the type needed.
Soil Boxes	9	box	$ 5	$ 45	Boxes can be constructed from cedar lumber and buried in the garden.
Stepping Stones	3	stone	$ 10	$ 30	
Tree Cookies	8	cookie	$ -	$ -	Tree cookies can be sliced by a volunteer who is handy with a chainsaw.
Woodchip Mulch	18	bag	$ 4	$ 70	Each bag has 2 cu. ft. of woodchips.
Materials Total				**$ 356**	
Plants and Materials Total				**$ 496**	

SOUTHEAST JUNIOR HIGH STUDY GARDEN

This small garden of raised beds and fruit trees sits outside the school science room. It is designed to be both a hands-on learning area and a study area.



Notes

1. Raised Beds: Vegetable beds next to sidewalk are fully accessible.
2. Entryway Arbors: Arbors over wide entryways provide support for annual vining crops; e.g., cucumbers, beans, peas.
3. Pylons: Existing concrete pylons allow fruit in the tree to be easily reached.
4. Mulched Outdoor Study: Picnic tables support outdoor studies.
5. Limestone Edging: Enhances the beauty of the classroom while decreasing weeding chores.
6. Perennial Fruits: Fruit trees are surrounded by low-maintenance berry shrubs and durable, edible herbs, flowers and ground covers.
7. Buried Stumps: Stumps provide an area for sitting and chatting. They can also help reach fruit in the tree.

COMMUNITY EDIBLE CLASSROOM

The edible classroom can be configured in many ways depending upon the site characteristics and needs of participants.

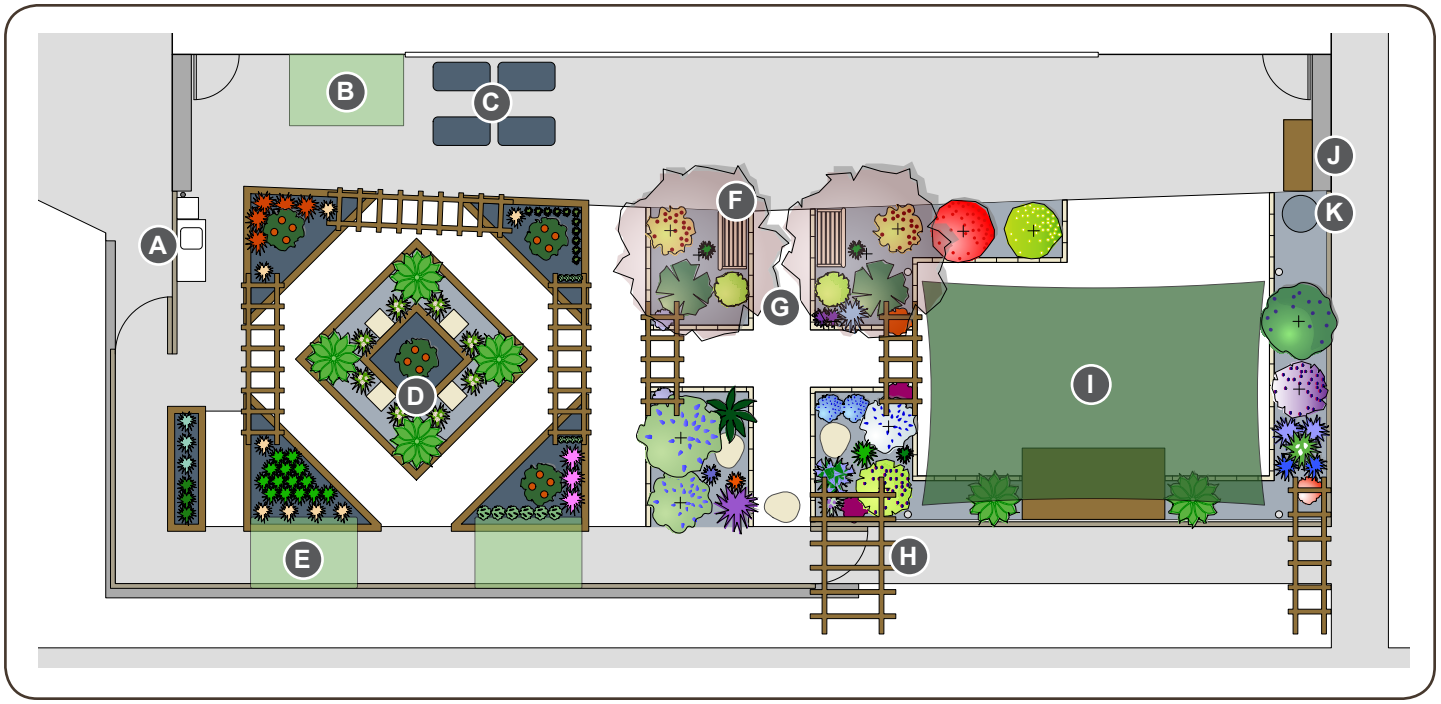


Figure 5. Edible Classroom Design
Components of the classroom can be moved and sized based upon the needs of the community and available funds.

A. Water: A long, durable hose is necessary for establishing plants. A sink and counter will help prepare harvested food.

B. Greenhouse: While expensive, a small greenhouse can support year-round learning.

C. Moveable Beds: Small garden beds on wheels can provide a flexible growing area. Beds can be placed in the greenhouse over winter.

D. Raised Beds: Establish familiar and easy-to-nibble annual vegetables in the first couple of years to increase attendance and acceptance. Several varieties of cherry tomatoes, cucumbers, beans, snap peas and lettuce can make up the majority of the plantings. Digging a bed of potatoes and harvesting miniature pumpkins can be the main attraction at a fall celebratory event. Keep beds narrow—2 to 4 feet wide–so children can reach the entire growing area.

E. Vegetation Tunnels: Use cattle panels to create a tunnel structure that supports dangling vegetables.

F. Seating: Shaded benches, picnic tables or buried stumps will encourage lingering and conversation.

G. Orchard Crops: Young fruit trees, berry bushes and perennial herbs may look spindly for 2-3 years after establishment. Interplanting with annual flowers and short-vined melons can fill in the area.

H. Entryway: An inviting, highly-visible entry can be beautified with an arbor, flowers and vining plants.

I. Study and Recreation: A shaded, open area with seating and a stage creates and ideal learning environment. Hosting familiar classes can increase the popularity of the space. Outdoor games and activities can also be attractive; for example, bean bag toss and sidewalk drawing.

J. Tool Shed: Basic gardening tools and a place to store them will help greatly with maintenance.

K. Compost: Posting a sign with instructions about proper composting will help ensure the area's appearance and odor are maintained.

EDIBLE MONARCH WAYSTATION

Monarch Waystation gardens can be designed in a variety of ways, but keeping them simple and easily accessible is key to success.

This design provides nectar and habitat for monarch butterflies throughout the growing season while also yielding easily-picked food.

A. Flowers: Keep patches of perennial flowers separate from vegetables so the perennials are undisturbed by annual cultivation. If screening the vegetable garden is desired, place flowers on one or more sides to create a pleasing view.

B. Brush Pile: Accumulate leaves, sticks, kitchen scraps and undiseased plant debris between the flower patch and vegetable area. In addition to helping overwinter insects, the barrier will help reduce seeding between the areas and can be used as an in-place compost pile.

C. Vegetables: Yields of vegetables will increase due to activity from nearby pollinators. Predatory insects will help manage pests. In fall, place 4-12" of leaves and/or straw atop the entire area to protect soil organisms from significant temperature fluctuations. In early spring, after the danger of deep freezes has passed, rake the leaves into the pathway and brush pile then use the material as mulch around plants throughout the growing season.

D. Permanent Pathway: Make the pathway a 3-4' wide cul-de-sac into the garden rather than a route through it. This design provides more growing space instead of pathway space. Mulch deeply with woodchips or straw that will last the entire season so weeding is minimized.

E. Expansion: The base design can be replicated side-by-side to indefinitely expand the garden.

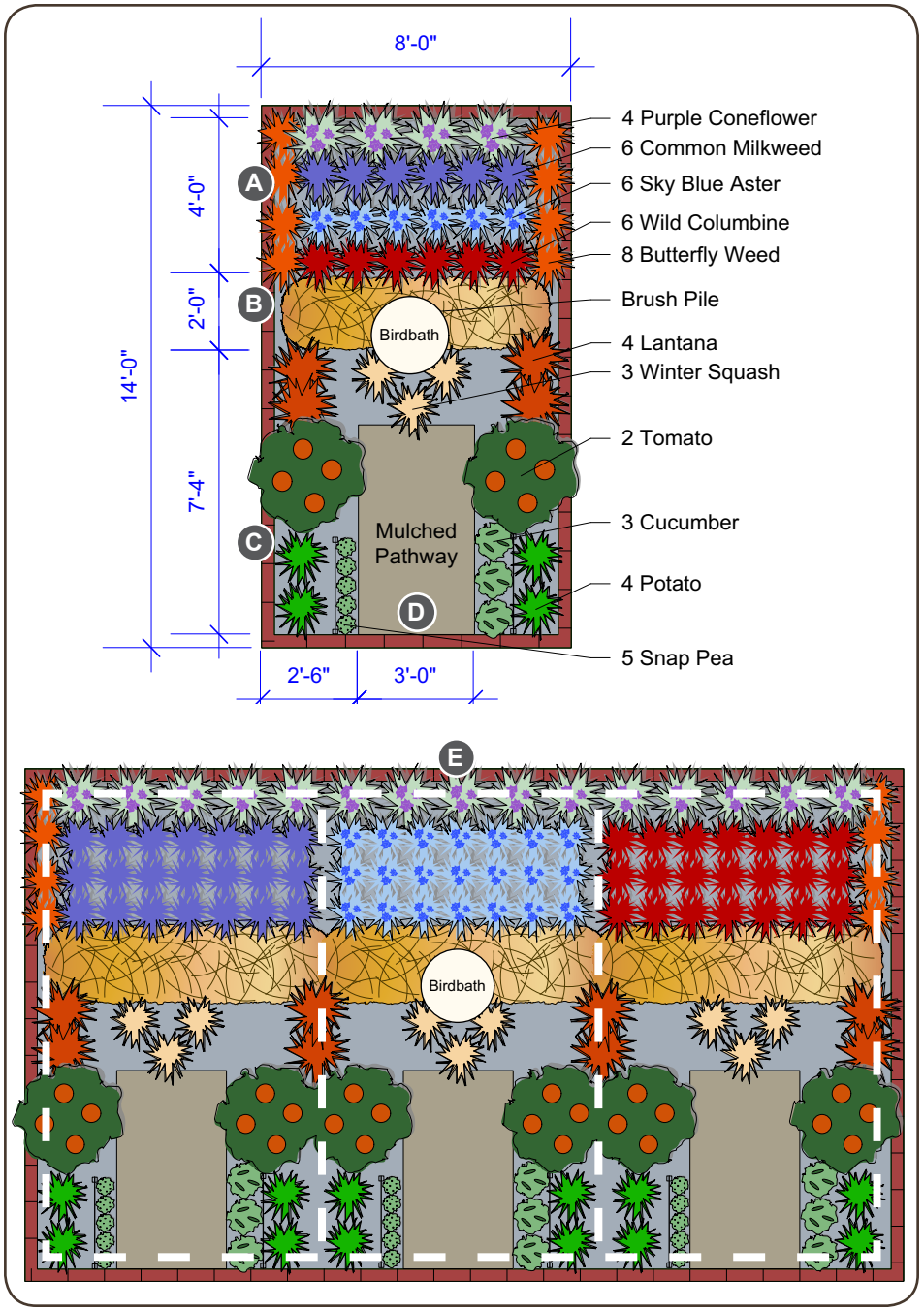


Figure 6. Edible Monarch Waystation Design
The integration of food and habitat creates a small, healthy ecosystem that lowers maintenance and increases yields.