



GROWING THE OUTDOOR CLASSROOM

A Handbook on Gardening in Albuquerque Public Schools

September 2014

2nd Edition

Growing Gardens Team and the Albuquerque Public School District



Table of Contents

| | |
|---|---------|
| Introduction | 4 - 5 |
| Acknowledgements and About Growing Gardens Team | |
| The Outdoor Classroom..... | 6 - 15 |
| Youth Engagement/Ownership | |
| Safety in the Garden | |
| Classroom Management in the Garden | |
| Gardening and Academic Curriculum | |
| Science in the garden Math | |
| in the garden Language arts | |
| in the garden | |
| Garden Education Activities and Definitions | |
| Planning a School Garden..... | 16 - 23 |
| Phase 1: Create the Plan and the Design | |
| Phase 2: Build the garden | |
| Phase 3: Maintain the Garden | |
| Growing Basics for Plants..... | 24 - 33 |
| Soil | |
| Water | |
| Protection for Plants and Soil | |
| APS and School Gardens..... | 34 -39 |
| Background checks | |
| Facilities Design and Construction Department | |
| Food and Nutrition Services Health | |
| and Wellness Department | |
| Maintenance and Operations (M & O) | |
| Risk Management Department | |
| APS Education Foundation | |
| School Nurses | |
| School Counselor and Social Workers | |
| School Garden Resource List..... | 40 - 42 |



Table of Contents

Appendix A: Gardening Definitions43

Appendix B: Garden Book & DVD Bibliography44 - 51

Appendix C: School Composting52

Appendix D: Edible Landscaping in Schools53



***The purpose of this handbook is to provide resources,
and guidance information to APS staff and students
so that their gardens will be successful and fruitful.***

This handbook contains information on the basics about gardening in the climate of the southwest. There are many theories and techniques related to appropriate seeds and plants, soil, water, sun, mulching, and beds. This publication shares the best thinking of the Growing Gardens Team but you may find that you have a technique that is different or works better for you. That's fine! Gardening is always an evolving art.

Acknowledgements

Le Adams, Director - Farm to School Program, Farm to Table
Olivia Andrade de Sanchez, Environmental Health Supervisor - City of Albuquerque
Christianna Cappelle, Project Facilitator - GardenersGuild
Mary Erwin, 3rd Grade Teacher - Bandelier Elementary School, Albuquerque Public Schools
John Garlisch, Agent - NMSU Cooperative Extension Service
Tess Grasswitz, Urban/Small Farm IPM Specialist - NMSU Agricultural Science Center, Los Lunas
Whitney Kane, Social Worker - Grant Middle School, Behavior Intervention Program, APS
Jennie McCary, Wellness Manager - Albuquerque Public Schools
Cara McCulloch, Architect and Community Volunteer
Nissa Patterson, Community Volunteer
Becky Pierce, Board member - Rio Grande Community Farm and Horticultural Therapist
Joran Viers, Horticulture Agent - Bernalillo County Cooperative Extension Service/NMSU

The following people contributed to the updated handbook in 2014

Natalie Donnelly, School Gardens Coordinator - Albuquerque Public Schools and FoodCorps
Jeanne Forrester, Wellness Manager - Albuquerque Public Schools



Introduction

The outdoor classroom is an excellent environment in which to build skills, connect curriculum to concrete experiences and coach children in the exercise of stewardship of the natural world. For the purposes of education, a school garden provides the ideal environment for experimentation and therefore isn't ruled by ideas of growing for traditional purposes related to profit or pristine plots. **The critical function of a school garden is in the process of learning and for that reason a garden must be planned and designed to meet the educational needs of those children who will steward it.**

An often unforeseen advantage of school gardens, children are quickly engaged in the gardening process, leading to greater personal confidence with the simplest of achievements. Guided by clearly established goals, children are rewarded each day by connecting with their environment. Given a safe space to experiment, young people are uplifted by the contact with nature and the lessons it teaches about the world we live in. These lessons provide valuable insights that prepare them for a healthier, empowered and compassionate way of living.

Why school gardens?

The Albuquerque Public Schools (APS) district wellness policy supports many aspects of student wellness that include nutrition, health education, physical activity, social/emotional well-being and family/community partnerships. The impact of learning in a school garden reaches and extends beyond each of these areas. We know that a child's health and school attachment affect their school performance. School gardens have the potential to promote bonding between students and strengthen a student's feelings of connectedness with their school. In Albuquerque's urban areas, youth are surrounded by cement and asphalt and may not have opportunities to connect with nature. In our society children are increasingly drawn away from their natural habitat by electronic devices. By re-connecting with their innate nature, children learn about the real world and the interrelation of life systems. When children are drawn again toward nature, their sense of wonder and awe awakens. This interest in biological life cycles transforms into renewed interest in classroom learning. Children who learn by observing nature are better able to protect it as adults. A garden on a school campus provides a dynamic learning environment that engages and excites students.

Learning in a garden naturally promotes a healthy lifestyle. Eating more fruits and vegetables and being physically active are two evidence-based strategies proven to help kids and families maintain a healthy weight and improve overall health. Gardeners of all ages get excited about pulling up and eating the carrots they have tended for so long; this extends to interest in trying new vegetables and interest in where our food comes from. Involving students in gardening is a promising strategy for increasing their fruit and vegetable intake and positively impacting their food choices.

The popularity of school gardens as an educational outdoor classroom is growing. School garden-based activities promote overall student well-being and have the potential to improve student academic achievement through experiential learning. Lessons come alive in the garden. Garden-based education addresses multiple learning styles and provides a vehicle to help educators meet standards in a hands-on, positive learning environment.

School gardens provide a place to teach and learn a wide range of academic subjects, including:

- Literacy
- Math
- Science
- History
- Art
- Creative writing
- Health and nutrition

In addition to academic subjects, gardens are an ideal place to teach important social and life skills:

- Enjoying a hobby (gardening is the number 1 hobby in America) Experiencing cooperation, teamwork, sharing
- Caring for something other than self, nurturance
- Setting and achieving goals
- Assessing personal safety
- Managing disappointment, frustration
- Connecting self to the larger web of life

School gardens are rich with opportunities to engage parents, community volunteers and agencies in the education of our students. They nurture community spirit, common purpose, and cultural appreciation by building bridges among students, school staff, families, local businesses, and organizations.

About the Growing Gardens Team

In summer 2009 a group of dedicated school gardeners began to meet and share ideas. Shortly thereafter the *Growing Gardens Team* (GGT) was formed. During the 2009-2010 school year the GGT surveyed schools, developed a directory of APS gardens and determined the needs of the staff working in these gardens. The results of the survey and case study are in a report, "*Growing the Outdoor Classroom: A Report on School Gardens in Albuquerque Public Schools,*" which can be found at:

www.apshealthandwellness.com/ or
www.gardenersguild.org/schoolgardensABQ.

Additional surveys of Albuquerque area school gardens were done in 2012 and 2014. The needs assessed in these surveys guide the work of the Growing Gardens Team. In the summer of 2013, APS secured a FoodCorps service member who was designated as the district "School Gardens Coordinator".

GGT VISION

APS schools have vibrant gardens and outdoor classrooms. These gardens are integrated into the curriculum and are actively supported and sustained with the help of community partners.

GGT MISSION

Foster a network to provide training, tools and resources to Albuquerque area school staff that want to garden with students.

The Outdoor Classroom

Student enthusiasm is perhaps the school garden's most valuable resource. Students of all ages and abilities can participate in gardening activities that connect to academic learning and social/emotional growth. School gardening programs can help students develop a wide range of skills, and foster a greater connection to their environment and the natural world. Students generally enjoy being outside and can be amazingly productive, eager workers. Often, student energy just needs to be garnered and focused. Below are a list of considerations and ideas for creating safe, productive and fun outdoor classrooms.

Youth Engagement/Ownership

Student buy-in is critical to any school gardening program, and there are many ways to generate student engagement and youth voice in the planning process. Try to involve student input at numerous stages of the garden's development.

- Ask students to share any previous gardening experiences or any experiences about being or playing outside.
- Gather ideas about what it means to be a gardener.
- Discuss where food comes from (you may be surprised by some of the answers!). Explore the concept of gardening as community service.
- Include students in the planning stages (if possible): create a scavenger hunt to familiarize the student with a site, write donation letters or a garden proposal, test soil, sketch the planned garden, research local gardening resources, create planting/watering charts, order seeds.
- Read stories about gardens, look at inspiring gardening photos, ask students to talk about their home gardens/community gardens/parks, etc.
- Ask students to draw a picture or write a description of their ideal school garden.
- Communicate to students that their ideas matter by trying out their ideas.
- Introduce the idea that students are members, workers and leaders of the school gardening community.
- Talk with students about your own experience/comfort level with gardening.
- Reassure students that prior knowledge is not necessary. The garden is a place to learn.



Safety in the Garden

Preparation is important in creating a safe gardening experience. Unsafe situations can occur when students are not aware of the expectations, lack basic gardening skills, and/or are unfamiliar with safe use of gardening tools. There are many ways to promote safety in the garden; much of this preparation can take place indoors and involve student input:

- Create a list of Garden Ground Rules *with* students.
- Review the rules before every gardening activity.
- Teach students about each and every gardening tool. Use proper tool names, describe what the tool is used for, demonstrate how to safely use and transport the tool. Talk about why tool safety is important. Review tool use and safety before every gardening activity. Designate one location for tools during a garden activity. Every student uses one tool at a time and replaces tools to the designated place when finished. Be aware of the dangers associated with a large group of excited children working close together using long handed tools.
- Know your students' allergies to plants and insects (bees, ants). Know the severity of these allergies and have a plan to get immediate assistance for students experiencing an allergic reaction.
- Have a plan if injuries occur.
- Engage the school nurse and/or school social worker in leading conversations about safety in the garden. Have students teach safety lessons.
- Review garden safety concerns with your school administration, school nurse, and/ or APS risk management.

TIP: Eat What You Grow

Students love to eat what they help grow in the garden and should be encouraged to do so. School-wide tasting in the cafeteria can be a fun way to share your garden harvest with others. See section – APS & School Gardens: Partnering for Success – Food & Nutrition Services Department for suggestions on how to safely use food in the classroom and the cafeteria.



Classroom Management in the Garden

Exploration in outdoor settings can provide meaningful educational experience for students. However, exploration in outdoor settings does not have to mean an unfocused free-for-all. For effective classroom management in an outdoor setting, students must know the expectations, rules, and feel comfortable learning new skills. Outdoor classrooms need reasonable limits the same way indoor classrooms do.

- Make sure students feel comfortable and familiar with the garden space before jumping into work. Spend time outside just observing the sights and sounds of the garden.
- Discuss the gardening activity *before* going outside.
- Review gardening rules and tool safety before any gardening activity.
- To build skill levels and confidence, practice gardening skills - like seed planting/transplanting - indoors at first. Do not assume all students have experience planting seeds in the ground! Start with larger seeds first. Then advance to working with trickier, smaller seeds as manual dexterity is mastered.
- Garden in small groups to facilitate order, focus and individualized attention.
- Develop associated paper-based activity sheets and other resources to use as garden extensions, in case of inclement weather or if individual students need special attention.
- Create rotation stations in the garden (i.e., weed pulling, planting, harvesting, watering, drawing/journal writing, etc.) to manage larger groups and keep attention focused.
- Create garden roles and responsibilities: Tool Manager, Seed Holder, Hose Coordinator.

Gardening and Academic Curriculum

Gardens are an easy way to integrate New Mexico State Standards throughout the curriculum areas and across grade levels. Planning, making and maintaining a garden can provide a context for knowledge. This context then provides the framework for making connections between the abstract and the concrete. This is especially important in language development.

As students learn what is needed for a seed to grow, they do a variety of tasks and activities that support what is happening in the garden. From watering to maintaining soil vitality to harvesting, preparing and consuming - the entire process offers opportunities for learning, exploring and wondering.

Using the idea of 'begin with the end in mind', State-mandated standards should always be the beginning of curriculum planning. Know and align what standards are appropriate for your grade to any activities in your garden. These can be found at the New Mexico Public Education Department website: <http://www.ped.state.nm.us/standards/>.

Tip: Gardening Activities to Help Build a Gardening Community

The garden can be a hub of activity, creativity, community and learning. Below are some ideas to complement the growing of plants:

Hold celebrations such as planting/ harvest parties, class parties and school events in the garden.

Worm Composting or “vermiculture”

Traditional Composting

Create a wildlife habitat including plants, water and food that attracts local wildlife.

Self-guided tours facilitated by plant identification tags and signs, like they often have in botanical gardens

Guided tours to show parents and community members the garden area (these can be integrated with school open houses)

Weather station attractions such as rain gauges and thermometers.

Recommended Curriculum Resources

- Life Lab: *The Growing Classroom – Garden and Nutrition Activity Guide*. Grades k-5, linked to Common Core State Standards & Next Generation Science Standards
- White Barrett and Kop: *Math in the Garden: Hands-On Activities That Bring Math to Life, Ages 5-13*
- American Friends Service Committee: *Building a Community Garden*
Free online
- New Mexico Agriculture in the Classroom: *Agricultura*. Free online at: [_](#)

The following are some examples of how the garden can be used to support standards:

Science in the garden

Science is often taught in a garden. From the hydrological system to how a plant grows and the life cycles of plants, insects and animals, gardens are the perfect place for experiencing and understanding these amazing phenomena. Students of all ages can study famous earth scientists and practice the scientific process.

Many projects in the garden can help students understand basic earth processes. Loss of topsoil and soil vitality is a leading concern for farmers today. Students who learn how soil is made through composting and vermiculture can contribute to a more sustainable future for us all.

Our understanding of genetic mapping was pioneered in a garden (Gregor Mendel) and for thousands of years farmers and ranchers have been breeding desirable characteristics into our plants and animals. The field of genetic science is as old as humans and remains a topic of current events and scientific study. And it began in a garden.

Math in the garden

Measurement - linear, weight, temperature, volume, standard US and metric

Estimate - percentage of clouds in the sky, temperature, ratio - seeds germinated

Data - how to collect, display and analyze

Patterns - in nature, in a plant, seasons/cycles, repeating, predictable

Geometry - lines of symmetry identify and name shapes in nature

Sums and differences, products and quotients

Time - how long does it take to sprout a seed? Make a sundial for the garden

Money - how much do the seeds/plants cost? What is the cost of food production?

Word problems galore

Language arts in the garden

Reading - poetry, fiction and non-fiction, drama, biography, magazines, comic books

Literature - From the many simple vocabulary and alphabet books at the young-reader level to the important work of visionary environmental writers like Aldo Leopold and Rachel Carson for more sophisticated readers; reading in, around and about gardens and outdoor classrooms is one step towards building a person's awareness and connection to the place where they are. Work with your school librarian to identify relevant books.

Refer to the Appendix B: Garden Book & DVD Bibliography on pages 44-51 for a list of garden related books and DVDs, compiled by Annie Huggins (Librarian at Georgia O'Keeffe Elementary School).

Writing in the garden

Nature journaling is a well-regarded pastime and has produced some great writers. Keeping a nature journal can be a great way to build, reflect and affirm knowledge. Spend about 1-2 minutes just sitting still and quiet before you begin writing. This time allows students to slow down and get focused on where they are. Having specific topics can help young writers to get started.

Be sure to save time and space for students to draw and write ideas. Scientific drawing as opposed to cartoon or comic drawing can help students to look closely at something, which improves their observational powers over time. As observations improve, connections become easier to see.

Nature journals often include specific information like location, temperature, season/date, and weather as well as personal reflections about observations. Write with your class and be sure to offer time to share writing.

- To create a class poem about a time in the garden, ask every student to use one word that sums up the experience for that day/month.
- Have students arrange these words in a way that they find powerful or expressive of the experience.
- Summarizing an experience into one word can be a challenge, but collectively, those words will reflect a range of feeling and experiences common to all.

Nature Journal Activities

1. Draw and or write what is growing in the garden.
2. Draw and label the plant/s.
3. Make a menu of only plant foods.
4. Insect hunt-draw each one you find.
5. How does wind affect the garden? How does it help or hurt?
6. Make a list of every non-living thing in the garden area.
7. Design a sign for our garden area.
8. Make a rhyming poem about spring and illustrate it.
9. Draw and label 6 symmetrical things we find in nature (leaves, animals, flowers).
10. Valentine's Day? Write 10 ways to love the Earth.
11. What are some ways we could catch rain to use in our garden? Draw and write about your plan.
12. John Muir had a lot of adventures outside. Write about an adventure you have had outside.
President's Day? If you were President, what would you do to help the Earth?
13. Make a top ten list of things that come from a garden.
14. List the living things you can see in the garden area.
15. List the letters of the alphabet down the side of your paper-write a plant, fruit or vegetable, herb or tree for each letter.
16. Measure and sketch 5 plants in the garden.
17. Pretend you only get your food from a farm. What would you eat? Where would it come from?
18. 10 tomatoes had 1,000 seeds each, if each had the same number of seeds, how many altogether?
Use picture words and numbers to show how you got your answer.
19. Make a mini-menu for a restaurant that uses our garden's plants.
20. Pretend you are on an overnight trip to the mountains. What do you need to take to survive?
21. Draw an underground scene of animals hibernating in dens and tunnels.
22. Draw the lifecycle of a tree.
23. Draw the lifecycle of an insect.
24. Make a list of observations in the garden, include everything you see, hear, feel and smell.
25. What is the weather like today? Write a weather report.
26. What if you spent a week in the forest with only a sleeping bag and a jug of clean water? How would you survive, what would you eat, what would you do for shelter?
27. 100 seeds were planted, 64 sprouted. How many didn't grow? Draw and write about it.

Nature Journal Activities

28. Collect a leaf-sketch and label it.
29. Design a creative bird feeder for the garden, draw and write about it.
30. Henry David Thoreau liked to live a natural life. What in your life is natural and what is unnatural; make 2 lists.
31. Design a salad garden.
32. Design a pizza garden.
33. Make up a new kind of ice cream using fruits from the garden.
34. Summer is coming, draw and write about 5 things that you like to do in the summer.
35. Create a postage stamp honoring gardens.
36. Make a salsa recipe for Cinco de Mayo.
37. Write a haiku (lined 5, 7, 5) about the current season.
38. Measure out one square foot (or inch or yard) of a garden or other outdoor place and draw a detailed map of that square.
39. If you could go anywhere in the world for an outdoor vacation, where would you go?
40. If seeds have been recently planted, how will it grow and what will the final plant look like?
41. Write an acrostic poem using WINTER/SUMMER/AUTUMN/SPRING as the word.
42. List ways that animals stay warm in the winter.
43. How would our city be different if every family had a garden?
44. Make a list of how animals change in the winter.
45. Draw a tree decorated only with things found in nature.
46. How would your winter holidays be different without plants?
47. Design a garden for fairies or some other imagined creature.
48. In what ways is a plant a person alike? In what ways are they different?
49. Draw your dream garden. What would grow and where? Label your garden and be as specific.
50. Write about the best thing you ever ate. Answer who, what, where, how and why it was so good.
51. Make a list of adjectives (describing words) about the garden.
52. Make a list of verbs about the garden.
53. Find an insect and follow it for a minute, then try to draw a map of where it went.
54. Draw a map of your favorite place to be outdoors.

Planning a School Garden

Even if you have an existing garden, reading each of these sections may be helpful as you may learn about tips or ideas you had not considered.

Refer to the Appendix A: Garden Definitions on page 43 for more info.

So you have the desire to start a garden? Since this is a school project, it is important to gain support from the principal, staff, parents and students. Start by talking with your school principal and others about your idea to start a garden. You may learn that they have the same desire. Once you get commitment, it's time to have fun and start planning.

This section is divided into 3 phases:

- Phase 1: Create the Plan and the Design
- Phase 2: Build the Garden
- Phase 3: Maintain the Garden

Phase 1: Create the Plan and the Design

Identify the purpose and goals of your school garden.

To achieve the highest goals, a garden must meet the needs of the children it serves. It is a learning environment, and can be adjusted to achieve a wide variety of educational experiences. In Albuquerque, gardens can be grown year-round to maintain a consistency that is important to children. When the purpose is identified, it will be much easier to make other decisions such as location and plant selection, coordinated with the seasons.

- Form a planning team.
- Engage multiple partners in planning and engage more than the usual suspects. Be sure the entire planning is not dependent on one person. Make sure there is buy in from a core group at the school.
- Decide the purpose of the garden, the philosophy, integration into classroom and make sure there is buy in from a core group at the school.
- Do your homework: visit other school gardens and “buddy up.”
- Hold multiple planning meetings such as meetings focused on the “vision” of the garden and the design.
- Develop strategies to engage teachers, families and youth in the planning process.
- Take your time.

Locate your garden plot.

Where will your garden be grown? In New Mexico, locating your garden in an area that is protected from the most stressful elements can moderate our extreme conditions. Protect your garden with things such as buildings, walls trees and trellises.

Answering these questions will help the school gardeners to select an appropriate method for growing in a specific location and microclimate. For example, tomatoes will like sun most of the day, but strong winds are not well tolerated. If possible, tomatoes would be placed in spots where the least amount of wind reached them.

Plants – What do you want to grow? What are the favorite foods of the students?

Space – How much do you need? How will the space be allocated or shared?

Time – How much time do you have to take care of the garden? If you determine you do not have much time then starting with a small plot may be advisable.

Sun – A vegetable garden needs 6-8 hours of direct sunlight a day. Examine your space at different times of the day. How does the sun move across the space? How does this change with the seasons?

Soil – What is the quality of the soil? What needs to be done to improve the quality so that plants will be successful? Is the soil compacted or loose? If it is compacted how will you loosen it? Is the soil safe? For more information on investigating what the land was previously used for and soil testing see Page 24.

Water – How will you water the garden? Who will water in summer? You want to build your garden close to a spigot or hose bib. If needed, who can help you install a water system?

Types of plots – Individual, classroom, communal? Rows, raised beds, double dug?

Planting – Will students direct seed into the soil or start the garden with transplants? When and what varieties do you start early? If you start early where will that be done?

Accessibility – A garden that is close to classrooms will be more accessible. Can garden work be done without stepping on the soil that plants are growing in? Is the garden accessible to all children (height, disability)?

Fencing – What is your plan to secure it from 2 and 4-legged creatures?

Permissions – Have you obtained permission(s) to use land and water from school leadership, district as appropriate? Having plans/ sketches in hand can be very helpful.

Sketch – Do you have a visual representation of the proposed space to share?

Here are sample questions to help you with your sketch/design:

- What will you grow?
- What structures (trellises, fences) or conditions (shade, certain soil types) do these plants need? How will your design reflect these needs?
- How can you plan the structures and planting to create ideal microclimates? For example, you might use climbing beans or sunflowers to shade other plants from harsh western sun or plant lettuce on the east or north side of the tall-growing corn.
- Where are existing plants or structure? Of these, which will stay, which will go? Where will the garden beds go?
- Where will walking paths go?
- Where will seating areas be?
- Where is water, how will you access it?
- What signs do you need to identify the garden or plants?
- Where are fences needed?

Identify garden participants, budget source, gardening supplies.

Growing a school garden is a great way to encourage parent participation in the educational process.

Participants – Who will tend your garden? What happens on breaks or during the summer? Which classes will be involved? How will they be involved? Are there community groups or parents that can help?

Materials – Where will your needed materials come from? With a little creativity and a list of needs drawn from your garden plan, many supplies can be donated or accessed for free. Seeking recycled materials or other supplies from the businesses and others nearby provides a way for individuals to participate when they don't have time to contribute.

Budget – How much money do you need for your garden? How will you raise funds?

Supplies – What supplies do you need?

Typical materials include seed, plants, soil, tools, water related supplies such as hoses or drip irrigation, mulching materials, materials to build structures (raised beds, seating, shade structures), shade cloth, materials for staking larger or tall plants, curriculum/ books/posters.

Tools needed for a garden – Shovels, rakes, hoes, hand tools (trowels, weeders, cultivators), watering cans, hoses/nozzles, wheel barrows/buckets for carrying soil, knee pads, gloves, hats.

Pitching a Garden

“Pitching” the garden is all about explaining your gardening project and bringing the community (school, neighborhood, youth, parents) on board. It can be very helpful when pitching your idea for a garden to be able to clearly explain:

- ✓ How the garden will be used to support classroom learning.
- ✓ The plans for building and maintaining the garden.
- ✓ Your budget and supply needs and how the community can help financially.
- ✓ The benefits of gardening. Benefits and research can be found in the GGT Gardening Report at <http://www.apshealthandwellness.com/>

It can also be helpful to engage students and parents to help develop and deliver the pitch.

Phase 2: Build the Garden

There are lots of aspects of building a garden but we will focus on the types of beds you can install. For building projects many school gardens hold a community workday to build your garden. Invite students, parents, staff, neighbors and local businesses and elected officials.

The garden’s location and purpose will determine what type of bed build. Below are four types of garden in which to grow plants.

- 1) Raised Beds
- 2) Waffle Beds
- 3) Double-Dug Garden Bed
- 4) Traditional In - Ground bed

1) Raised Beds

Raised beds are commonly used in school gardens because they help to prevent compaction. They can be placed almost anywhere and serve both practical and decorative roles as a focal point in the garden. A typical height is anywhere from 10-24". Keep them narrow enough for small people to reach the center of the planting area.

Advantages of Raised Garden Beds

- ✓ Turn almost any area of land into a healthy place to grow. Even parking lots can have plantings.
- ✓ Lessen the physical strain of gardening, provide universal access for ADA compliance, and provide an easier reach for daily weeding and harvesting the bounty.
- ✓ Create healthier soil conditions with reduced labor.
- ✓ Easier maintenance of soil from year to year by preserving soil "tilth" (quality and texture), by avoiding foot traffic on the beds.
- ✓ Extend the growing season with soil temperatures. Soil in raised beds averages 5°F warmer than ground temperatures.
- ✓ Plants can be featured in elevated areas, and more easily arranged by design, or tiered for greatest impact.
- ✓ Provide opportunity to utilize interesting and attractive materials to build raised bed structure.
- ✓ Provide a fun and straightforward project for the school community.
- ✓ Allow for better drainage, especially if original soil drains poorly.



Disadvantages of Raised Garden Beds

- Can create warmer soil in high summer heat.
- Slightly faster rate of soil losing moisture
- Soil quality can deteriorate if it is not amended regularly.
- Does not improve the quality of surrounding soil the way in-ground planting can.
- Does not provide the same opportunity for youth to learn about improving and
- Maintaining the native soil.



Most Commonly Used Materials for Raised Beds

Wood (new or recycled) or recycled plastic lumber - use 6-8" boards in twos vs. a single 10-12" plank because the wider boards tends to warp. Be sure that the wood is free of chemical treatments and do not use railroad ties. Cedar or redwood is more expensive but has the advantages of resisting rot and bug damage. Wood does not last as long because of the strong sun and soaking rains in New Mexico.

Dry stack stone - simple but expensive unless you have the material available. Stone may increase evaporation. Water leakage may occur if stones are not mortared.

Border bricks - easy, expensive. Bricks are made of clay so they may wick water away from soil and increase evaporation. Water leakage may occur if bricks are not mortared.

Straw bales - easy, inexpensive, portable impermanent, insulating, breaks down and amends soil.

Cinder blocks - very inexpensive, and often found for free if donations are requested from the neighborhood. Cinder blocks create quick and easy raised beds that will last a long time and can be painted by the students for color and creativity. Blocks may wick water away from the soil and increase evaporation. Painting the blocks can reduce this problem. Water leakage may occur if blocks are not mortared.

Adobe bricks - use them if someone has the bricks, but be aware they will deteriorate, especially when they come into contact with water regularly. One layer with un-stabilized adobe will disintegrate in a year. Two layers of stabilized adobe bricks will last 4 to 6 years. Use only for flowers since there might be contamination of the soil from materials used in the bricks. Adobe bricks are good borders for ground level beds or slightly raised beds; they are cheap, heavy, and when they melt into the ground another layer can be added on top.

Filling Raised Garden Beds

Fill your garden beds with a combination of soil from the site, compost, possible sand for drainage and other organic material like as wood shavings or straw for water retention.

2) Waffle Gardens

Waffle gardens, or “deep beds”, are a type of in-ground garden developed hundreds of years ago by local cultures living in New Mexico to combat difficult growing conditions. The waffle garden is created by low wells for collecting and keeping water surrounded by a mounded earth grid that provides a path for gardeners to access the square garden beds. When completed, the garden looks similar to a waffle and provides a flexible growing space for warm season varieties. In this fashion Native Americans developed a “Three Sisters Garden” with beans, squash and corn in a combined planting: vine beans supported by the tall straight corn and squash to shade the soil.

Advantages of Waffle Gardens

- ✓ Conserves water, captures rain
- ✓ Facilitates discussion of local planting practices



Disadvantages of Waffle Gardens

- Requires careful watering of each well, hand watering usually
- Requires investment of time to build wells and mounded earth and maintain them
- More time spent bending over deeply

3) Double-Dug Garden Beds

This method creates prepared beds that can be used for several years. The method emphasizes creating defined beds with airy soil that is *never* walked on and planted densely to create a cool microclimate. John Jeavons explains the double-dug method in his book, *How to Grow More Vegetables*.

Advantages of Double-Dug Gardens

- ✓ Creates defined beds, and allows all areas of the bed to be within easy reach.
- ✓ Creates an excellent quality soil in which to grow.
- ✓ Encourages a healthy soil structure and teaching about soil maintenance.
- ✓ Building the initial beds is a great project for students and volunteers. The hard work is very rewarding!



Above: completed double-dug beds surrounded by mulch and with hoops for season extension (plastic covers them)

Disadvantages of Double-Dug Gardens

- Requires an initial investment of time and labor.
- The technique is labor intensive when building the garden for the first time. Requires hard work.

4) Traditional In-Ground Garden Beds

Growing in-ground is the most commonly understood means of growing a garden in the US and follows the farming tradition seen in almost every part of the country.

Advantages of In-Ground Gardens

- ✓ Can be easy to install.
- ✓ Many people are familiar and comfortable with this method.
- ✓ In-ground gardens are easily maintained if the planting areas are clearly taped off with string and ribbons. The students should tape off the areas for planting themselves to increase understanding of the boundaries of the paths and the beds. The paths can be marked with a mulch of pine needles, bark or wood chips, and the beds can be marked with a mulch of another type of biomass such as straw or grass clippings. Posting signs can help define the space.

Disadvantages of In-Ground Gardens

- Very difficult to prevent soil compaction and requires clear, defined pathways through the garden. Imagine 20 little feet scampering among the rows and the damage this can do!
- The soil in Albuquerque areas is easily depleted and will require amending every year unless the double-dug method is used in conjunction with the growing of these plots. Use sheet mulch and crop rotation to maintain soil quality.

Phase 3: Maintain the Garden

Gardens are not self sufficient (even if they have drip irrigation systems on a timer) and they can go downhill fast or thrive depending on the amount of attention they receive. Ideally a garden should be checked on daily basis. Even 10-15 minutes can make a huge difference. Often, the condition of a garden reflects the time given to it.

A maintenance schedule must include these basic activities for positive results:

- Watering schedule based on the garden's unique design
- Pest-watch and removal without the use of chemicals
- Regular weeding without the use of chemicals
- Planting in accordance with weather and seasonal conditions
- Harvesting of vegetables and flowers in a timely manner to maximize flavor and appearance
- Installation of cold frames, shade cloth or other structures to protect plants from weather conditions
- Fertilize veggies at least once in a season, 1 month after planting
- Regular mulching
- Work days 2-3 times a year that include big jobs like raking, loosening soil, planting, building new structures, repairing old structures

TIP: Organizing on-going maintenance of garden

Maintain a "To Do" list and/or calendar for the garden. This can be kept in a central location and accessed by classes as well as volunteers. It can contain regular and episodic garden needs. Have different classes assume responsibility for certain tasks such as weeding, watering, pest watch, planting, harvest, leaf raking, sign making, compost turning, and general clean-up.—*Down to Earth*, a book put out by the Albuquerque Master Gardeners, has a month by month guide to garden maintenance ideas.

Growing Basics for Plants

- ✓ **Healthy soil**
- ✓ **Adequate water**
- ✓ **Protection from the elements and pests**
- ✓ **Your time!**

This section includes information on planning and maintaining a garden. In the realities of growing in an extreme and unique environment such as the one we have in Albuquerque, it will be very important to focus on the experiences in the garden versus the quality or quantity grown. That said, the experiences and yields can be enhanced by incorporating some basic techniques and principals into your gardening practice.

SOIL

Amending and maintaining your soil is the key to healthy plants.

- Soil should have a loose and airy texture with lots of organic material to hold water for roots to grow. Crumbly soil called ‘friable’ or ‘in good tilth’ has good air circulation for healthy roots and proper drainage. However, this kind of soil is not native to New Mexico. Unfortunately for vegetables, local soil has little organic material to retain water. Though native plants like this condition, annuals require more nutrients and moisture. Our soil is also highly alkaline, which reduces the availability of nutrients for plants and affects what grows successfully. Our soil is also often compacted, which causes poor drainage.
- Learn what type of soil you have by:
 1. Going to <http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>. If you need help using this tool contact the Bernalillo County Cooperative Extension Service.
 2. Doing a quick test to find out the percentage of clay, sand and silt in your sample: <http://hydrology1.nmsu.edu/teaching/soil456/soiltexture/soiltext.htm>
- There are many private companies that test soil. Ask your favorite farmer where they get their soil tested. NM State University no longer has a soil testing lab but nearby state universities have excellent testing labs.

Option 1: Colorado State University. Vials and paperwork can be picked up at the Bernalillo County Extension Office, 1510 Menaul Extension NW, 243- 1386. A basic test costs \$31. The test includes an analysis of pH, soil salts and nutrient levels in the soil as well as an interpretation of the results and recommendations.



Option 2: Utah State University Analytical Labs. A basic test costs \$14. Instructions can be found at: <http://usual.usu.edu/index.html> (choose forms and then soil). Samples are submitted in a quart sized Ziploc bag (no gallon sized bags please). The test includes pH, salinity, texture, P, K ,and recommendations.

- Investigate what the soil in the garden area was exposed to in the past. What was here before a garden? What was here before this site was a school? The City of Albuquerque has information on sites in the city that were previously gas stations or dumps. The city contact is Billy Gallegos at 768-2658. If you have concern about lead have the soil tested (see below).
- Many soils in Albuquerque need amendment (adding organic matter to improve soil health). Usually this means adding compost. Select a soil mix that supports your plant choices and improves your soil conditions. Some plants will like more consistently moist conditions, while others (such as xeric plants) will appreciate a fast draining mix. If possible, research the ideal conditions for your plants first and place plants with similar needs close to one another.
- You can add straw, wood shavings or pine needles to the top layer of soil. These materials are not often used in other regions because of their effect on nutrients; however, we can use them here because they break down slowly in our climate.
- Mulch garden beds to preserve your soil, retain moisture, and protect it from sun.
- Soil needs to be maintained. You cannot just amend it once and be done with it. Monitor the quality of your soil and practice techniques such as crop rotation, planting cover crops and mulching heavily.
- Vermicompost is a great way to compost. In this system worms (usually red wigglers) convert food waste into worm castings (worm manure). The castings are full of amazing nutrients for the garden plants. Vermicompost is usually done in "worm bins" which can be built out of wood but are more commonly portable systems made out of paint buckets or plastics bins. They are idea for the classroom setting. More at: http://aces.nmsu.edu/pubs/_h/H164.pdf

Loosening the soil

Compacted soil prevents plant roots from spreading and water from draining appropriately. Plants cannot thrive in this condition. Tilling with machinery is a popular method of loosening soil. Many school gardeners find they need to till when they first begin a garden to loosen compacted soil. However, many experienced gardeners discourage annual tilling because it disturbs the natural ecosystem of the soil, kills earthworms, and disintegrates the soil structure. Tilling also requires expensive equipment. Other less destructive methods for loosening soil include hand loosening with trowels, shovels and pitchforks. Many schools find this method useful as it can involve many students. Students can also see the immediate results from working with hand tools. Schools can prevent soil compaction by minimizing walking on the soil. Mulching and adding compost regularly is the best long-term method to maintain loose, healthy soil.

TIP: Benefits of Digging in the Soil

It is important to allow children to participate in building their garden from the ground up without dependence on adults to haul in materials or provide equipment to prepare soil. Children also grow a connection with the living soil when they explore, observe and struggle to dig small pieces of soil and turn them over.

To know the soil is to know the earth, and to know the earth is to protect it. Additionally, the pleasures of using one's physical prowess in concert with a tool and the earth, enables one to fully reap what they sow.

People of all abilities (with the right tools) take great pleasure in digging; it is a basic hardwired activity of humans. City kids who are great with an electronic device may be challenged to learn about the physics of managing a hand tool, but it is a lesson that will make connections to other basic skills, cerebral and physical.

Below: Students from NM School for the Deaf (Left) and East San Jose Elementary (Right) use their hands to dig in the soil.



Fertilizing

When we feed our garden plants, they are more productive and return the favor by improving our environment. Feeding your garden regularly with natural fertilizers makes plants healthy and strong. Healthy plants that are fed well, but in moderation, are more nutritious for you and more resistant to problems. Natural fertilizers include: bone meal, alfalfa meal for foliar spray, fish and seaweed compounds, products of vermiculture, and fish emulsion. The product should be organic or certified organic to assure the quality of the product. It is best to stay away from fertilizers that depend upon just adding a specific nutrient like nitrogen, potassium, and phosphorus. Remember that the healthier the soil, the healthier the plants; healthy soil requires no supplemental fertilizer at all.

Compost

Compost is food for your soil, and acts like a sponge to hold water. It is an indispensable tool in garden survival. Teaming with billions of hungry microbes, its addition to your garden helps ensure essential minerals in the soil are available as food. Please refer to the Resource section for reliable compost sources in Albuquerque. See Appendix C: School Composting on page 52 for more information on safety considerations with compost.

School-Made Compost: School gardens can provide an ideal location for making compost on-site. Students can compost vegetable and fruit scraps from meals, and can observe the composting process first-hand while creating soil amendment. Examples of school compost systems: indoor worm compost bins, outdoor compost pile contained by pallets and chicken wire, commercial outdoor compost bins or wheels (made of plastic or metal). Refer to the Master Composter website for more info: <http://bernalilloextension.nmsu.edu/mastercomposter/what-is-a-master-compost.html>.

WATER

Not watering enough is the biggest mistake people make in watering their garden.

When plants are not adequately watered, their roots stay near the surface where they are vulnerable to heat, wind and other weather conditions. Deeper roots create more sturdy plants, and roots will only go where the water is! Aim to maintain water at least 4-6 inches deep. Dig down and check to see how deep your watering goes. About 2/5ths of all the fresh water used in the United States goes to irrigate crops. The majority of irrigation occurs in the west where water is scarce; given this, it is important to use efficient and appropriate irrigation methods.

The following are important reminders for watering in the desert Southwest:

- Evaporation of water from the soil surface is the greatest gardening challenge. Water deeply (4-6 inches).
- Keep seedlings moist (this may require twice daily watering in midsummer).
- Water more mature plants regularly and deeply, every few days. Allowing plants to go too long without water stresses them, stunts their growth, makes them vulnerable to diseases and pests and will reduce the harvest.
- Adjust your watering/ watering systems according the weather conditions.

- Use mulch or straw to retain water and reduce evaporation.
- Research shows that the best time to water is in the early morning or between midnight and sunrise; when humidity is high but temperatures and wind speed are low. Water as early as possible in the morning.
- Remember that some plants, such as those in the cabbage family, like water on their leaves. Others such as tomatoes, peas, and members of the squash and melon families, can suffer from mildew or rot when their leaves are wet.

Capturing water

Catching water in rain barrels can be an important part of the garden and a fabulous hands on teaching tool. A good book to read on water catchment is Brad Lancaster's *Rainwater Harvesting for Drylands and Beyond*. This book teaches about how to catch water in barrels but also how to direct rain water for maximum benefit in the garden setting.

- The key to capturing water is gravity. Water always runs downhill.
- Gravity can be used to feed a manual watering approach by putting up tanks on a stand.
- Any non-permeable container can be used to collect water.
- An average monsoon rain will fill a 50-gallon barrel in minutes. When it does rain, 200 gallons could be collected for use with the right set-up!

TIP: Seek Ideas

If watering your garden becomes frustrating, you may find it helpful to visit other school or community gardens to get ideas from them. There is always a way to water a garden! Don't let water issues stop you.

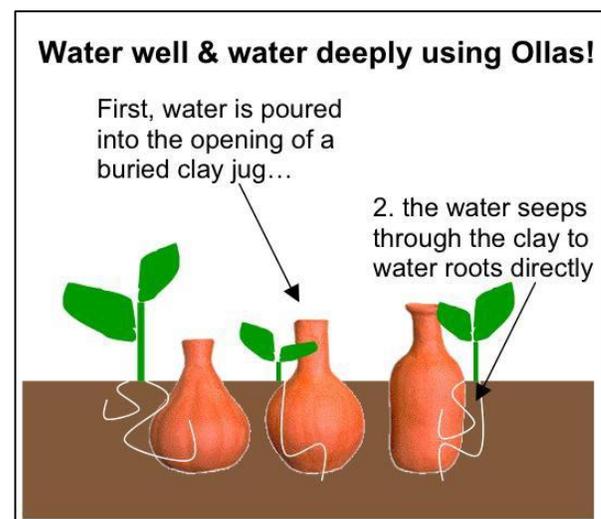
Lower tech ways to water

- Hand watering by hose or watering can. Keep in mind that a heavy stream can significantly compact soil; use an attachment that creates a diffuse stream.
- Transport water from a source near the growing spaces.
- Create irrigation canals.
- Use clay pot, or Olla, irrigation.
- Capture and harvest large amounts of rainwater with gravity feeding that is diverted to the garden area.

Higher tech ways to water

Requires greater input of materials, maintenance and infrastructure, but can be very efficient.

- Soaker hose, T-tape, drip tape or tubing
- Watering systems used in conjunction with timers, which can be very useful in managing weekend, holiday and summer watering
- Keep irrigation and timers out of site to discourage mischievous pranksters.



PROTECTION FOR PLANTS AND SOIL

Mulch

Mulching is a highly effective technique to address the hot and dry weather conditions in the desert southwest while improving soil quality. Mulch materials can also be piled on your garden area in fall/ winter, watered occasionally (to stimulate rotting of the materials), and then turned into your soil in the spring.

Keep in mind that in heavily mulched gardens you have to be careful to water sufficiently otherwise the water cannot make it through the mulch layer. Even a moderate rain may not reach through the mulch layer. Drip irrigation systems should be placed *beneath* the mulch layer.

Why mulch?

- shades the soil which keeps it soft
- reduces evaporation
- keeps soil cool
- discourages weeds
- encourages earthworm and microbial activity
- adds a design element with minimal expense
- adds organic matter to your soil and improves soil quality when it decays

Examples of mulch include:

- leaves
- straw (NOT hay, which has seeds)
- newspaper (7-10 sheets)
- cardboard
- shredded or chipped wood pecan shells
- *Stones are not a good mulch – they compact the soil and retain heat.*

“Sheet Mulch” in the Fall to prepare the soil for the spring garden:

1. Mark off the garden area.
2. Trample down the weeds but don't cut them off.
3. Water the area well.
4. Spread out some weeds gathered from other garden areas.
5. Lay down a 6 inch thick carbon-rich layer of material such as brown leaves, dried grass, and dead weeds.



TIP: Modified Mulching Method

Start with existing soil

Have students loosen the soil with shovels, removing or chopping large roots. Dig compost into the soil with kid-sized shovels. This can be done throughout the early spring into March.

Allow soil to combine with the compost for several weeks before planting to allow integration of microbes into the soil.

After planting, mulch the soil with grass clippings, shredded leaves or more purchased compost.

As the plants grow taller, add more mulch to minimize water loss and weed growth. Continue this practice to greatly improve the soil over the years.

6. Lay down at least a 3 inch layer of a nitrogenous material such fresh weeds or fresh green grass clippings.
7. Sprinkle on some good rich garden soil, or even better, some live compost. The microorganisms in the compost or soil will inoculate the sheet mulching pile: they are responsible for decomposition of the pile, will multiply and begin their work.
8. Completely cover the sheet mulch area with something thick and carbonaceous, such as many sheets of newspaper, big pieces of corrugated cardboard, or an old cotton or wool rug.
9. Water the sheet mulch well.
10. Add a weed-free carbon layer (i.e. dead leaves or dried grass clippings) to facilitate the decomposition of the cardboard or rug. The layer should be several inches thick.
11. Add a layer of aesthetically pleasing mulch such as pine needles, straw, or fine wood chips.
12. Water again and maintain moisture throughout the winter.
13. You can now plant directly into the newly created pile with transplants; just cut an X into the sheet to penetrate the newspaper or cardboard layer, add some nice potting soil, and plant your transplant.
14. Or wait until spring and slice into the sheet wherever you want to put a plant or a seed. Add some soil and tuck the sheet mulch back around the plant.
15. Keep the whole sheet mulched area moist. This will not be difficult given the sheet's water holding capacity.
16. Expect the sheet to decompose and become shorter in height as the years go by. You will want to continue to add several inches each of nitrogen and carbon layers annually.
17. **NOTE:** in our dry climate it is a good idea to water after each addition of a layer.



sheet mulching

Microclimates

In Albuquerque's climate, elements can be dramatically different from one spot to another and separated by as little as 5 or 10 feet. Study your garden to discover the favorable conditions that support plants, and the obstacles that cause difficulties for plants. Students can develop their skills of observation by helping to identify these microclimates too. Elements that affect your microclimates include:

- exposure to and protection from wind and sun
- drainage and collection areas for water after rain
- location of buildings, walls or fences during different times of day that can provide opportunities for shade, wind breaks and heat collection in winter

Sun & Shade

In our hot, arid desert, all living things need a respite from the scorching sun. Shade is a cooling ally that aids in high desert survival. Here are some ideas for providing shade to plants:

- In garden plots, shade cloth will protect plants during the hottest parts of the day. Construct a frame made of recycled materials.
- Use walls strategically to shade plants from constant exposure, from the harshest sun of the day, or the strong winds in spring and fall.
- Assess how existing walls may radiate the sun's intensity and be harsh for plants.
- Shade structures can create a comfortable place for teaching to occur, and may be necessary for people to enjoy the garden.
- Plant more trees (but think about how their roots will impact your watering).
- Plant strategically so that plants shade the ground when mature. For example, grow corn with squash beneath it so that the large squash leaves shade the ground.
- Grow a hedge on the western side of the garden – sunflowers, amaranth, corn, wheat all make good annual hedges. Perennial hedges might include Jerusalem artichokes, butterfly bushes, wild plum, gogi berries.

Seasonal planting

Choosing plants to grow in your garden depends, in part, on the season. Many vegetables grow only for one season (annuals), with new varieties planted in the following season as the weather cools or warms. Air and soil temperatures determine what annuals will grow and when seeds will germinate. Perennials continue to grow year and after year, and will not be killed by seasonal cold or heat. Planting vegetables in the right season will improve garden success and yields.

Cool Season Vegetables and Herbs:

Typically planted in March/ April AND/ OR August/September, harvest October-April.

artichoke, asparagus, beets, broccoli, brussel sprouts, cabbage, carrots, chard, kale, spinach, lettuces, mache, kohlrabi, peas, radishes, turnips, cilantro, parsley, garlic (over winter it and harvest in early summer)

Warm Season Fruits, Vegetables and Herbs:

Typically planted outdoors after May 1 - end of June.

beans, carrots, okra, onion, peppers, pumpkin, squash, tomatoes, watermelon, basil, chives, lavender, rosemary, sage, sorrel

The following table is reprinted with permission from Bernalillo County Extension Service from *Down to Earth: a Gardeners Guide to the Albuquerque Area*, 3rd Edition.

| Vegetable | Seed Planting Dates | When to Harvest |
|-------------|---------------------|---|
| Asparagus | March 1 – April 30 | Cut or snap spears off at soil line when 6-10 inches long, before heads open. Cease harvesting when average spear diameter is less than 1/4 inch. |
| Beans, snap | May 1 – May 31 | Full-sized pods, beans about 1/4 of their mature size, before constrictions in the pod are evident. |
| Beans, Lima | May 1 – July 15 | When well-filled, but not over-mature. Seeds should be green and tender. |

| | | |
|----------------------------|--|--|
| Beets | March 1 – April 15 July 15 – August 1 | Diameter of 1 1/2 – 2 inches. Harvest before hot weather in Spring or moderate frost in Fall. Tops used for greens should be tender. |
| Broccoli* | March 15 – April 1 July 1 – July 15 | When head is fully developed, tight and before flowers begin to open. Remove with sharp knife, leaving 4-6 inches of stem. |
| Brussels sprouts* | April 1 – May 15 | Mature from bottom up. Harvest sprouts when bright green, plump, firm and before hard freeze. |
| Cabbage | March 15 – March 31 July 1 – July 15 | Compact, firm head. |
| Cantaloupe* (Muskmelon) | April 15 – April 30 | When stem separates easily from fruit. |
| Carrots | February 15 – April 1 July 1 – August 1 | Depending on variety, about 3/4 to 1 1/2 inches in diameter. In Fall, harvest before moderate frost. |
| Cauliflower* | March 15 – March 31 July 1 – August 1 | Tie or break outer leaves over developing head when 1-2" in diameter to protect them from sun. Check heads every 2-3 days afterwards and harvest when they are tight and smooth. |
| Chard, Swiss | March 1 – April 15 July 1 – August 1 | As leaves become large enough. Harvest continuously through summer until frost. |

| Vegetable | Seed Planting Dates | When to Harvest |
|--------------------|---|--|
| Corn, sweet | April 20 – July 1 | When kernels are near full size and silks brown. |
| Cucumber, slicing* | April 15 – May 15 | Size desired. |
| Eggplant* | April 15 – May 15 | Immature to less than full grown, firm, glossy and black to purple in color. Harvest before the skin toughens and seeds become large. |
| Lettuce, Leaf | March 1 – March 31 July 15 – August 15 | Whole, before hot weather. |
| Okra | April 15 – April 30 | Immature pods (3-4 inches long) |
| Onions | February 15 – March 15 | Depending on variety, when about half the tops have weakened and fallen over and bulbs are at least 2" in diameter. |
| Peas (edible pod) | February 15 – April 15 | When pod is fully developed, but before seeds are more than 1/2 full size. |
| Peppers* | April 15 – May 15 | Fruit should be full size, but still green (or slightly red), firm and crisp in texture. If red fruits are desired, leave on plant until red color develops. Let red fruit dry on plant. |
| Potatoes, Irish | April 1 – May 15 | Do not harvest until vines turn yellow or die. Tubers should be allowed to cure for a few days in a well-ventilated, shady place. |

| | | |
|-----------------|--|--|
| Pumpkin | May 1 – May 15 | When fully colored with skins hard enough to resist denting with a fingernail, and before a hard freeze. |
| Radishes | March 1 – April 30 | When roots reach edible size. |
| Spinach | February 15 – March 15 August 1 – August 30 | Can be cut just below the crown for once-over harvest, or above the growing point to allow regret. Older leaves can also be pinched off near the base of the plant to allow multiple harvests. |
| Squash, summer* | April 15 – July 1 | As immature fruit when young and tender. Zucchini are harvested when 6-8 inches long. Scallops should be 3-4 inches in diameter. |
| Tomatoes | April 15 – April 30 | At the pink stage or beyond. |
| Watermelon | April 20 – May 20 | Dull sound at thump. Soil spot is white to yellow. Rind at soil is tough and resists denting. |

*Transplants should be set out about 2 weeks later than the date for seeding these plants.

Compiled from –Growing Zones, Recommended Crop Varieties, and Planting and Harvesting Information for Home Vegetable Gardens in New Mexico, Circular 457-B, by New Mexico State University Cooperative Extension Service, College of Agriculture and Home Economics; and –When to Harvest Vegetables, Guide H-216, Ibid., Revised by George Dickerson, Extension Horticulture Specialist. These guides are available online at cahe.nmsu.edu/pubs for downloading.

Check out Appendix D: Edible Landscaping in Schools on page 53 for more planting ideas!

Harvesting vegetables

Once your vegetables are growing many people have questions about when to harvest them and how to harvest them. NMSU has an excellent publication on this at: <http://aces.nmsu.edu/pubs/howto/howto.html>.

Season Extension

In New Mexico we can grow vegetables year round. Growing year round can be important to engaging students throughout the school year.

- Cool Season – some plants need protection from the cold. This can be accomplished by cold frames, hoop houses, greenhouses, frost covers (cloth, jars, plastic) and heavy mulching. Find information on cold frame construction at: http://aces.nmsu.edu/pubs/_circulars/CR-606.pdf
- Warm Season – some plants may need shade (commonly used techniques are shade cloth or shade from other plants) and mulch to extend their growing season
- Xeric plants – It a method to sustain a quality of landscape on limited water supplies. <http://farmingtonsc.nmsu.edu/xeriscape-plants.html>

TIP: Don't know? Look it up!

NM State University has TONS of easy to read information related to gardening in New Mexico.

Check it out: <http://aces.nmsu.edu/pubs/> and NM growing zones and recommended varieties: http://aces.nmsu.edu/pubs/_circulars/circ457B.pdf

APS and School Gardens: Partnering for Success

This section of the handbook provides information on APS district departments and the resources they can offer school gardeners.

Developing a project in the school environment requires collaboration with many entities. For the long-term success of your garden it is wise to make sure that you have gone through the proper channels to approve your project plan and gain support for sustainability. To determine the proper steps consult with your school principal.

Background checks

APS requires community and parent volunteers who might be alone with students have a background check (valid for 2 years).

APS Fingerprinting Background Check Provider Process:

- Obtain the **APS BACKGROUND CHECK / FINGERPRINTING** form from the Student, Family, and Community Supports (SFCS) Division ((APS City Center - 6400 Uptown Blvd, Suite 340 West).
- Take fully completed **APS BACKGROUND CHECK / FINGERPRINTING** form to: APS Fingerprinting Office 6400 Uptown BLVD. NE Suite 105 E(8am-4pm Monday-Friday).
- Provide picture identification.
- Pay Background Check Fee:
 - \$44.00 with Debit/Credit, Money Order or Cashier's Check **Only** payable to: **3M COGENT**
- SFCS Division will issue an **APS SFCS Division Provider Clearance Name Badge** to providers who successfully clear the APS Fingerprinting Background Check.
 - Both providers and their agency will be notified (via e-mail) to pick up their **APS SFCS Division Provider Clearance Name Badge** at the SFCS Division office at City Centre: 6400 Uptown Blvd. NE Suite - 340 West
(Contact Person: Janet Walters, Administrative Assistant to Dr. Kristine M. Meurer, Executive Director, SFCS Division, [855-9796](tel:855-9796))
- Providers will be required to display their **APS SFCS Division Provider Clearance Name Badge** on APS property. In addition, providers may be asked for a picture ID.
- Principals have the right to refuse access of students in their school to any outside provider.
 - Providers must have school principal/designee **approval prior** to rendering services at school sites. (Note: This approval may come through communication with the SFCS Division, such as with afterschool providers. However, during school hours a principal may determine, on a daily basis, whether or not it is appropriate for the provider to see students –e.g. a principal may refuse access to students during testing).
- Volunteers during school hours must comply with the schools check in/sign in process.
- Providers must be professional, both in appearance and behavior.
- All providers have a limited scope of work and are not “at-will” to provide additional services or participate in school related functions without permission from the school administration.

APS procedure is that volunteers should:

- 1) Get a volunteer confidentiality form signed by the school principal and
- 2) Take the form to the first floor of the APS Administrative Offices, 6400 Uptown Blvd. NE, along with a picture ID and an \$18 cashier's check, money order or credit card. No personal checks or cash are accepted.

Volunteers who have cleared their background check will receive a volunteer card distributed by the school. They will be required to present this card each time they volunteer for a school activity.

For more information: <http://www.aps.edu/volunteer-with-aps>.

Facilities Design and Construction Department

APS Facilities Design & Construction (FD&C) is responsible for the on-going, district-wide construction, renovation and major repairs of APS facilities.

If your school is in the early stages of a remodel it may be possible to work with the Facilities Design and Construction Department to include a garden space (including water access via spigot or water catchment tanks) in the remodel plans. A similar opportunity exists when new schools are being built. Additionally, the FD&C Department will have information about how planned remodels might affect existing garden locations.

At the school level, there may be a facility committee. It may be helpful for school gardeners to be in contact with this committee to learn about proposed remodel activities and how they might affect an existing garden or be an opportunity to build a garden space.

Contact: Karen Alarid, Director, 848-8818, alarid_k@aps.edu



Above: Shade Structure and outdoor seating at Bandelier Elementary

Food and Nutrition Services

The following was developed in cooperation with the APS Food and Nutrition Services.

APS Food and Nutrition Services provides healthy school breakfasts, lunches, and snacks to students. They provide nutrition education and work with children who have special nutrition needs.

APS Food and Nutrition Services supports school gardens as a way to teach children about food, nutrition, healthy weight, food history and food cultures, food preparation, sanitation and hygiene.

The below guidelines were developed based on the USDA/FDA Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables (<http://www.fda.gov/downloads/Food/GuidanceComplianceRegulatoryInformation/GuidanceDocuments/ProduceandPlanProducts/UCM169112.pdf>), information from the University of Maryland's "Food Safety in the School Garden" website, and with guidance from the City of Albuquerque Environmental Health Department (<http://www.cabq.gov/envhealth/>).

1. **Compost:** Be sure to purchase soil or compost from professional, reputable, traceable sources. Do not use any product that cannot verify the safety of treatment. Do not use fresh or un-sterilized manure. Only use heat-treated manure, which should be stated on the label. Aged manure is NOT the same as heat-treated and can contain disease-containing organisms. Do not use donated compost or soil from households. To avoid any contaminants in school-made compost it should not be used on edible plants. School-made compost can be used for flowers, decorative plants, or school landscaping. School-made worm castings from indoor worm bins are fine to use on both edible and decorative plants.

Check out Appendix C: School Composting on page 52 for more details.

2. **Lead:** Lead can be absorbed into plant tissue, but the greatest exposure occurs when contaminated soil dust is inhaled, when contaminated soil is ingested by young children, and when soil particles containing lead adhere to garden produce that is later consumed. It is recommended that garden soil be tested for lead (see Page 24). Additionally it is important to research what the garden site was used for previously. Was it a trash dump? A parking lot? See Page 22 for more information on how to research a site)
3. **Building Materials:** Do not use items that can contain toxic materials. This includes railroad ties which contain creosote, a carcinogen; treated lumber which contains the poison cyanide; or old tires which can leach petroleum products into the soil.
4. **Site security:** Site security is very important. When you look at the garden area think about ways that the plants and produce could be contaminated or tampered with by visitors and how you might prevent this. The area needs to be located so as to discourage entry by unauthorized persons and animals. Rabbits, mice, raccoons, prairie dogs, coyote, dogs, and cats may damage crops and leave feces. Fencing can be used to discourage entry into a garden. It is best if fencing goes several inches into the ground and has small openings so that small animals cannot enter.
5. **Pest control:** Pests need food, shelter and the correct environmental conditions. If you minimize access to these requirements, you can minimize their populations. Harvest produce regularly and pick up and remove rotting fruit or vegetables. If you feed birds near your garden, remember that bird feed can attract rodents if access is not prevented (e.g. by feeder design). Don't leave standing water in or near the garden: mosquito larvae can thrive even in small amounts of stagnant water. Restrict nesting and hiding places for rats and mice by mowing the grass or other vegetation at the edges of your garden. For insect pests, gardeners are encouraged to use non-chemical techniques such as crop rotation, mechanical exclusion, hand removal of bugs and sanitation. Flowering plants can encourage beneficial insects such as predators and parasitic wasps, and some plants may help deter pests. See Resource section for pest control websites.

6. **Water:** Be familiar with the quality and safety of the water source you use in your garden. Since this is food for consumption the water source must be from a clean source which might include hoses and rain barrels. Water of inadequate quality (for example well water, ditch water) could be a direct source of contamination or a vehicle for spreading localized contamination. It is recommended that garden hoses be connected to a backflow prevention device.
7. **Suggested crops:** Due to the difficulty of effectively cleaning mushrooms and sprouts these are discouraged. Leafy produce should be washed with extra care. Tomatoes, carrots, corn, zucchini, herbs, radishes, green beans, peas and other easily cleaned vegetables are recommended for meal consumption. Decorative corn, lavender, gourds and pumpkins are recommended for harvest sales. Be sure you are planting items that are safe for children to touch or consume. Some plants or parts of plants are toxic and/or cause allergic reactions: <http://www.pioneerthinking.com/toxicg.html>
8. **Hand and foot hygiene:** Hygiene and sanitation practices are critical to safe gardening. Staff working with youth gardeners must work diligently to ensure fruits and vegetables are handled in the most hygienic manner possible. Hand washing and shoe cleaning are two of the most important areas to minimize this. Hands should be washed with warm water 20 seconds and dried with a paper towel before vegetables are picked, prepared or served. Hands should also be washed after students have worked in the garden area. Cover wounds of anyone who may touch vegetables with gloves. Do not let anyone with an illness handle food. The best way to avoid shoe contamination is to keep students on mulch pathway. When working in the soil it is recommended that rubber shoes or designated -garden shoes|| be worn in the garden. Bare feet, sandals, or flip flops should not be allowed. Information on how to properly wash hands: <http://www.cdc.gov/cleanhands/>
9. **Harvesting:** Use clean containers that are made from materials designed specifically to safely hold food. Examples include paper grocery bags, 5-gallon food-grade buckets (that held pickles or other food products), colanders or kitchen bowls. Plastic garbage bags, trash cans, and any containers that originally held chemicals such as household cleaners or pesticides are not food-grade. Use clean hands or gloves (that have not been used to stir compost or pull weeds) when picking produce. Brush, shake or rub off any excess garden soil or debris before putting the produce into the harvest container or bringing produce into the kitchen.
10. **Consuming produce from the garden:** Food grown in APS gardens may be prepared and consumed by the students in the classroom and at lunch. When in the garden, students should always consult with an adult before they consume something picked from a plant. Food prepared for classroom consumption should be prepared in accordance with the below guidelines. Food served in the cafeteria can be served as an addition to the menu not as a substitute for any item.
11. **Preparing vegetables and fruits:** Items prepared in the classroom should be triple washed before they are cut and/or served. There needs to be a pre-designated area for washing the vegetables with potable water. The washing area and cutting instruments must be clean. Extra care should be taken to wash greens and the exterior of vegetables with rough surfaces (such as melons and certain squash). Glove use is advisable. It is advised that you keep a sample of what

students consumed in a container in the refrigerator for one week. To be safe, do not use fresh, cut-up fruits and vegetables if they have been held longer than 2 hours at room temperature or longer than one hour at temperatures above 90 degrees F., unless you intend to cook them. Information for schools and students on food safety: www.foodsafeschools.org/ A website that reviews the basics of how to keep food safe from bacteria: www.fightbac.org/

12. **Cafeteria handling:** Produce is to be received after an initial washing by the growers and is to be maintained in a separate area. This is to be washed a minimum of two (2) more times before consumption. The produce is to be saved on a separate -Charlie II tray for one week (sample of fresh food). There should always be a week of trays on hand. All food from gardens should be served to students in addition to the menu not in place of a menu item and noted on food production records as such.

13. **Collaborating with cafeteria staff:** Like all school staff, cafeteria staff are often very busy. If you would like to incorporate garden food into the cafeteria menu or offer garden vegetable tasting in the cafeteria allow ample time to meet with cafeteria staff to see how you might work together to accomplish a common goal.

If you have additional questions contact Food and Nutrition Services.

Contact: Janet Novak, Special Needs Dietitian, 505-345-5661 x37040, janet.novak@aps.edu

Health and Wellness Department

APS Health and Wellness Department is responsible for providing support services and prevention programs that promote student well-being, address barriers to learning and contribute to student success.

In terms of gardening this department can be helpful in supporting schools in incorporating gardening into their wellness policy, plan and school health advisory council/wellness team activities. They may also be able to direct you to local resources and connect you with other school gardeners.

Contact: Jeanne Forrester, Wellness Manager, Ed.D. 505-855-9793, forrester@aps.edu

Maintenance and Operations (M & O)

APS M & O is responsible for the APS physical plant. The mission of the department is to provide the highest quality district facilities and operations to enhance the environment for teaching and learning, and to provide for safe, clean, comfortable, attractive, and functional facilities throughout the school district.

APS M&O can offer resources and help with many garden related issues and projects. See below for the proper procedure and contact for your issue. When you request M & O's assistance be mindful that they have many responsibilities

- If you are **starting a garden, or are expanding to new areas**, M&O can conduct a site visit to assess potential garden plan and recommend appropriate garden site.
 - Email Benny Baca (baca_b@aps.edu, Landscape Supervisor) & Judy Sanchez (sanchez_jud@aps.edu, Irrigation Supervisor)

- If you are going to **dig into the ground** you must have M&O check your site to mark underground water pipes, electrical cables or gas mains before digging begins.
 - Call Joseph Kolozy (865-5950, ext 200)
- For **irrigation issues** (M&O will only repair existing systems. Note: They will not install new irrigation systems).
 - Email Judy Sanchez (sanchez_jud@aps.edu, Irrigation Supervisor)
- M&O can **provide free compost** from the city and deliver it to your site. **mulch or soil?**
 - Put in a work order through your main office for the amount of compost you'd like (in cubic yards). The work order should be for the M&O landscaping department. Please include contact info for the person requesting the compost.
- M&O can **pick up and deliver compost or other products (soil, mulch, etc) from non-APS suppliers** like Soilutions.
 - Once you have paid and ordered your product, put in a work order through your main office for the landscaping department. In the work order include your contact info, where & how much product your ordered, and a PO# from the supplier.
 - For example – Fallon Bader (cell phone #) purchased 3 cubic yards of topsoil from Soilutions.
 - For questions with this process, email Philo Ramirez (Ramirez_ph@aps.edu, Heavy Equipment supervisor)
- Also, **before starting a garden project**
 - Check with APS Dept of Facilities Design & Construction (Call 848-8810) to see if there are any future plans for reconstruction at your site. You don't want to build on a garden on a site that may be bulldozed in a few years

TIP: Do not spray signs
 APS campuses are regularly sprayed with weed killer. If you do not want your garden area sprayed make permanent signs with a statement like:

*“VEGETABLE GARDEN:
 DO NOT SPRAY WEED
 KILLER HERE”*

Risk Management Department

The mission of the Risk Management Department is to provide the Albuquerque Public Schools effective and efficient property and casualty insurance services intended to mitigate accidental losses and minimize disruption to the learning environment.

Risks associated with gardening might include injuries related to tool use, bug bites, sunburns, prickly plants, hazardous pesticides, and anything that could trigger asthma or an allergy. Staff should work to eliminate or minimize risks. If you have questions about minimizing risks involved in your gardening project first discuss it with your school principal. With the principal's consultation you may decide you need the advice of APS Risk Management.

Contact: Brandie Duncan, Director and Loss Control Coordinator, 505-830-8463,
Duncan_b@aps.edu

APS Education Foundation

The APS Education Foundation is a non-profit organization established for promoting private support of the district and its students. The Foundation may be helpful in locating opportunities for grants for school gardens and/or providing fiscal management.

Contact: Phill Casaus, Director, 505-878-6165

School Nurses

Your school nurse is a great person to partner with to teach safety and health topics to student gardeners. Safety topics might include sunscreen use, glove use, effective hand washing, proper tool use too avoid hurting self or others. Health topics might include nutrition and exercise (such as working in the garden). All of these topics can be taught within the context of the garden.

School Counselor or School Social Worker

Like the school nurse, your school counselor or social worker can be partners in teaching social skills topics such as communication, cooperation, teamwork, and conflict management in the context of working in the garden.

School Gardens Resource List

Local Resources

American Friends Service Committee, *Building a Community Garden: A Collaboration of New Mexico Farmers and Educators* handbook, <http://afsc.org/resource/agricultural-curriculum>

This handbook was published by the American Friends Service Committee (AFSC) of New Mexico in February 2010 as a handbook for school teachers and community groups to teach gardening skills. The handbook features information and lessons on planning a garden, soil preparation, water, seeds, plants, insects, harvesting, winter production and food systems. Interspersed in the lessons are stories by the Advisory Council about farming in New Mexico, including using the acequia system, chile harvesting, and the tradition of San Ysidro Day. Photographs of familiar New Mexico landmarks and hand drawings by local New Mexico artists add to the charm of the handbook. A handy -crosswalk chart|| in the back of the book shows the content areas that each chapter enhances, such as science, reading, math, language arts, etc. *It can be downloaded for free off of the website or people can purchase a hard copy for \$10 by contacting 505-842-7343.*

Bernalillo County Extension Service, <http://bernalilloextension.nmsu.edu>, 243-1386

Offers guidance, technical assistance, training and educational programs on gardening, agriculture, horticulture, pest identification/management, plant identification, food and nutrition. Programs include:

- Albuquerque Area Extension Master Gardeners, <http://www.abqmastergardeners.org/>
- Horticulture Agent
- Master Composter
- Home Economist
- 4-H curriculum <http://aces.nmsu.edu/4h/>

East Central Ministries, <http://www.eastcentralministries.org>

ECM can partner with school groups to:

- Fundraising- ollas and seedlings at a discount price, then groups can sell at retail. A great way to raise funds for a school garden or other project!
- Ollas (clay pot irrigation)- discounted price on ollas, also seconds (chipped, cracked, etc., but still functional)
- Seedlings- discounted price on locally grown vegetable and flower seedlings in the spring
- Edible landscaping plants- grapes, blackberries, strawberries, etc.
- Seeds- free seed (vegetables, flowers)
- Worms- free (you dig) red wigglers for composting
- Chicks- young chicks or fertilized eggs for incubating
- Workshops- we can come do a workshop on any aspect of gardening

GardenersGuild, <http://www.gardenersguild.org/>

Offers support for growing in extreme Albuquerque environments, including online library.

Locally-owned nurseries

Many local, independent nurseries in town are supportive of school gardens, offer expertise and may offer resources for your garden. Consider them as field trip locations as well, used by permission. Possibilities: Rehms, Jericho, Plants of the SW.

Project Wet, www.projectwet.org, search for Albuquerque

The mission of Project WET is to reach children, parents, educators and communities of the world with water education. We invite you to join us in educating children about the most precious resource on the planet — water.

Rio Grande Community Farm, <http://www.riograndefarm.org>, 345-4580

Non profit urban organic farm, owned by the people of Albuquerque, where people grow food for people. This fall, they are offering class tours and volunteer opportunities for middle and high school students. RGCF provides APS Food Services with fresh organic produce. The annual Maize Maze is always big attraction for elementary students. In the springtime they offer workshops to teachers and the community on gardening, soil building strategies and food issues. By the 2011-12 school year they will have an education coordinator who will provide field trips and activities for elementary classrooms. Please visit for more information.

Veggiegrower Gardens, <http://www.veggiegrower.net>, 217-5110

Offers demos and supplies micro-intensive garden beds, seeds and other garden supplies

Farm to Table, <http://www.farmtotablenm.org/>, Le Adams, 473-1004 x10,

ladams@cybermesa.com, building hoopouses, supply lists and DVD, garden grant program, curricular resources

Compost/Mulch Resources

Soilutions, <http://www.soilutions.net>, 877-0220

Provides high quality information and products for composting and landscaping. This is an excellent resource for a beginner composter. Will accommodate field trips with prior notice.

Water Authority compost http://www.abcwua.org/Compost_Request.aspx

Baca's trees. 899-6666 Free wood chips. Call them to get on their list and they will call you when they have available chips.

City of Albuquerque Compost and Soil

Online Resources

National Gardening Association, Kids Gardening, <http://www.kidsgardening.com/>

National Farm to School, <http://www.farmentoschool.org/>

New Mexico Farm to School, <http://www.farmtotablenm.org>

Edible School Yard, <http://www.edibleschoolyard.org/>

Harvest of the Month, <http://www.harvestofthemonth.com/>

Life Lab Science Program, <http://www.lifelab.org/>

Peaceful Valley Farm Supply, <http://www.groworganic.com/default.html> (offers school gardens reduced prices)

Project Learning Tree, <http://www.plt.org>

Junior Master Gardner, <http://www.jmgkids.us/>

NM State University, http://aces.nmsu.edu/pubs/_h/ NM specific publications on a wide variety of horticulture topics. Very useful!!

School Garden Wizard, <http://www.schoolgardenwizard.org/>

USDA Team Nutrition School Garden Resources, <http://www.fns.usda.gov/tn/>

USDA Ag in the Classroom Teacher Center, <http://www.agclassroom.org/teacher/index.htm>

Special help for pests problems:

- Pest control in a garden: <http://www.attra.org/pest.html>
- Integrated Pest Management (IPM) & Plants that deter pests:
<http://www.nmda.nmsu.edu/pesticides/integrated-pest-management/>

Appendix A: Gardening Definitions

Below is a brief list of *functional* definitions in the context and for the purpose of growing a school garden. Many of these terms take a different shape in an adult, non-educational context where “success” and “failure” are more relevant to goals.

Compaction – When the soil gets hardened by outside pressure such as by walking or equipment. This is a condition of the soil that is most difficult for plants as it stunts the growth of roots and prevents water from draining appropriately. If growing a school garden in-ground, there is a high likelihood that the soil will be compacted, except in areas where the soil is mostly sand. After loosening and/or amending the soil, it is very important to create pathways through the garden to guide footsteps and prevent future compaction of the soil at the root zones. Teaching students about compaction helps them understand why they need to stay on the paths and lean into the garden to do work.

Irrigation – Any method used to bring water to a garden site.

Microclimate – A local climate that differs from the surrounding climate. For example, the climate underneath bushy plants or under a tree may be different than the surrounding climate. Any given area may have several different microclimates. Buildings, walls, existing plants and other elements create microclimates unique to that location so be ready to use them to your advantage!

Mulch – Any material that protects soil from exposure to the sun’s harsh rays, reduces evaporation, as well as the required maintenance in a garden (such as weeding).

Organic – Gardening using natural soil amendments, fertilizers and non-synthetic pest control methods. The focus is on building up soil health and vitality by stimulating below ground eco systems. The “organic” used in labeling commercially grown food has a very technical definition that is not used in this organic gardening context. (See <http://www.organic.org/> for more information on the commercially used term).

Sustainable gardening – Gardening that considers the long term effects or changes made to the environment. It generally has three focuses: environmental, economic and social sustainability. Any farm or garden will have a unique level of attainment in each of these areas. Sustainability questions you might ask include: Is this a good use of water? Will someone always use this space for a garden? Can we continue to purchase compost and seeds? Can we continue to take care of our tools? Can we keep the community interested in our project? If we put a lot of effort into the garden for a few years and then it goes fallow, what will be the impact?

Companion planting – Refers to plants that when grown together provide some level of mutually beneficial interaction such as pest deterring, fertilization enhancement, or crop compatibility.

Permaculture – Follows similar underlying concepts of sustainable agriculture with more focus on the environment, including nutrient cycling and site synergies. Also often includes the inclusion of perennial agriculture such as food forests and fruit trees.

Weeds – This term refers to plants that are growing where you do not want them. “Weeds” for the purpose of a school garden is a subjective term, determined by the specific garden plan

Appendix B: Garden Book & DVD Bibliography

Sorted by Title / Author. IL=Interest Level RL= Reading Level (Grade levels K-3, 3-5, 4-8)
PF = Professional

The all-new illustrated guide to gardening : planning, selection, propagation, organic solutions.

Completely rev. and updated. Pleasantville, N.Y. : Reader's Digest, c2009.
Planning your garden -- Lawns and ground covers -- Perennials -- Irises -- Peonies -- Daylilies -- Hostas -- Chrysanthemums -- Carnations -- Ornamental grasses -- Ferns -- Bulbs, corms, and tubers -- Dahlias -- Gladioli -- Lilies -- Rock and water gardens -- Annuals -- Trees -- Shrubs and vines -- Hedges -- Roses -- Rhododendrons and azaleas -- Heathers and heaths -- Fruits -- Vegetables -- Herbs -- Taking care of your garden. Presents a fully organic guide to cultivating more than 700 types of plants in one's garden, from flowers and shrubs to fruits and vegetables. Features more than 2,500 full-color photographs. **PF**

Kimmel, Eric A. **Anansi and the talking melon.** New York : Holiday House, c1994.
A clever spider tricks elephant and some other animals into thinking the melon in which he is hiding can talk. **RL 3.9 IL K-2**

Spier, Peter. **And so my garden grows.** New York : Dell, 1969. **RL 4.9 IL K-3**

Thompson, Lauren. **The apple pie that Papa baked.** 1st ed. New York : Simon & Schuster Books for Young Readers, c2007.
A cumulative tale, in the style of "The house that Jack built," about the chain of events that culminate in Papa baking an apple pie. **RL 2.9 RL K-3**

Mizejewski, David. **Attracting birds, butterflies and other backyard wildlife.** Upper Saddle River, NJ : Creative Homeowner, c2004.
Presents one hundred seventy full-color illustrated photographs of backyard wildlife habitats along with instructions for seventeen projects including bird feeders, amphibian house, butterfly garden, and more. **PF**

Roth, Sally. **Attracting birds to your backyard : 536 ways to turn your yard and garden into a haven for your favorite birds.** Emmaus, Pa. : Rodale Press ;, c1998.
Offers 536 different ways that gardeners can attract different types of birds into their gardens. **PF**

King, Elizabeth. **Backyard sunflower.** New York : Dutton, 1993. **RL 3.5 IL K-3**

Berenstain, Stan, 1923-2005. **The Berenstain Bears grow-it.** New York : Random House, c1996.
As Brother and Sister help Mama plant seeds in the garden, they discover the importance of seeds and how they become useful and important plants. Includes various activities related to plants. **RL 2.4 IL K-3**

Creasy, Rosalind. **Blue potatoes, orange tomatoes.** 1st pbk. ed. San Francisco : Sierra Club Books for Children, 1997, c1994.
Describes how to plant, grow, and cook a variety of unusually colored vegetables, including red corn, yellow watermelons, and multicolored radishes. **PF**

O'Malley, Kevin. **Bud.** New York : Walker, 2000.
The orderly Sweet-Williams are dismayed at their son's fondness for the messy pastime of gardening.

Barner, Bob. **Bugs! bugs! bugs!** San Francisco : Chronicle Books, c1999.
A nonsense rhyme introduces children to familiar bugs. Includes a fun fact section. **RL 2-8 IL K-3**

- Shannon, George. **Busy in the garden.** 1st ed. New York : Greenwillow Books, c2006.
A collection of short poems and riddles about planting seeds, watching garden vegetables dance, and growing jack-o-lanterns. **RL 1-7 IL K-3**
- Farndon, John. **Butterflies and moths.** San Diego : Blackbirch Press ;, c2004.
Describes the physical characteristics, behavior, life cycle, and habitat of various types of butterflies and moths, and includes instructions for creating a butterfly garden, and for making a light frame to attract moths. **RL 6.0 IL 3-6**
- Stevens, Jan Romero. **Carlos and the cornfield : Carlos y al milpa de maiz.** Tucson : Northland, c1995.
When he sees the results of not following his father's instructions on the proper way to plant corn, a young boy tries to make things rights. **RL 4.8 IL 3-6**
- Stevens, Jan Romero. **Carlos and the squash plant : Carlos y la planta de calabaza.** Flagstaff : Northland, c1993.
A sprouting plant comes out of Carlos' ear when he ignores his mother's warnings about what will happen if he doesn't wash the dirt out of his ears. Carlos lives in the Espanola Valley in Northern New Mexico. **RL 4.9 IL K-3**
- Krauss, Ruth. **The carrot seed.** New York : Harper, c1945.
Only the little boy who planted the seed believed it would come up. **RL 2.2 IL K-3**
- Segal, John. **Carrot soup.** New York : Margaret K. McElderry Books, c2006.
After working hard on his garden all spring and summer, Rabbit looks forward to harvest time when he can make soup, but every carrot disappears and Rabbit must find out who has taken them. Includes a recipe for carrot soup. **RL 1.8 IL K-3**
- Grant, Judyann. **Chicken said, "Cluck!"** 1st ed. New York : HarperCollins, c2008.
Earl and Pearl do not want Chicken's help in the garden, until a swarm of grasshoppers arrives and her true talent shines. **RL 1.6 IL K-3**
- Williams, Vera B. **Cherries and cherry pits.** New York : Scholastic, c1986.
Bidemmi draws pictures and tells stories. **RL 3.9 IL K-3**
- Siddals, Mary McKenna. **Compost stew : an A to Z recipe for the earth.** 1st ed. Berkeley [Calif.] : Tricycle Press, c2010.
A rhyming recipe explains how to make the dark, crumbly, rich, earth-friendly food called compost. **RL 4.8 IL K-3**
- Koontz, Robin Michal. **Composting : nature's recyclers.** Minneapolis, Minn. : Picture Window Books, 2007.
Learn about compost and how it can be used in gardens or yards. **RL 4.1 IL K-3**
- Inches, Alison. **Corduroy's garden.** New York : Viking, c2002.
When the beans that Lisa has planted are dug up by a dog, Corduroy reseeds the garden, but he and Lisa are in for a surprise when the "beans" finally appear. **RL 2.0 IL K-3**
- Jurenka, Nancy E. Allen, 1937-. **Cultivating a child's imagination through gardening.** Westport, CT : Teacher Ideas Press, 1996.
Contains forty-five lessons designed to enhance childrens' imagination and literacy, focusing on specific books about gardening, with related reading, writing, word play, music, and movement activities, and includes discussions of ecology; gardeners in fiction and real life; legends and folktales centered on plants; and more. **PF**
- Brown, Peter, 1979-. **The curious garden.** 1st ed. New York : Little, Brown, c2009.
Liam discovers a hidden garden and with careful tending spreads color throughout the gray city. **RL 4.4 IL K-3**
- Kudlinski, Kathleen V. **Dandelions.** Minneapolis, MN : Lerner, 1999.
Describes the physical characteristics and life cycle of this plant, originally brought to America by

English settlers to grow in their gardens. **RL 4.1 IL K-3**

Faulkner, Megan. **A day at the pumpkin patch.** Toronto ; : Scholastic Canada, c2006.
A group of children explore and enjoy nature's autumn bounty, including apples, raspberries, gourds, and pumpkins, on a day at a pumpkin patch; describes the parts of a pumpkin and how pumpkins grow. **RL 3.5 IL K-3**

Harkins, Susan Sales. **Design your own butterfly garden.** Hockessin, Del. : Mitchell Lane Publishers, c2009.
Butterflies! -- Designing for butterflies -- Preparing the ground -- Planting and maintaining -- Butterfly habits and shelters. Provides step-by-step instructions to create a butterfly garden in a backyard environment, and also describes how to choose and care for the proper plants, build butterfly log houses, and more. **PF**

Mota, Deborahlise. **Don't bug the bugs.** U.S.A. : Greendreambooks, ©2012.
Lily's organic garden adventure --back cover. **IL K-2**

Down to earth : garden secrets! garden stories! garden projects you can do! San Diego :
Harcourt Brace, c1998.
Forty-one authors and illustrators of books for children share their gardening experiences.
Includes various activities and recipes related to gardening. **PF**

Sage, James. **Farmer Smart's fat cat.** San Francisco : Chronicle Books, 2002.
Farmer Boast, Farmer Bluster, and Farmer Smart fight over who has the best cornfield, until one of them finds a way to win the competition. **RL 5.2 IL K-3**

Falwell, Cathryn. **Feast for 10.** New York : Clarion Books, c1993.
Numbers from one to ten are used to tell how members of a family shop and work together to prepare a meal. **RL 1.6 IL K-3**

Wilkes, Angela. **First garden activity book.** London : Dorling Kindersley, 2008.
Gardening by pictures -- Garden gear -- Seed search -- Planting seeds -- Salad garden -- Bulbs -- Spring flowers -- Hanging baskets -- Garden in a basket -- Desert garden -- Desert in miniature -- Strawberry feast -- From flower to fruit -- Pit planting -- New plants from old -- From cuttings to plants -- Vegetables in pots -- Vegetables galore -- Window garden -- Garden in bloom -- Herb feast -- Mini knot garden -- Bushy tops. Teaches young gardeners how to growing plants and includes projects to enjoy with easy-to-follow ideas. **PF**

Gourley, Robbin. **First garden : the White House garden and how it grew.** New York : Clarion, c2011.
History of the White House grounds, including its gardens past and present. **RL 3.5 IL K-3**

Bunting, Eve, 1928-. **Flower garden.** 1st Voyager Books ed. San Diego, Calif. : Harcourt Brace, 2000, c1994.
Helped by her father, a young girl prepares a flower garden as a birthday surprise for her mother. **RL 1.9 IL K-3**

Burnie, David. **Flowers.** New York : Dorling Kindersley, c1992.
Describes the physical characteristics and life cycles of flowers and examines kinds of garden flowers, woodland flowers, desert flowers, and others. **RL 5.5 IL 3-6**

Dahl, Michael. **From the garden : a counting book about growing food.** Minneapolis, MN : Picture Window Books, c2004.
Introduces the numbers from one to twelve as family members pick a variety of vegetables from the garden. Readers are invited to find hidden numbers. **RL 2.6 IL K-3**

Ribke, Simone T. **A garden full of sizes.** New York : Children's Press, c2004.
Photographs and text describe sizes of things in a garden, such as tall and short shovels, large melons and small tomatoes, and narrow and wide leaves. **RL 1.7 IL K-3**

Van Allsburg, Chris. **The garden of Abdul Gasazi.** Boston, Mass : Houghton Mifflin, ©1979.
When the dog he is caring for runs away from Alan into the forbidden garden of a retired dog-

- hating magician, a spell seems to be cast over the contrary dog. **RL 4.4 IL K-3**
- Holub, Joan. **The garden that we grew.** New York : Puffin Books, c2001.
Children plant pumpkin seeds, water and weed the garden patch, watch the pumpkins grow, pick them, and enjoy them in various ways. **RL 1.5 IL K-3**
- Stewart, Sarah, 1939-. **The gardener.** New York : Farrar Straus Giroux, c1997, 2000.
A series of letters relating what happens when, after her father loses his job, Lydia Grace goes to live with her Uncle Jim in the city but takes her love for gardening with her. **RL 3.5 IL K-3**
- Azarian, Mary. **A gardener's alphabet.** Boston : Houghton Mifflin, c2000.
Presents a word and illustration associated with gardening for each letter of the alphabet, from arbor to zucchini. **RL 1.5 IL K-3**
- Kite, L. Patricia. **Gardening wizardry for kids.** Hauppauge, NY : Barron's, c1995.
Over 300 indoor gardening projects and experiments with information about plants, flowers, herbs, and legends about plants. **PF**
- Go organic.** Irvine, CA : Saddleback Educational Publishing, c2009.
Go organic : an introduction--Why go organic : Part 1--Why go organic : Part 2--Organic farming--Organic living--Organic food--Better for our health--Nutritional value--Chemicals in conventional foods--Protect the newborn--Better for our planet--Food standards--National Organic Standards Board--Organic labels--Organic fibers--Organic clothing--Avoid GM food--Reduce toxic use--The dirty dozen--The clean dozen--The fallen fruit project--Organic food myths--Control farm pollution--Go for biodiversity--Organic cleaning products--Environmentally friendly furniture--Organic gardening--Organic fertilizers--Vermicompost--Make your own organic bread and coffee--Index--Glossary. Introduces readers to organic farming, gardening, living, and clothing. **PF**
- Smucker, Anna Egan. **Golden delicious : a Cinderella apple story.** Morton Grove, Ill. : Whitman, c2008.
Based on real events, the story of how the Golden Delicious apple came to be. **RL 4.8 IL K-3**
- Smith, Lane. **Grandpa Green.** New York : Roaring Brook Press, 2011.
A young child explores the ordinary life of his extraordinary great-grandfather, Grandpa Green, as expressed in his topiary garden. **RL 2.9 IL K-3**
- Matthews, Clare. **Great gardens for kids.** London : Hamlyn, c2002.
Ideas for outdoor celebrations and instructions for projects such as a sailing boat sandpit, a bird feeder, a strawberry tower and more. **PF**
- Carlson, Laurie M., 1952-. **Green thumbs : a kid's activity guide to indoor and outdoor gardening.** 1st ed. Chicago : Chicago Review Press, c1995.
Over 80 different indoor and outdoor garden projects for children, including creating herb gardens, growing potatoes, and making scarecrows, garlic braids, and candied flowers. **PF**
- Ehlert, Lois. **Growing vegetable soup.** San Diego : Harcourt Brace, 1987. **RL 1.7 IL K-3**
- Bial, Raymond. **A handful of dirt.** New York : Walker, c2000.
Discusses the nature and importance of soil and the many forms of life it supports. **RL 5.8 IL 3-6**
- Cherry, Lynne. **How Groundhog's garden grew.** New York : Blue Sky Press, c2003.
Squirrel teaches Little Groundhog how to plant and tend a vegetable garden. **RL 3.7 IL K-3**
- Havill, Juanita. **I heard it from Alice Zucchini : poems about the garden.** San Francisco : Chronicle Books, c2006.

Twenty poems celebrate the joys of a garden. **RL 3.5 IL K-3**

Child, Lauren. **I will never not ever eat a tomato.** 1st U.S. pbk. ed. Cambridge, Mass. : Candlewick Press, 2003, c2000.

A fussy eater decides to sample the carrots after her brother convinces her that they are really orange twiglets from Jupiter. **RL 2.6 IL K-3**

Lewis, Richard. **In a spring garden.** New York : Dial Press, c1965.

A collection of Haiku or poems of seventeen syllables (in the original Japanese) in three lines. The verses here follow a day of spring from the early-morning admonition to a careless grasshopper to the glowing goodnight of a firefly. **RL 2.4 IL K-3**

Mallett, David. **Inch by inch : the garden song.** 1st Harper Trophy ed. New York : HarperCollins, 1997.

Inch by inch, row by row, a child grows a garden with the help of the rain and the earth. **RL 2.5 IL K-3**

Pinczes, Elinor J. **Inchworm and a half.** Boston : Houghton Mifflin, c2001.

Several small worms use their varying lengths to measure the vegetables in a garden. **RL 2.3 IL K-3**

Parker, Steve. **Insects.** New York : Dorling Kindersley, 1997, 1992.

Describes the physical characteristics, behavior, and metamorphosis of insects and examines kinds of garden insects, woodland insects, insects in the home, and others. **RL 5.5 IL 3-6**

Ancona, George. **It's our garden : from seeds to harvest in a school garden.** 1st ed. Cambridge, Mass. : Candlewick Press, c2013.

Visit this lively, flourishing school-and-community garden and be inspired to cultivate your own. **RL 4.0 IL K-3**

Cole, Henry. **Jack's garden.** 1st Mulberry ed. New York : Mulberry Books, 1997.

Cumulative text and illustrations depict what happens in Jack's garden after he plants his seeds. **RL 3.9 IL K-3**

Herd, Meg. **Learn and play in the garden.** Hauppauge, NY : Barron's, c1995.

Crafts, games and activities for children using items found in the garden and grouped by seasons. **IL K-3**

Hewitt, Sally, 1949-. **Local wildlife : what's in my garden?** Mankato, Minn. : Stargazer Books, 2006.

Presents an introduction to things that are found in a garden, in simple text with illustrations, including trees, birds, snails, compost, bees, grass, and more. **RL 2.9 IL K-3**

Steffora, Tracey. **Measuring in the garden.** Chicago : Heinemann Library, c2011.

Photographs of garden scenes and brief text introduce the mathematical concept of measuring. Includes a picture glossary. **RL 1.4 IL K-3**

Parker, Steve. **Microlife that lives in soil.** Chicago : Raintree, c2006.

Micro-jungle -- Rich and poor soil -- Micro-bugs -- Micro-plants -- Sliding along -- Recycling soil -- Tiny creatures -- Soil mites -- Pincers and springs -- Grubby grubs -- Soil pests -- Underground cities -- Nature's gardeners -- Find out for yourself -- Glossary -- Index. Describes and illustrates some of the many different microscopic life forms that live in soil, and discusses their role in nature, including microbugs, microplants, soil mites, grubs, and others. **RL 5.0 IL 3-6**

Rylant, Cynthia. **Mr. Putter and Tabby pick the pears.** San Diego : Harcourt Brace, c1995.

When he gets too old to climb up the ladder, Mr. Putter and his cat, Tabby, figure out an ingenious way to pick pears for pear jelly. **RL 2.2 IL K-3**

- Pattou, Edith. **Mrs. Spitzer's garden.** 1st ed. San Diego : Harcourt, 2001.
With her sure, loving, gardener's touch, Mrs. Spitzer nurtures the students in her classroom each year. **RL 3.0 IL K-3**
- Fleming, Candace. **Muncha! Muncha! Muncha!** New York : Atheneum Books for Young Readers, c2002.
After planting the garden he has dreamed of for years, Mr. McGreely tries to find a way to keep some persistent bunnies from eating all his vegetables. **RL 2.7 IL K-3**
- Kij, Krysia. **My garden.** Rosen Publishing Group. **RL 1.2 IL K-3**
- Ostrow, Jesse S. **My garden.** New York : Scholastic, c1994.
- Burstein, John. **Number conservation : planting monster melons.** Milwaukee, WI : Weekly Reader Early Learning Library, c2004.
While planting two gardens, the monsters learn that the number of monster melon seeds, and the length of two hoses, does not change when the objects are moved or rearranged. **RL 3.5 IL K-3**
- Roberts, Bethany. **Ogre eats everything.** 1st ed. New York : Dutton Children's Books, c2005.
May Belle and her friend Ogre have a good time as she teaches him how to plant and tend a garden, how to read, and what to do when feeling bored. **RL 2.5 IL K-3**
- Sollinger, Emily. **Olivia plants a garden.** 1st Simon Spotlight ed. New York : Simon Spotlight, 2011, c2010.
"Olivia Plants a Garden" : Olivia is not sure what will grow in her garden when she plants mystery seeds. "Olivia and Her Ducklings" : Olivia and Ian are playing in the park when they leave they notice that a mother duck and her ducklings are following them home. **RL 1.5 IL K-3**
- Roberts, Rann. **Our school garden : patterns.** Huntington Beach, CA : Teacher Created Materials, c2011.
Students work together to plan different types of gardens at their school and use various patterns as they plant their seeds. **RL 3.0 IL K-3**
- Levenson, George. **Pumpkin circle : the story of a garden.** Berkeley, Calif : Tricycle Press, 2002, c1999.
Rhyming text and photographs follow a pumpkin patch as it grows and changes, from seeds to plants to pumpkins ready to harvest, to jack-o-lanterns and then to seeds again. **RL 3.5 IL K-3**
- Titherington, Jeanne. **Pumpkin pumpkin.** New York : Greenwillow, c1986.
Jamie plants a pumpkin seed and, after watching it grow, carves it, and saves some seeds to plant in the spring. **RL 2.4 IL K-3**
- Lobel, Arnold. **The rose in my garden.** New York : Scholastic, 1984. **RL 4.1 IL K-3**
- Zoehfeld, Kathleen Weidner. **Secrets of the garden : food chains and the food web in our backyard.** New York : Knopf, c2012.
Depicts a family of four who make their garden their summer home as they prepare the soil, plant seeds, water the garden, and watch for a harvest of vegetables. **IL K-3**
- Fleischman, Paul. **Seedfolks.** New York : Joanna Cotler Books, 1997.
One by one, a number of people of varying ages and backgrounds transform a trash-filled inner-city lot into a productive and beautiful garden, and in doing so, the gardeners are themselves transformed. **RL5.0 IL 5-8**
- Krauss, Ruth. **La semilla de zanahoria.** New York : Scholastic, c1978.
Despite everyone's dire predictions, a little boy has faith in the carrot seed he plants. (SPANISH) **IL K-3**
- Royston, Angela. **Soil : let's look at a garden.** Chicago : Heinemann Library, c2006.

- Presents an introduction to a garden, in simple text with illustrations, describing the soil, plant, flowers, and animals that live there. **RL 1.7 IL K-3**
- Bunting, Eve, 1928-. **Sunflower house.** San Diego : Harcourt Brace, c1996, 1999.
A young boy creates a summer playhouse by planting sunflowers and saves the seeds to make another house the next year. **RL 2.8 IL K-3**
- Potter, Beatrix, 1866-1943. **The tale of Peter Rabbit.** New York : F. Warne, 1987, c1902.
With new plates from the original illustrations, the story of little Peter Rabbit and the mischief he gets himself into when he ventures into Mr. McGregor's garden. **RL 4.2 IL K-3**
- Politi, Leo, 1908-1996. **Three stalks of corn.** New York : Scribner, 1976. **RL 4.7 IL K-3**
- French, Jackie. **Too many pears!** New York : Star Bright Books, c2003.
Pamela the cow loves pears so much that no one else ever has a chance to eat any. **RL 1.5 IL K-3**
- Stevens, Janet. **Tops and bottoms.** San Diego : Harcourt Brace, c1995.
Hare turns his bad luck around by striking a clever deal with the rich and lazy bear down the road. **RL 3.8 IL K-3**
- Coy, John, 1958-. **Two old potatoes and me.** 1st ed. New York : Knopf :, c2003.
After a young girl finds two old potatoes at her father's house, they plant and tend them to see if they will have new potatoes in September. **RL 2.3 IL K-3**
- Lin, Grace. **The ugly vegetables.** Watertown, MA : Talewinds/Charlesbridge, c1999.
A little girl thinks her mother's garden is the ugliest in the neighborhood until she discovers that flowers might look and smell pretty but Chinese vegetable soup smells best of all. Includes a recipe. **RL 3.1 IL K-3**
- Godkin, Celia. **What about ladybugs?** San Francisco : Sierra Club books for children, c1995.
A gardener upsets the natural balance in his garden by using poison and learns the value of another method of controlling pests. **RL 4.5 IL K-3**
- Keller, Holly. **What I see.** 1st Green Light Readers ed. Orlando, Fla. : Green Light Readers/Harcourt, c2000.
Illustrations and simple rhyming text describe what a child sees around the house and garden. **RL 1.3 IL K-3**
- Chappell, Rachel M., 1978-. **What's going on in the compost pile? : a book about systems.** Vero Beach, Fla. : Rourke Pub., c2008.
Why should you compost? -- Why is a compost pile a system? -- How do you create a compost pile?. Discusses the various aspects of a compost pile. **RL 5.2 IL 3-6**
- Appelt, Kathi, 1954-. **Watermelon Day.** New York : Henry Holt, c1996.
Young Jesse waits all summer for her watermelon to ripen. **RL 2.8 IL K-3**
- Ryder, Joanne. **Where butterflies grow.** 1st Puffin Unicorn ed. New York : Puffin Books, 1996, c1989.
Describes what it feels like to change from a caterpillar into a butterfly. Includes gardening tips to attract butterflies. **RL 3.5 IL K-3**
- Brown, Marc Tolon. **Your first garden book.** New York : Trumpet Club, 1981. **RL 3.5 IL K-3**
- Rosenberg, Pam. **Yuck! icky, sticky, gross stuff in your garden.** Mankato, MN : Child's World, c2008.
Describes "gross" things that can be found in gardens, such as bacteria and slugs, as well as some of the distasteful activities of garden insects such as bees and flies. **RL 5.5 IL 3-6**

Gardening DVDs

- DVD **All about plant adaptation.** Standard format. Wynnewood, PA : Schlessinger Media, 2006, c2000.
Describes the ways plants have adapted to harsh or unique environments such as the Arctic, deserts, and rain forests; explains how epiphytes, such as mosses, lichens, and some orchids, obtain water and nutrients from the air rather than soil; and presents a hands-on experiment on the Venus flytrap's ability to survive in mineral-free water. **IL K-4**
- DVD **All about plant pollination : fruit, flowers & seeds.** Standard format. Wynnewood, PA : Schlessinger Media, 2006, c2000.
Uses microscopic photography and graphics to familiarize students with the parts of a flower, showing how flowers become pollinated and examining the structure of seeds, their development, and dispersal. **IL K-4**
- DVD **All about plant structure & growth.** Standard format. Wynnewood, PA : Schlessinger Media, 2006, c2000.
Introduces the parts of a plant, including the roots, stems, leaves, and complex tissues called xylem and phloem; describes how a plant takes in water and minerals and how it manufactures sugar; and includes a hands-on experiment on the flow of nutrients throughout a plant's structures. **IL K-4**
- DVD **All about plants.** Standard format. Silver Spring, MD : Discovery School, c2005.
An introduction to the plant kingdom, examining the features of plant cells, and discussing the function of flowering plant parts, photosynthesis, plant reproduction methods and mechanisms, and the purpose of tree trunks.
- DVD **Bees and plants.** Standard format. [Chicago] : SVE & Churchill Media ;, c2004.
Details the relationship between bees and flowers, discussing the parts of the bee, their social structure and communication skills, pollination, and related topics.
- DVD **Characteristics of plants.** Widescreen format. Wynnewood, PA : Schlessinger Media, 2006, c[2003].
Contains video clips and animations that demonstrate the characteristics of plants and how plants are used in everyday life, including visits to a banana plantation, and a desert. **IL K-4**
- DVD **Eyewitness plant.** Standard format. [New York] : DK, 2006, c1997.
Provides information about plants, using live-action photography and special effects to examine the variety of the world's flora, and their survival strategies.
- DVD **Plant.** New York : BBC Worldwide Americas/DK Vision, c1997.
A colorful tour of the world's most dazzling flora.
- DVD **Plant & animal interdependency.** Standard format. Wynnewood, PA : Schlessinger Media, 2006, c2000.
Looks at the ways in which plants and animals interact, discussing the interdependency caused by the mutual need for nutrients and gases, and including a hands-on experiment. **IL 5-8**
- DVD **Plants.** Standard format; Classroom ed. DVD. Elk Grove Village, IL : Distributed by Disney Educational Productions, 2004, c1996.
Host, Bill Nye. Bill Nye the Science Guy answers questions about plants and

conducts two experiments that demonstrate the production of oxygen by lettuce leaves and the existence of chlorophyll in leaves. **IL 4-8**

Appendix C: School Composting

Every school day each student generates about two pounds or more of compostable materials, such as food scraps and soiled paper. Composting these materials can help schools significantly reduce their waste. It is an activity that can be integrated into school curriculum, providing hands-on learning opportunities in science, math, and other disciplines. Composting is a natural “recycling” process that uses "decomposition" to break down organic waste—like food scraps, soiled paper, leaves, and grass. With the help of beneficial organisms, such as insects, worms, and bacteria, organic debris is "decomposed" to form a nutrient-rich soil enhancer.

Choosing a location is important, keeping the compost pile as far away from the building(s) as is reasonable convenient. This will help with the concerns of attracting wild animals, rodent and insect too close to school structures. Make sure the compost area is a good distance from trash cans and school dumpsters. Trash cans and dumpsters can attract insects, rodents and bears. If the school has a garden, locating the compost near the garden is a good idea.

Decide how to contain the compost – the type and number of compost bins or pins depends on the volume of composting material generated. The minimum and maximum pins sizes (pile volumes) should be a minimum of 3’x3’x3’ and maximum of 5’x5’x5’. It is highly recommended to use a mobile compost bin if schools have concerns with a semi-permanent structure being built on campus.

Form a Compost Team – include representatives from administration, teachers, other staff, custodial staff, parents and students on the team and choose a coordinator. Be sure to include the cafeteria staff from the start.

Educate Students on what waste items from the cafeterias can be added to the compost. Fruit and Vegetable scraps. Other items that can be included from different areas of the school are coffee grounds, tea bags, egg shells, nut shells, used paper, paper towels, napkins, tissue, dried leaves, grass, plants, flowers, and untreated saw dust from shop classes.

Collection of Food Waste for Composting - Phase in the collection of waste one lunch period or one grade at a time to make sure only composting waste is being collected for the compost. Solicit student volunteers to monitor the cafeteria food scrap collection. Have at least one monitor to stand by the collection bin to assist younger students and ensure that all students know how to participate. Develop easy to read signage (with pictures) to place on collection bins.

Maintaining the Compost is extremely important, requiring turning of the composting material once a week or so to speed the composting process. This allows more air to filter through the pile or bin and exposes more material to the pile's feeding organisms. It may be easiest for students to mix materials on the ground first, and then shovel them into the bin.

- After several weeks, a good mixing of materials inside the bin/pile as new materials are added should be adequate, without a full turning. However, if the compost is not heating up or odor problems arise, the materials may need to be removed from the bin and turned. Compost piles (without a bin for containment) may need to be turned more often to maintain active composting.

Web Resource: <http://www.cabq.gov/solidwaste/recycling/yard-waste/backyard-composting>

Appendix D: Edible Landscaping in Schools

Mixing edible and non-edible plants into a visually pleasing, exciting and fun landscape for children so that they can explore and snack along the way.

Web resources

Lists of low water plants of the Southwest- <http://aces.nmsu.edu/pes/lowwaterplants/>

Xeriscape plants- <http://farmingtonsc.nmsu.edu/xeriscape-plants.html>

NMSU “how to” publications cover many types of plants and how to grow them in NM-
http://aces.nmsu.edu/pubs/_h/

List and pictures of edible plants growing in the Southwest <http://www.foragingtexas.com/>

PowerPoint on edible plants of the Chihuahua desert

http://wtufc.org/downloads/EdiblePlantsWildResourcesCD-KathBrooks_UofA.pdf

Books

Asphalt to Ecosystems, Gaia’s Garden, Down to Earth

Albuquerque sources of plants

Plants of the Southwest, Jericho Nursery, Osuna Nursery, Rehm’s Nursery

NM- adapted fruit and nut trees- Tooley’s (Plants of the Southwest also carries his trees)

<http://tooleystrees.com/>

Edible plants that work well in edible landscapes (although ANY edible plant will work these are just ideas)

Shrubs

currants
gooseberry
pomegranate
fig
artichoke
asparagus
lavender
wild rose
fennel
gogi (you can create hedge
out of these)

Tall walls

sunflower
jerusalem artichoke-
sunflower
quinoa
amaranth
sorghum
wheat
corn

Trees

ju ju be
asian pear
pear
apple
cherry
peach
pecan
walnut
medlar
pawpaw
persimmon
quince
pinon pine

Vines

grapes
squash
climbing beans
cucumber
squash

Herbs

stevia
lemon verbena
basil
parsley
cilantro
sage
mint
lemon balm
chives
oregano
rosemary
tarragon
thyme
chamomile
lavage
borage

Other

purslane
strawberry
yucca

prickly pear

peanuts