

2nd Ed.

Cultivando Tradición

A Community Garden Resource Manual for Southern New Mexico



Colonias Development Council

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2nd Edition

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Chapter 1: Community Gardens



In this section, you will learn:

- ✓ The benefits of community gardens.
- ✓ The steps involved in creating a community garden, including design & structure.
- ✓ The various types of community gardens.

Introduction to Community Gardens

What is a Community Garden?

A community garden is a place where members from a community come together with the common interest of growing food and other plants for beautification, education, and recreation. It is a place for people to interact while they work, share ideas, and stay active. It is a place of innovation, organization, and empowerment.

Why are Community Gardens Important?

Community gardens are important because they are a place for people to build community and learn together. They help beautify vacant lots or unused space. They attract diverse groups of people interested in gardening, food, health, and sustainability. They offer fresh, locally grown vegetables to people that may not have access to fresh produce.

What are Different Types of Community Gardens?

Community gardens come in all shapes, sizes, and forms. Community gardens are located in schools and neighborhoods, urban and rural areas. They are large gardens worked collectively, plots of land parceled into smaller family gardens, gardens that donate food to other community members, and gardens that sell or create CSAs (where members receive weekly shares of each harvest). They may even integrate small farm animals such as chickens that can be raised for eggs.

Benefits of Community Gardens

Engage Youth. Community gardens serve as an outdoor classroom where youths learn about the origins of food, nutrition, the environment, and community responsibility. They provide opportunities for youths to practice math, science, and basic business skills while expressing themselves artistically and creatively. As youths become involved in the process of organizing a garden and taking responsibility for actions, they develop leadership skills and have the potential to become more interested in community issues.

Build Community & Create Safer Neighborhoods. The gardens provide opportunities for intergenerational and cross-cultural connections that foster a sense of community and lower crime rates. They encourage community organizing around critical neighborhood issues. Community gardening requires skills such as teaching, recruiting, planning and collaboration that can be used in other settings to tackle issues such as economic revitalization.

Promote & Preserve Cultural Heritage. Community gardens provide exposure to multiple cultural traditions, food histories, and family recipes. Gardeners may grow traditional, heirloom, and other distinct plants that are otherwise not available locally.

Provide Fresh Food & Financial Savings. Community gardens provide a significant source of food and supplemental income to individuals and families.

Grow Physically, Mentally & Spiritually Healthier Communities. Gardening is a good way to stay healthy and physically fit. It reduces stress, calms and heals. People involved in community gardening also tend to eat healthier foods than other families. Gardening also helps foster positive connections to the earth and environmental stewardship.



Starting a Community Garden

Organize a Meeting of Interested People.

Determine whether a garden is really needed and wanted, what kind it should be (vegetable, flower, herb, organic, etc.), whom it will involve, and who benefits. Secure a meeting space and invite anyone likely to be interested, including neighbors, Master Gardeners, Cooperative Extension Service agents, community and neighborhood leaders, city and county officials, school teachers, churches, community organizations, farmers' market and grower associations, youth clubs and organizations, and local retail cooperatives. Distribute flyers and encourage anyone you think may be remotely interested to come.

Form a Planning Committee.

This can be comprised of people who feel committed to the creation of the garden and have the time to devote to it. Choose well-organized people as garden coordinators. Form committees to tackle specific tasks: funding and partnerships, youth activities, construction and communication. If possible, form committees composed of people with various levels of experience and different ideas and areas of expertise. This can be a time consuming but very worthwhile process.

Identify all of your Resources.

Complete a community asset assessment. What skills and resources already exist in the community that can aid in the garden's creation? Contact local municipal planners about possible sites. Working with the city, county, schools, and other large bureaucracies to secure land can be difficult since the process is time-consuming and most community gardens are run by volunteers in their spare time. Community-based non-profit organizations, churches, and private landowners may be better suited to accommodate potential community gardens. At each step of the way, be sure to think through possible community garden partners—water companies may be willing to install a separate garden meter for a reduced fee, hardware stores may donate tools, service organizations (like the Rotary Club and Lions Club) may donate money or time, a local farmer may be willing to till the land, local nurseries may contribute compost or seedlings, and seed companies often donate seeds. A more thorough discussion of budgeting for your community garden can be found in Appendix 1.

Choose a Site.

When deciding on a site for the garden, remember to think about water access, city and county regulations, visibility and accessibility of the garden site, wind breaks, and the amount of sun the site receives. Choose a site appropriate to the time and energy your group can contribute to preparing the site. You may also want to consider choosing a site that will afford room for expansion down the road. It is important to consider the type of soil on the site; conduct a soil test (New Mexico State University's Soil, Water, and Agricultural Testing Laboratory offers this service for a nominal fee); and think about any fencing that may be required. Work with the landowner(s) to establish a written and signed agreement/contract that includes a set period of time. Aim for a period of seven to ten years, since it takes time to develop gardens and build the soil. Finally, consider who will cover liability insurance, if necessary. There are policies available specifically for community gardens, but they are expensive. As an alternative, if the garden is located on city, county, community organization, or church property, the landowner could assume the insurance cost and the garden could reimburse her/him for this expense.

Prepare & Develop the Site.

In most cases, the land will need considerable preparation for planting. Organize volunteer work crews to clean it, gather materials and decide on the design and plot arrangement. Consider asking clubs and organizations (Boy and Girl Scouts, New Mexico State University/University of Texas El Paso clubs and organizations, and church groups) to contribute community service volunteer hours to help clean or prepare the site. The time you spend coordinating large-group workdays will pay off!

Organize the Garden.

Members must decide how many plots are available and how they will be assigned. This will be partly defined by the number of community garden members participating and size of the site in general. Be sure that all garden members have a voice in organizing the garden structure. There are numerous examples of the ways a garden can be organized. Common examples include: individual and family plots, communally-worked plots, or a combination of the two. Allow space for a shed for storing tools, compost bins, trees, and pathways between plots. Planting flowers or shrubs around the garden site's edges will attract beneficial insects, create a border to keep undesirable creatures out, and promote good will with neighbors.

**Include Children & Youth.**

Consider creating a special garden just for kids and youths where they can explore the garden at their speed, on their time, and with their creativity. Children and youths aren't as interested in the size of the harvest as in the process of gardening. The garden can be an outdoor classroom—exposing children and youths to ideas and activities they might not otherwise experience. Children and youths bring tremendous energy, fresh ideas, and unmatched creativity. Be sure to listen to and incorporate their suggestions!

Determine the Rules & Put Everything in Writing.

The best garden rules are those created through consensus of all garden members (see Appendix 2 for an example). We are more willing to comply with rules that we have had a hand in creating and discussing. Ground rules help gardeners to know what is expected of them. Think of the rules as a code of behavior and formalization of garden structure. Some examples of issues that are best dealt with by creating agreed upon rules are: Will there be dues? How are plots assigned? How is produce used? What are the responsibilities associated with maintaining a plot? Will gardeners share tools? Meet regularly? Maintain communal ownership of the garden? Finally, we advise discussing and including a rule prohibiting the use of fertilizers, pesticides, herbicides, and insecticides for the safety and benefit of young people, adults, and the environment.

Help Members Keep in Touch with Each Other.

Good communication ensures a strong community garden with active participation by all. Keep all garden members informed. This can be best accomplished by doing the following things: forming a telephone tree, installing and continually updating a bulletin board in the garden, and having regular celebrations. Community gardens are all about creating and strengthening communities—be sure to take time to celebrate, and invite others to celebrate, your hard work and accomplishments.

Types of Community Gardens

Community gardens can be large or small; formal or informal; urban, suburban, or rural. They can be rental gardens, school gardens, youth gardens, demonstration gardens, accessible gardens, neighborhood gardens, or a combination of the different types. Community gardens may exist on municipal land or private land and may be supported by cities, non-profit organizations, schools, or private businesses. In some gardens, there are individual plots and, in others, gardeners work collectively. Each community garden's design, layout, and organization are unique to the community that creates them.

Rental Gardens

Rental gardens are gardens where people can rent plots for their personal use. Plot sizes vary and may use garden rows or raised beds. While renters commonly grow vegetables, they also grow annual and perennial flowers and native plants. A rental fee usually covers water bills and irrigation equipment. At the Salud y Vida garden in Chaparral, for example, gardeners decided that a combination rental garden best serves the needs of all individual gardeners. Each gardener or family pays a small monthly fee or dues which covers irrigation, seeds, and any inputs which are purchased collectively.

School/Youth Gardens

School gardens enrich the curriculum at public and private schools. Teachers or school administrators often maintain the gardens, and the produce grown may be used in cafeterias. At the Gadsden Middle School Garden, produce has been used in snacks as part of the after-school Elev8 program. Several Las Cruces schools have and are creating school gardens.



Youth gardens, gardens that involve children but are not operated by the staff of a specific school, can also supplement school lessons. While many young people learn about nutrition in school, few are aware of our food systems and their social and environmental impacts. Youth gardens provides space for youth to dialogue about what healthy food is, where it comes from, and to learn about the benefits of local and organic produce. Engaging youths in gardens allows them to learn hands-on about developing a small and local food system from the ground up by growing, preparing, and distributing food in their communities. Some youths even sell produce at local farmers' markets. This gives youths the opportunity to learn about business and marketing. When gardens allow young people to become leaders rather than merely helpers, the youths develop skills that serve the community and prepare the youths for future success.

Demonstration Gardens

Demonstration gardens provide a space for gardeners and educators to share valuable information with the public. They are places where home and community gardeners can share knowledge and tips and learn from each other. They may serve as a library of plants with labels and information, in addition to a place to host workshops, conducting experiments, and encouraging exploration.

Accessible Gardens

Accessible gardens allow community members with special needs to participate. They often contain raised beds that allow individuals with wheelchairs and walkers to garden. Alternatives to raised beds include large pots, table beds and vertical gardening. Additional features of accessible gardens may include wide rows and shaded resting areas throughout the garden.

Market/Job Training Gardens

Market/job training gardens may be run in conjunction with local farmers' markets. They provide job and leadership training and may run agriculture or small farm business internship programs.

Neighborhood Gardens

Neighborhood gardens provide valuable green space within urban neighborhoods. They are usually maintained by a variety of individuals and neighborhood organizations. They may be created on a roof or in the courtyard of an apartment building.

In reality, most community gardens are a combination of these different types of gardens; a neighborhood garden may be accessible to gardeners with special needs and have youth program, and a rental garden may have a demonstration plot.



Community Garden Resources

Sample Community Garden Budgets, Agreements, Flyers, & Other Materials

- "Starting a Community Vegetable Garden" at aces.nmsu.edu/pubs/_h/H-246.pdf
- "From Neglected Parcels to Community Gardens: A Handbook" at wasatchgardens.org/resource/starting-community-garden
- American Community Gardening Association at www.communitygarden.org

Community Gardens and School Gardens in Southern New Mexico

Anthony:	Anthony Community Garden	414 St. Anthony
	Women's Intercultural Center	303 Lincoln St.
Chaparral:	Salud y Vida Community Garden	250 S. County Line
Las Cruces:	Alma d'Arte & Court Youth Center	402 W. Court Ave.
	Conlee Elementary	1701 Boston Dr.
	Fairlight Gardens at the Community of Hope	999 W. Amador
	Farm & Ranch Museum	4100 Dripping Springs
	Hermosa Heights Elementary	1655 E. Amador
	Jornada Elementary	3400 Elks Dr.
	Lynn Middle School	950 S. Walnut
	Jardín de Esperanza	Mesquite Neighborhood
	Puente al Futuro Garden at Peace Lutheran	1701 Missouri
	Sierra Middle School	1700 Spruce Ave.
Vado:	Vado/Del Cerro/Mesquite Community Garden	180 La Fe, Del Cerro
	Vado Elementary School Garden	330 Holguin Rd.

Community Garden Websites

American Community Gardening Association	www.communitygarden.org
Appalachian Harvest Network	www.asdevelop.org
California School Garden Network	www.csgn.org
Capital District Community Gardens	www.cdcg.org
City Slicker Farms	www.cityslickerfarms.org
Community Crops	www.communitycrops.org
Community Gardens of Tucson	communitygardensoftucson.org
Doña Ana Colonias Development Council	www.colonias.org
East New York Farms!	www.eastnewyorkfarms.org
Edible Schoolyard	www.edibleschoolyard.org
Gardeners in Community Development	www.gardendallas.org
Growing Power	www.growingpower.org
Los Poblanos	www.lospoblanosorganics.com
NMSU Cooperative Extension Service	extension.nmsu.edu
Nuestras Raíces	www.nuestras-raices.org
Rio Grande Farm	www.riograndefarm.org
School Garden Wizard	www.schoolgardenwizard.org
Sustainable Food Center	www.sustainablefoodcenter.org

Chapter 2: Garden Design



In this section, you will learn:

- ✓ How to plan and design your garden.

Garden Planning & Design

Planning and designing your community garden are two of the most important steps in starting a successful and sustainable garden. Take time to get to know your potential garden area by walking the land and familiarizing yourself with what is around you. Take note of wind direction, water sources and flow, sun exposure, soil conditions, and existing structures.

Things to Consider for Garden Layout & Design

- Keep it simple.
- Be site-specific; plan according to *your* terrain and climate.
- Incorporate existing landforms and features such as trees, slopes and boulders.
- Pay attention to soil types; use a shovel to discover your soil type.
- Note the path of the sun, including its summer and winter heights.
- Consider the location of your water source; keep it close to your garden and easily accessible.
- Consider a convenient place for compost, and the type and volume of composting planned. Composting large amounts of plant material and local manure will require more space and truck access than composting small amounts of food waste.
- Start with an area that is small and intense, rather than sprawling. This area will be more manageable, use less water, and can be expanded later if necessary.

Encourage biodiversity. Biodiversity establishes a natural balance that leads to a healthier and more sustainable garden. Plant a variety of species; incorporate native well-adapted plants as well as flowering plants that attract beneficial insects and birds. Minimize mono-cropping by integrating different varieties throughout the garden. This creates self-sustaining and resilient mini-environments that mimic nature.

Plan accordingly. Think about the mature size and shape of various plants. Allow for healthy root growth between plants and prevent them from shading out one another.

Plan symbiotically. Use a tall plant as a trellis. Utilize shade to extend heat-sensitive plants' seasons. Plant flowers to encourage pollination and insect life.

Other Garden Design Principles & Practices

Organic. Organic style gardening is often portrayed simply as the elimination of chemical pesticides and fertilizers, but it goes well beyond this; it focuses on enriching and sustaining the soil as the source of a healthy and balanced garden. This includes rotational cropping, the encouragement of biodiversity and soil life, cover cropping, and the use of natural pesticides and fertilizers (see Chapter 5).

Permaculture. This design practice is based on the idea of permanent agriculture. In a sustainable and interconnected way, permaculture incorporates intentional land formations, water catchment, animals, edible crops, and housing into a permanent system. The established interconnections in a permaculture-based garden create an environment that continually feeds both its human hosts and the plants and animals that live within it.

No-till. No-till aims to mimic the seasonal patterns and plant growth principles found in nature while causing minimal damage to soil. This practice limits soil disturbances associated with tilling by using mulch and soil organisms to build and maintain a healthy soil, retain soil moisture, and decrease erosion.

Lasagna Gardening & Composting. This practice involves creating a thick layer of organic material in which to plant by spreading mulch and/or compostable materials on the ground. This method allows easier garden bed preparation and creates a fertile, healthy, and living soil (see Chapter 3 for more on mulching).



Chapter 3: Soil Health



In this section, you will learn:

- ✓ What it means to build healthy soil.
- ✓ The benefits of creating your own compost.
- ✓ How to create your own compost and mulch.

Growing a Healthier Garden

A garden begins with the soil. Enriching, encouraging, and sustaining your garden's soil is the most important thing you can do. A healthy soil grows healthy plants that are better able to withstand stresses like disease, insects, and heat and water extremes. Plants grown in healthy soil are also better for you, producing the highest quality vitamin and mineral rich food.

Soil Health Philosophies: Conventional & Organic

Soil is an ever changing, complex system of life, energy, and minerals. It is fragile and difficult to repair once damaged. Unfortunately, most conventional agriculture practices have severely injured, and continue to destroy, soil fertility. Many conventional practitioners approach soil, plant life, and our environment as something to control. They research, study, and experiment not to benefit soil or plant life, but to manipulate these life systems into producing as much as possible with the aid of synthetic products and processes.

These practices have not only caused severe damage to our soil and plant life, but they also put our own health at risk. Our personal and community health are directly tied to our environmental health. Plants, soil, and people have adapted and evolved together over time to survive and thrive in local conditions. When we manipulate and try to control these processes, we alter symbiotic relationships within our environments. As soil and plant life are manipulated and riddled with chemicals, our water, air, and food often become polluted to toxic and deadly levels. These transformations have radical and devastating consequences for our health such as respiratory illnesses caused by pollution, higher rates of diabetes, increasing incidence of cancer, and yet unforeseen consequences.

Soil

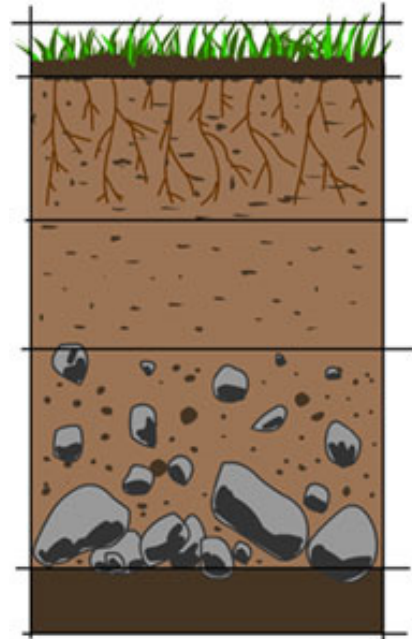
Soil Layers/Horizons

Soil horizons can be seen by digging a hole in your garden.

Topsoil. This is the darkest and uppermost portion of the soil that generally ranges from 1 to 6 inches deep. It contains varying amounts of organic matter, fungi, bacteria, insects, and worms necessary for healthy plant growth.

Subsoil. This layer is usually lighter in color and may contain clay, sand, and other organic material that has been partially broken down. Subsoil affects soil drainage and plant fertility. Incorporating organic matter and maintaining soil moisture can increase plant root depth and promote fertile subsoil.

Parent Matter. Parent matter consists primarily of unaltered rock. It is the layer least affected by any changes in the topsoil. It may be a few feet below the topsoil or hundreds of feet down.



Types of Soil

Sand. Sandy soil is dry, light, and gritty. It tends to drain easily because sand particles are large, leaving space for water and air to move between particles. As a result, sandy soil dries rapidly and can be cultivated when other soils are unworkable. Sandy soil also warms up quickly, thus stimulating early plant growth. However, sandy soil is also extremely demanding and requires large portions of organic matter to create a good garden soil.

Clay. Clay soil is heavy and cold. It feels sticky when moist and hard and compacted when dry. Since clay particles are small, clay soil does not drain easily and is difficult to work in wet conditions. However, clay soil can be greatly improved through the addition of organic matter. Clay soil is normally well supplied with nutrients, retains moisture, and is capable of supporting a wide variety of plants.

Silt. Silty soils are often the best garden soils. Silty soil is neither sticky nor gritty. It maintains moisture and is rich in essential nutrients. However, wet soil has a tendency to compact, becoming cold, heavy, poorly draining and generally hard to work. The addition of organic matter will improve and maintain good soil conditions.

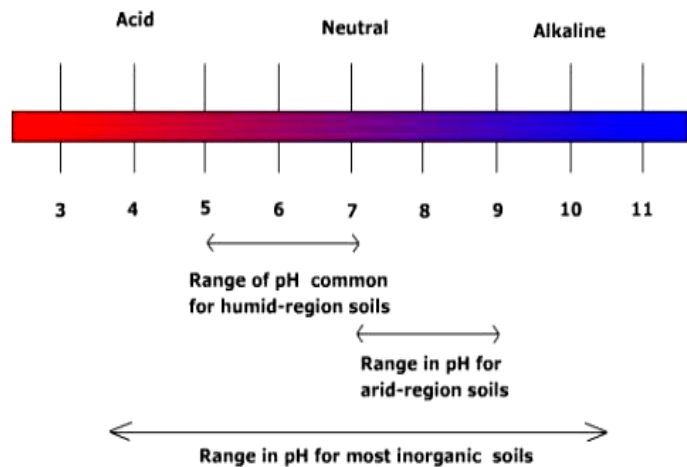
*Soil compaction may occur if soil is walked on often or is manipulated when too wet. A compacted soil inhibits roots as well as soil life, resulting in poor soil structure and poor growing conditions.

Building Healthy Soil

Soil building is an ongoing process that refers to the addition of organic matter and nutrients and the establishment of biodiversity in order to create a well-balanced and healthy soil. Ideal soil is dark in color, crumbly and un-compacted, deep, rich in organic material and mineral nutrients, well-draining (no standing water), and moderate on the pH scale (between 6 and 7). Microorganisms are also necessary for soil health. In just a pinch of soil, there are millions of beneficial microorganisms that break down and mineralize organic minerals in the soil. Microorganisms include bacteria, fungi, protozoa, nematodes, and microarthropods.



Incorporate Compost. Most of our soils are sand or clay. Adding organic matter to our soil in the form of compost and mulch will improve the drainage of clay soils and improve the ability of sandy soils to retain water and nutrients. Typically, soils in our region have a slightly high pH rating, around 7.0 to 8.0, making them alkaline. Ideally, soil pH should be near 6.5. When organic compost is added to our soils, the pH will generally go down, causing soil fertility and nutrient availability to increase.



Plant Cover Crops. Cover crops are edible and non-edible plant varieties used to maintain and enrich soil health when gardens are dormant. Cover crops can also be inter-planted with garden plants as living mulch. Cover crops fall generally into two categories: organic matter and nitrogen fixers. Varieties such as rye add organic matter to the soil when they are tilled under or allowed to rot. Fava beans are one of the most effective and versatile cover crops that produces edible young greens and beans; the variety “Sweet Loraine” grows particularly well in our region. Plants such as hairy vetch add nitrogen and organic matter to the soil via a symbiotic relationship between the plant and microorganisms on the plant’s roots.

Use Cover Crops...

- To prevent soil from eroding and maintain soil activity.
- To integrate organic matter (plant material) into the soil by tilling or turning under.
- To prepare a new garden site: A year before you plant a garden, sow a thick cover crop. Till the cover crop into the soil before planting.

- Between gardening seasons: After harvesting your crops in the fall, sow a cover crop for the winter. Turn it under in the spring. Make sure you prevent the cover crop from maturing and going to seed, so it does not become a weed.
- During the garden season: Some cover crops are useful as permanent ground-covers in orchards and in the areas between permanent planting beds.

Rotate Crops. Moving crops to new parts of the garden each year will keep soils from becoming depleted of certain nutrients and will help control pests and diseases. Follow crops that use lots of nitrogen, such as sweet corn and tomatoes, with crops that add nitrogen to the soil, such as beans and peas.

Do Not Use Chemical Fertilizers. When injected with chemical fertilizers, soil becomes less healthy over time. The soil can even become stripped of nutrients all-together (burned), creating a need for greater amounts of chemical fertilizer to be added with increasing frequency.

Composting: Let it Rot

What is Composting?

Composting is the break-down of organic matter. Compost is an earthy, dark, crumbly substance that is an excellent addition to any garden soil. Composting is an easy way to recycle your yard and kitchen wastes, turning them into the vitamins and minerals your garden needs. It is also a critical step in reducing the volume of garbage needlessly sent to landfills for disposal.



Benefits of Composting

- Compost helps protect plants from diseases and insect pests.
- Compost enhances the soil's ability to hold water and air, essential qualities for plant growth. It improves drainage of clay soils and improves the capacity of sandy soils to retain water.
- Compost-amended soil is often darker and lighter in weight than the original soil. It warms up more quickly in the spring and stays warmer into the winter, extending the growing season.
- Unlike chemical fertilizers, compost releases nutrients slowly, as plants need them.
- You can put your kitchen and garden scraps to good use. It's much better than putting them in a landfill.

Compost Piles Are Alive!

In a hot pile, where the balance of carbon (brown: leaves) to nitrogen-rich materials (green: kitchen waste) and air to moisture are just right, bacterial life explodes. If the pile is really

cooking, it should reach at least 125°F for two to three days. This will promote the spread of thermophilic bacteria that kill weed seeds and plant diseases. The compost may be too hot to put your hand over it! In a cool pile, invertebrates (insects and earthworms) and microorganisms (bacteria and fungi) help transform organic material into compost. Composting is a natural form of recycling, which continually occurs in nature. As the decomposers in the compost munch their way through the pile and through each other, they release energy and nutrients.

How to Compost

Bins & Containers. You can compost using a variety of different systems, enclosures, or containers. Composting bins can be purchased commercially or constructed at home and can be made of wood, metal, plastic or just about any other available materials. While methods employed will vary somewhat depending on the system you choose, the principles and purpose remain the same.

Making Compost

Layer Browns and Greens.

- Browns (carbon-rich): Dead plants, dried leaves, straw or hay, newspaper, eggshells, and corncobs.
- Greens (nitrogen-rich): Fresh leaves or plants, kitchen scraps, coffee grounds, tea bags, green grass, weeds, flowers, freshly pruned trimmings, and manure.
- **Do not put** meat, fish, dairy products, salsas, anything containing cooking oil or grease, sick plants, or weeds that have started to seed in your compost. Fatty foods produce odors that attract pests. Do not use pet or pig manure which may contain disease organisms that can infect humans. Cow manure contains salts which can add to soil salinity; be cautious if your soil has an already high salinity. Finally, do not add ash to your compost and garden as it is very alkaline and our soils are already alkaline.

How to Care for Your Compost Pile

Turn Your Compost Pile. Aeration, the incorporation of oxygen to the compost pile, is important for efficient decomposition. Turning can be done with a pitchfork, shovel, or a special tool called an “aerator,” designed specifically for that purpose. Turning your pile also brings new materials in, keeping the process working.

Water Your Compost Pile. Compost piles should be kept moist but not wet. The material should have the moisture content of a well wrung sponge. Watering your pile once a week in the heat of the summer may be necessary. Check your pile moisture by digging down few inches. Water deeply to ensure even moisture throughout the pile.

Using Compost

- Incorporate compost into soil in the spring or fall before planting.
- Use compost as mulch.
- Side-dress trees and shrubs.

- Add to planting holes transplants, and many trees and shrubs.
- Create compost tea by adding compost to a bucket of water. Use for transplants, stressed plants, foliar-feeding, or regular watering.

Vermicomposting. Vermicomposting, or worm composting, is a great way to transform kitchen scraps into nutrient-rich compost. Red-worms are placed in a box or bin along with moist shredded paper (preferably newspaper) and kitchen scraps. The worms must be "fed" regularly and moisture levels maintained. Once the worms have become established, you can begin to harvest the worm manure, or castings, by sifting out the worms. The castings, which are rich in necessary nutrients and minerals, can be added to potting mixes, plants and directly to the garden.

Mulch

What is mulch?

Mulch is any organic or inorganic materials used to cover your garden.

What can you use as mulch?

Organic Mulches. Organic Mulches include hay and straw, bark/wood chips, leaves, pine needles, grass clippings, and pecan and nut shells.

Inorganic Mulches. Inorganic mulches include landscape fabrics (plastic), gravel, and carpet.



What are the benefits of mulching?

Mulching helps soil maintain moisture and a more even soil temperature, keeps soil warmer in the winter and cooler in the summer, helps prevent soil compaction, and reduces the build-up of salts in the soil. Mulching is a great way to smother and prevent weed growth (saving you valuable time weeding). It mimics nature by providing a "leaf litter" that is home to insects and microorganisms that help feed the soil and utilizes "wastes" that might otherwise end up in a landfill to create a healthier garden.

How to Mulch

- Lay a thin layer of mulch right after you plant seeds directly in the ground. Lay your mulch material evenly, trying to leave no soil exposed. Plant seedlings after you have mulched; use a hand trowel to pull the mulch back if you have trouble digging a hole.
- The amount of mulch needed depends on the mulch material; 1 to 3 inches is a good average depth.
- Chop up potential mulch material (leaves, straw, and branches) with a mower or chipper to spread more easily and quicken the return of nutrients to the soil.

- While some weeds will die if mulched over, it's best to remove weeds prior to mulching. Lightly water the mulch to bind it and help it stay in place.
- Larger plants and trees may rot if mulch is placed against their trunks or stems.
- Check mulch regularly and add more as needed.



Growing Cycle

Plants are made mostly of water. They absorb carbon dioxide from the air and nutrient and mineral-rich water from the ground. Through photosynthesis, leaves absorb energy from sunlight. Plants depend primarily on three essential nutrients: nitrogen, phosphorous and potassium. Some plants have symbiotic relationships with insects or fungi that help them grow; the plant releases sugars through its roots, which feed fungi, that in-turn create or "fix" essential nutrients for the plant, like nitrogen. Once a seed is placed in contact with the ground and sufficient water is available, the seed begins to grow. From the stored energy of the seed, the plant sends down roots to find water and nutrients. It then begins the formation of the plant, pushing up through the soil. As the plant grows, it utilizes the nutrients in the soil and depletes it, unless we add compost or other organic fertilizers. Some plants, like tomato plants, reach maturity by forming fruit while others, like broccoli (young flowers) and peas, form flowers and seed pods.

Climate

Here in the Southwest we benefit from a long growing season, but we also have to contend with hot summers, monsoon rains (during July, August, and September), and dry winters. This makes our climate and gardening conditions very unique. Our growing zone is 8 which means we have **greater than 180 frost free days**, with the last day of frost occurring in late March or early April. The growing period for individual gardens in southern New Mexico can vary as much as 20 days due to variations in elevation, exposure of the site to the elements, and soil type. Our climate allows us to grow all year round!

Soil Health Resources

The **National Sustainable Agriculture Information Service** (formerly Appropriate Technology Transfer for Rural Areas or ATTRA) has extensive soil, compost, mulch, and other sustainable production articles, information, guides, and other resources available, including extensive Spanish language materials, through their website at attra.ncat.org.

The **New Mexico State University Cooperative Extension Service** has several soil health and garden-related publications, such as "Backyard Composting" by George Dickerson, available free online at extension.nmsu.edu. The **Doña Ana County Cooperative Extension Service** office can also assist with questions and resources. A good starting point is their website (donaanaextension.nmsu.edu). You can contact their office at (575)525-6649.

Soil Testing

New Mexico State University's Soil, Water, and Agricultural Testing (SWAT) Laboratory offers extensive soil testing. Their website contains an updated soil testing price list (swatlab.nmsu.edu/soilist.html) and extensive soil analysis resources. You can contact them at (575)646-4422.

Compost

- *Let it Rot! The Gardener's Guide to Composting* by Stu Campbell
- *The Rodale Book of Composting*, Grace Gershuny & Deborah L. Martin, eds.
- Extensive compost resources available at www.howtocompost.org

Good sources for readymade bulk compost and soil amendments include:

- Sierra Vista Growers (2800 NM Highway 28 in La Union and www.sierravistagrowers.net) has high quality compost and mulches available. Bulk compost is \$30 per yard. Sierra Vista Growers can be reached at (575)874-2415.
- The City of Las Cruces has composted yard waste available at the Foothills Landfill (555 South Sonoma Ranch Blvd.). Mulch material is free and finer grade compost is \$14 per yard. The Landfill is open Monday through Friday from 8am to 4pm and Saturdays from 9am to 3pm. For more information call (575)528-3700.

Vermicomposting

- "Vermicomposting" by George W. Dickerson at aces.nmsu.edu/pubs/_h/h-164.pdf
- Additional Resources available at vermicompost.net

Chapter 4: Wise Water Use



In this section, you will learn:

- ✓ To conserve valuable water resources.
- ✓ The benefits of drip irrigation and water harvesting systems.

Wise Water Use

Using water wisely is as important in the garden as it is in your home. There are a number of simple things that you can do to use water efficiently in your garden. Installing a simple water catchment and drip irrigation system to feed your garden is a relatively inexpensive and easy way to save valuable time, reduce water bills, and wisely use limited water resources. Adding organic matter to build soil fertility helps the soil retain water, reducing the required amount of water and frequency of irrigation (the artificial application of water to the soil). Mulching helps retain soil moisture by preventing evaporation from the soil surface. Indicator plants, which are more sensitive to soil dryness, can be planted to help inform you of soil moisture levels. Squash, for example, will wilt much sooner than other vegetables as a result of soil dryness, informing you that soil moisture is low.

Permaculture Principles & Wise Water Use

If you are planning a garden or will be landscaping, consider applying permaculture principles to shape your land to channel, concentrate, and use as much rainwater as possible. This may include creating depressions around trees and shrubs; angling walkway and other surfaces to direct runoff to plants; digging channels and furrows to direct water to a garden; and planting drought-tolerant, native, and other appropriate plant varieties.

Greywater Systems

Greywater systems are a wise way to recycle much of your wastewater, rather than putting it into sewer and septic systems. In New Mexico, greywater is defined as untreated household wastewater that does not come from kitchen sinks or come in contact with toilet waste. Greywater systems distribute reusable wastewater for irrigation and other uses. New Mexicans may use up to 250 gallons per day of greywater for gardening, composting, and landscape irrigation without a permit.

Irrigation Methods

Plants watered by flood irrigation methods often show the effects of plant stress from periods of insufficient and inconsistent watering. Likewise, watering your garden with sprinklers can be insufficient and inconsistent and increase the chance your plants will develop diseases from water sitting on the leaves. Since only a portion of sprinkler water is absorbed into the soil to be consumed through plants roots, this method wastes significant water. Sprinkler and flood irrigation methods can waste up to 70 percent of water through evaporation on a hot and windy day. Drip irrigations systems are the best method of irrigation since the water goes directly to the plant roots where it will be used. Drip systems also allow you control the quantity and frequency of irrigation with ease. This method prevents water loss from evaporation, plant stress from periods of insufficient and inconsistent watering, and diseases associated with water sitting on plant leaves. No matter which irrigation method you use, remember that it is always best to increase your frequency of watering and decrease the amount of water.

Drip Irrigation

Watering with a drip irrigation system allows you to water any time of day, although morning and evenings are best. Choosing to install an automatic timer alleviates the time involved with hand watering and monitoring an irrigation system each time you need to water. You should, however, monitor a drip irrigation system periodically to ensure that all parts are working properly. When setting up a drip irrigation system consider growing plants with similar water needs close to each other. For example, do not plant tomatoes and chiles together since tomatoes require significantly more water more frequently than chiles.



Drip irrigation line is inexpensive and can be purchased at many hardware stores and irrigation companies, such as Sierra Irrigation in Las Cruces. To install drip irrigation in your garden or landscaping, determine the length of line you need and the daily water requirements of the plants along it. Then purchase the appropriate size drip emitter for the amount of water required by each plant, and install the system. Instillation is fairly easy and painless. For all drip systems you should consider purchasing a water filter, pressure regulator, and automatic timer.

Another option for row crops and garden beds is to install drip irrigation utilizing T-tape. T-tape is an easy to install plastic line with pre-cut slits that eliminate the need for drip emitters. T-tape comes in high and low volume flow and slit spacings ranging from 8 to 24 inches. Installing a T-tape drip system in a 200 square foot garden will likely cost around \$50 to \$75,

possibly more depending on the components and timer you choose to install. The cost of installing a drip system on a ½ acre community garden in Chaparral was approximately \$400, including three inexpensive automatic timers. If you are thinking of installing a drip system at your community garden, develop rules of use and a schedule to ensure that all community members understand how the drip system works and that the system is checked regularly and receives necessary maintenance in a timely manner.

Rainwater Harvesting

A rainwater catchment system is used to collect, or harvest, rainwater from a roof or other surface (the “catchment”) for storage and future use. Rainwater harvesting is a common practice in places without public water service and is increasingly popular in places with centralized water utilities, especially as the environmental and economic cost of such services escalates. Many municipalities and states promote rainwater harvesting as a wise way to reduce demand on public services, unnecessary water use, and water gardens and yards in arid climates. To save valuable water resources you can create a simple water catchment system with rain barrels to help water your garden. Rainwater is free, better for plants than chemically treated water, and is valued for its purity and softness (it has a nearly neutral pH).

How to Build a Simple Water Catchment System

To build a simple water harvesting system use existing gutters and downspouts to direct water into barrels. The following materials are needed to complete your water catchment system:

- Rain barrel, preferably a 55-gallon polyethylene plastic barrel or larger. A rain barrel vendor can be found at the Las Cruces Farmers’ & Crafts Market.
- Hose spigot
- ¾ inch pipe coupling
- Window screen
- Teflon cement
- Garden hose and nozzle
- Concrete blocks (optional)

Cut a hole in the top of the rain barrel approximately the same diameter as your downspout. Then drill a 15/16 inch hole three inches from the bottom of the barrel. Screw the spigot halfway in, apply Teflon cement to the exposed threads, and finish screwing the spigot in until tight. Now drill a 15/16 inch hole three inches from the top of the barrel. Twist in the pipe coupling a quarter of the way, apply Teflon cement to the exposed middle portion of the coupling, and continue screwing it in, leaving one inch of thread exposed. Connect the hose to the pipe coupling overflow spigot at the top of the barrel. You can run this hose into another barrel if needed. Cover the hole in the top of the barrel with the window screen and secure it in place with glue to prevent debris and insects from getting in. Finally, place the barrel directly below your reconfigured downspout to flow directly into the hole at the top of the barrel. Raising the barrel on blocks will allow you to get a bucket under the spigot.

Water Catchment System Maintenance

Rain barrels need a little regular attention to keep working smoothly. Standing water will begin to smell, especially if leaves and other organic material get into your barrels. This water won't hurt your plants, as it is essentially compost tea, but the smell can become a nuisance. To prevent problems:

- Use all water in the barrel within a month of collection and rinse the barrel out completely once per year.
- Check periodically to ensure that the screens are sealed completely to keep insects from getting into your rain barrel and breeding.
- Clean your gutters regularly to avoid debris buildup that may clog your system.
- Attach another barrel to the overflow spigot of your existing barrel if you find you need additional water storage space.

Wise Water Use Resources

Drip Irrigation Systems

- "Drip Irrigation for Home Gardens" by C. Wilson and M. Bauer is available for free at www.ext.colostate.edu/PUBS/Garden/04702.html.
- Dripirrigation.org contains comprehensive guides, videos, and other resources for agriculture, landscape, and greenhouse drip systems.
- DripWorks can assist you with configuring an appropriate drip system. Their website (www.dripworks.com) contains comprehensive information about drip systems, configuration, and costs. Dripworks can be reached at 1(800)522-3747.
- Sierra Irrigation, Inc. sells and installs drip irrigation in the Las Cruces area. They are located at 480 6th Street and can be reached at (575)523-4500.

Water Harvesting

- The American Rainwater Catchment Systems Association has extensive resources at www.arcsa.org.
- Brad Lancaster, a Tucson-based water harvesting expert and consultant, has published two volumes on *Rainwater Harvesting for Drylands and Beyond* and has information available through his website at www.harvestingrainwater.com.
- Texas A&M University's AgriLife Extension has a website devoted to rainwater harvesting at <http://rainwaterharvesting.tamu.edu/index.html> which provides extensive rainwater harvesting information, links to suppliers of harvesting equipment, and a calendar of public rainwater harvesting workshops.
- *The Texas Manual on Rainwater Harvesting* from the Texas Water Development Board is a free and comprehensive publication that includes many water catchment system examples and approximate costs. The publication can be accessed at www.twdb.state.tx.us/iwt/rainwater.asp.
- To calculate your water footprint visit h2oconserve.org.

Chapter 5: Beneficial Insects



In this section, you will learn:

- ✓ The importance of attracting beneficial insects to deter pest insects in your garden.
- ✓ To create inviting habitat for common beneficial insects in your garden.
- ✓ Natural remedies for common pest insects in our area.

Beneficial Insects

Attracting Beneficial Insects

Attracting and maintaining a population of beneficial insects is important to managing insect pests in your garden. Tiny parasitoid wasps are aggressive beyond their size when it comes to pursuing aphids and caterpillars. Lacewing larvae and ladybug larvae and adults make inroads on aphid populations. Ground beetles prey on a variety of ground-dwelling pests.

These various beneficial insects consume large numbers of pest insects, but their diets are not limited to other insects. In fact, many of the beneficial species have periods in their life cycles when they survive only on nectar and pollen. Therefore, planting a variety of insectary plants will ensure an adequate supply of nutrients to keep beneficial insects going strong. Insectary plants also include those plants that provide shelter for beneficial insects, another critical requirement.

To create a natural system in your garden that attracts beneficial insects to ward off pests and to minimize time spent dealing with pest infestations, it is important to:

- Plan your garden carefully. Choose plant varieties that are adapted to your location; stressed plants attract pests and are more vulnerable to disease.
- Plant a diversity of plant varieties that attracts beneficials and wards off pests. The greater the diversity in the garden, the harder it is for pests to find their host plants and the more beneficial predators your garden will attract to eat pests.
- Build soil health; healthier soil equals less stressed plants and a decreased likelihood of soil-borne diseases.

- Pay close attention to and build your knowledge of insects; use your garden as a learning lab to explore the interesting bugs that live in the ecosystem and find out how they help or hinder it. Remember that it can take time for beneficial predators to find and kill pests, so use precaution and be patient.
- You may also consider mulches (but beware of insects that mulches may attract), crop rotations (planting plant varieties in a different area of your garden from year to year), and the timing of planting (planting to avoid the most damaging pest stages or to ensure the plants have grown enough to resist pest arrival).

Measures to Prevent Common Insect Infestations

Avoid Vigorous Chemical Control.

Plan Garden Borders. Plant a border of dwarf fruit and flowering trees, mixed with flowering shrubs, native plants and grasses, and other perennials. Planting buffers of native plants is a water-friendly and smart way to beautify your garden and provide habitat for beneficial insects. Most native plants also have a culinary or medicinal use. **Insectory borders**, or garden borders containing plants that bloom in succession from spring through fall, provide nectar to attract beneficial insects throughout the season. Common herbs and flowers that you may consider for a garden border include:

- Alyssum, anise, broccoli, buckwheat, cornflower, lavender, phacelia, and poppy (California, Icelandic).
- Fennel, angelica, coriander, dill, and wild carrot to attract parasitoid wasps. Encouraging large quantities of these and other plants with tiny flowers is more useful than plants producing a single, large bloom that can drown parasitoid wasps.
- Clovers, yarrow, and rue attract parasitoid and predatory insects.
- Thyme, rosemary, mint, and other low-growing plants provide shelter for beneficial ground beetles.
- Composite flowers such as daisies and chamomile and mints attract predatory wasps, hover flies, and robber flies. The wasps catch caterpillars and grubs to feed their young while the predatory and parasitoid flies attack leafhoppers and caterpillars.

Include Plants of Different Heights.

Companion Plant. Companion plant to attract beneficial and repel pest insects.

- Marigolds repels nematodes.
- Mints repel cabbage pests and aphids.
- Rue deters Japanese beetles.
- Sweet Basil controls tomato hornworm, repels aphids, mosquitoes, and mites, acts as a fungicide, and slows the growth of milkweed bugs.
- Using tansy as a mulch can repel cucumber beetles, Japanese beetles, ants, and squash bugs.



Interplant to control pest insects.

- Planting tomatoes near cabbage helps control flea beetles and cabbage maggots.
- Onions planted with carrots repels rust flies and nematodes; onions planted with squash can deter squash bugs.
- Horseradish planted with potatoes repels Colorado potato beetles.
- Radishes or nasturtiums planted with cucumbers helps control cucumber beetle,






Weed Selectively. Leaving some weeds can provide potential food sources for beneficial insects.







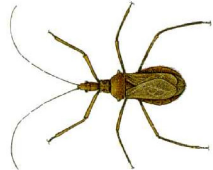


Common Beneficial Predator and Parasitoid Insects

All insects have a range of natural enemies: predators, parasitoids, and pathogens. Predators tend to be 'generalists' and are most frequently predatory in adult and immature stages.

Predatory insects include true bugs—big eyed bug, nabid (damsel bug), and pirate bug; beetles—ladybird beetle, ground beetle, rove beetle; and hover flies, yellow-jacket wasp, predatory mite, and spiders.

Parasitoids are parasitic insects—insects that feed on other insects. These include parasitic wasps and flies. Insect **pathogens** include diseases and illnesses such as viral and bacterial diseases, protozoal infections, and nematode infections.

Predators	Image
Rove Beetle	
Ground Beetle	
Soft-Winged Flower Beetle	
Lady Beetle	
Goldenrod Soldier Beetle	

Earwig	 A photograph of an earwig, a long, slender insect with prominent pincers at the end of its abdomen.
Syrphid Fly	 A photograph of a syrphid fly, a small fly with a body patterned to resemble a bee or wasp.
Spined Soldier Bug	 A photograph of a spined soldier bug, a large, brown, shield-shaped bug with prominent spines.
Damsel Bug	 A photograph of a damsel bug, a long, slender, brown insect with long legs.
Big-Eyed Bug	 A photograph of a big-eyed bug, a large, dark, shield-shaped bug with prominent eyes.
Leaf-Hopper Assassin Bug	 A photograph of a leaf-hopper assassin bug, a long, slender, orange-brown insect with long legs.
Assassin Bug	 A photograph of an assassin bug, a long, slender, green insect with long legs.
Pirate Bug (& nymph)	 A photograph of a pirate bug, a large, dark, shield-shaped bug with long legs.
Praying Mantis (& nymph)	 A photograph of a praying mantis, a green, raptorial insect with long, spiny legs.

Lacewing larvae



Thrips



Parasitoids

Images

Wasp Varieties



Tachinid fly



Common Pest Insects & Suggested Remedies

Aphids

Almost every plant has one or more aphid species that occasionally feeds on it. Aphids are generally wingless, although they have the ability to grow wings, and may be green (common in our region), yellow, brown, red, or black depending on the species and the plants they feed on. All are very small, pear-shaped insects with long legs and antennae. Aphids do not move rapidly and are generally found in large, dense clusters on leaves and stems. A low to moderate number of aphids in the garden is generally not damaging. However, you want to pay close attention as large numbers cause curling, yellowing, and distortion of leaves and stunt young shoots; they can also produce large quantities of honeydew, a sticky substance, which turns black with the growth of a sooty mold fungus. Some aphid species inject a toxin into plants, which further distorts growth. Aphids also spread viruses from plant to plant among squash, cucumbers, pumpkins, melons, beans, potatoes, lettuces, beets, chards, and bok choy. The presence of ants may be an indication of an aphid infestation, as ants ward off beneficial insects that prey on aphids. If you notice an aphid problem and the presence of ants



nearby, your first step is to deal with the ant problem. This will allow aphid predators to feed on the aphids.

Catch aphid infestations early. Check your plants carefully, especially the underside of leaves. Check plants every two weeks, especially when the temperature is warm but not hot (spring, early summer, and fall). Check to see if natural aphid predators such as lady beetle (ladybug) and parasitic wasps (which lay their eggs inside of aphids) are present; if so, they will likely keep the aphid population in check. Spray plants with a strong shot of water to knock aphids off plants; aphids cannot generally climb back up. Spraying in the morning will ensure that the plant has time to dry and fungal diseases cannot grow on the washed off honeydew. You can also squish and then rinse aphids off foliage. Introducing and/or encouraging lady beetles (ladybugs) and parasitic wasps will help control aphid populations. Spraying with soapy water will also kill aphids and disinfect honeydew.

Armyworm

The armyworm's diet consists mainly of grasses and small grains. An infestation is hard to detect, as the caterpillars migrate to new feeding areas in the cool of night. For this reason, diligence in checking your plants is very important. Armyworms will eat everything in an area in a few days, and once the food supply is exhausted the entire "army" will move to the next available food source. The larvae are a dull yellow to gray with stripes running down the length of the body, and a mature armyworm is 1.5 inches long. They turn into moths that are gray-brown with a white dot on the wing.



Look for armyworms on the underside of leaves and on new growth in the spring and summer. Organic matter on the ground can serve as a hiding place for armyworms. Birds are an excellent natural control. Putting out feeders to attract birds can help reduce the armyworm population. Predatory wasps can also control armyworm populations. Plant dill, fennel, coreopsis, and brightly colored flowers near the armyworm-prone plants. Handpick armyworms and drop them in a bucket of soapy water. Garlic oil spray may also help in early stages of growth very early in the season.

Striped Cucumber Beetle

Striped cucumber beetles feed on the stems, leaves, vines, and fruits of cucumber, squash, pumpkin, melons and related plants. Adults also feed on beans, peas, corn, and blossoms of other plants. Damage is also caused by larvae feeding on the roots. Striped cucumber beetles can over winter and emerge before you have even planted for the next summer to feed on tender seedlings. Striped cucumber beetles also spread a serious bacterial disease, bacterial wilt, that will cause plants to dry out and wilt before dying. Adult striped cucumber beetles are winged, oblong, yellowish-green in color, about 1/4 inch long, and



marked by three slate-black stripes. The head and antennae are dark colored. Eggs are light yellow or orange colored and round to oval shaped.

It is important to inspect newly planted plants frequently for the presence of any adult striped cucumber beetles. Inspect plants frequently throughout the season. Natural predators include soldier beetles, tachinid flies, braconid wasps, and certain nematodes.

Colorado Potato Beetle (Potato Bug)

The potato bug is about a half inch long with a bright yellow/orange body and 5 bold brown stripes along the length of its back. They feed on the leaves of potatoes, tomatoes, and eggplant.



Colorado potato beetle females are very prolific; they can lay as many as 800 eggs, which are usually deposited in batches of about 30 on the underside of host leaves. Potato bugs reproduce quickly (with a possible 3 full generations developing during one growing season) and cause severe infestation problems. There are few remedies for potato bugs. Row covers can help prevent potato bug problems. Plastic lined trenches can also prevent potato beetles from infesting gardens. Predators such as ladybird beetles, lacewings, predatory stink bugs, spiders, and parasitic wasps and nematodes provide some control. A number of herbs and herbal extracts are also reputed to repel or inhibit Colorado potato beetle, including catnip, tansy, sage, hemp, oak extract, wild potato (*Solanum chacoense*), and citrus oils.

Spider Mite

They generally live on the under sides of leaves of plants, where they may spin protective silk webs, and they can cause damage by feeding on the plant. Spider mites are very small (less than 1 mm) and vary in color. Spider mite problems can spread very quickly and intensively here, given our hot and dry climate. Lady beetles (ladybugs), pirate bugs, big-eyed bugs, and thrips are all good natural predators of spider mites.



Green Stink Bug

The green stink bug is typically bright green, with narrow yellow, orange, or reddish edges. It is a large, shield-shaped bug with an oval form about a half inch in length. Both adults and nymphs have stink glands that emit a foul-smelling liquid when disturbed. They attach their keg-shaped eggs on the underside of foliage in double rows of twelve eggs or more.



Green stink bugs are often found feeding with their needle-like mouthparts on the juices of a wide variety of plants from late April until the arrival of frost. Adults develop a preference for developing seeds and thus become crop pests in tomato, bean, pea, cotton, corn, soybean, and eggplant. When no seeds are present, they also feed on stems and foliage, also damaging

fruit trees such as apple, cherry, orange and peach trees. Green stink bugs are parasitized by the tachinid fly. Birds feed on green stink bugs.

Tarnished Plant Bug

Adults are oval-shaped, bronze to dark brown in color, and about $\frac{1}{4}$ inch long. They have white marks or lines behind the head and sometimes along the front wing. The back half of the front wing is membranous and held at a downward angle. The tarnished plant bug overwinters as an adult. It is active as soon as the weather is warm. Eggs are laid inside of plant tissue, in buds, soft, young stem tissue, or leaf veins.



The tarnished plant bug feeds on nearly half of all cultivated plants in North America; it is not picky. It is a pest in most vegetables and fruits. It is also found in flowers and herbs such as aster-like flowers (daisy fleabane, ragweed, goldenrod, horsetail), curly dock, cutleaf evening primrose, wild carrot, vetch, and clover. It is common to find populations much higher in these plants than in vegetable/fruit crops themselves. Low densities of tarnished plant bugs can be tolerated. From mid-April to early May, look for adults on flowers and foliage or for bleeding wounds on shoots. Adults fly when disturbed and are difficult to observe in the field. White sticky traps (or boards) will often catch adult tarnished plant bugs. The tarnished plant bug has a number of natural enemies, such as other true bugs (nabids), ladybird beetles, spiders, and parasitic wasps.

Grasshoppers

Birds, lizards, spiders, and rodents are natural predators. In the garden, horehound, cilantro, and calendula can be effective border herbs discouraging grasshoppers from feeding on other garden plants. Row covers also prevent grasshopper infestations. A heavy infusion of garlic oil can be sprayed as a repellent. Grasshoppers do not like nitrogen-fixing crops like peas and sweet clover.



Squash Bugs

Squash bugs are a major pest of squash, pumpkins, and other vine crops and are a vector of Yellow Vine Decline disease. Feeding, via piercing/sucking mouthparts, occurs primarily on the plant foliage. However, late in the season, squash bugs may also feed on fruit. The associated damage symptoms include wilting of leaves and ultimately results in leaves that appear black or dried out. Squash bugs can emit an unpleasant odor when disturbed. They grow to just over a half inch long. They are usually gray to black with the edges of the abdomen having orange and brown stripes. Eggs have a yellowish brown, brick red, and then black color as they age and are laid in groups of about twelve on the underside of leaves. Each cluster of eggs is usually laid in a characteristic V shape pattern following the leaf veins. Adults overwinter and



find shelter during the early fall under plant debris, around buildings, under rocks, etc. The overwintering adults will emerge in spring and will fly into fields and begin mating and laying eggs when the plants begin to grow. The adult squash bug is difficult to kill, so early detection of nymphs is important. The smaller the insect, the easier it is to control. Threshold is reached when the average number of egg masses (meaning groups of eggs) is greater than one egg mass per plant.

If only a few plants are affected, it is most effective to hand pick and destroy squash bugs and eggs. Another option is to place boards or shingles on the ground next to the plants. At night the squash bugs will aggregate under the boards and can then be squished each morning. Using resistant varieties such as Butternut, Royal Acorn, or Sweet Cheese and maintaining a healthy plant through proper care and watering are also important to limiting squash bug damage. Planting late in the season (some say after July 4th) may force squash bugs to settle elsewhere where food is available. It is also necessary to remove debris in and around the garden area that could possibly be used as shelter by the bugs. As stated above, by removing debris from the area, overwintering sites for the adults are reduced. Spraying eggs with garlic oil spray may help kill them. Tachinid flies and some parasitic wasps are natural predators of squash bugs. Companion planting can also help control squash bug problems. Good repellents may include catnip, tansy, radishes, nasturtiums, marigolds, bee balm, mint, and onions.

Garlic Oil Spray

Combine 3 ounces of minced garlic cloves with 1 ounce of mineral oil. Let soak for 24 hours or longer. Strain. Next mix 1 teaspoon of fish emulsion with 16 ounces of water. Add 1 tablespoon of castile soap to this. Now slowly combine the fish emulsion water with the garlic oil. Kept in a sealed glass container this mixture will stay viable for several months. To use: Mix 2 tablespoons of garlic oil with 1 pint of water and spray.

Beneficial & Pest Insect Resources

The Doña Ana County Cooperative Extension Service oversees the **Doña Ana County Master Gardener Hotline** which is open Tuesdays and Fridays from 9am to 1pm at (575)525-6649. The hotline is run by Master Gardeners that can assist with gardening, landscaping, and pest management questions. Publications are also available for free through their website at aces.nmsu.edu/damg.

Other Resources

- National Sustainable Agriculture Information Services @ attra.ncat.org/pest.html
- "Organic Gardening—Natural Pesticides" by L. M. English at aces.nmsu.edu/pubs/_h/h-150.pdf
- *Rodale's Encyclopedia of Organic Gardening*

Chapter 6: Companion Planting



In this section, you will learn:

- ✓ The benefits of companion planting.
- ✓ Which vegetables, fruits, flowers, and herbs are good companions.

Companion Planting

What is companion planting?

Certain plants can benefit one another when planted together. Plants may provide each other with pest control by hiding or masking each other from pests or by producing odors that deter or confuse pests. Companion plants may also provide each other with important nutrients, shade, or weed control. Companion planting is modeled after nature. In the forest, you see harmonious interrelationships between plants. Companion planting lessens dependency on pesticides. With companion planting, you not only protect plants from infestation, but you also avoid losing an entire season's harvest in the case of the infestation of a particular crop.

How to Companion Plant

Incorporate herbs and flowers with vegetable plantings to attract beneficial insects and deter pests from the crops. When planting a lot of a single crop, grow several plots of it throughout the garden, mixed with other vegetables, herbs, or flowers.

Examples of Companion Planting

Marigolds, mint, rue, and sweet basil planted thickly throughout the vegetable garden repel pests and protect neighboring plants. The Three Sisters Garden of corn, beans and squash is a traditional technique and an example of companion planting great for our region.



Plants & Their Companions

Plant	Companion(s) and Effects
Asparagus	Tomatoes, parsley, basil
Basil	Tomatoes (improves growth & flavor); dislikes rue; repels flies & mosquitoes
Bean	Most veggies & herbs, including potatoes, carrots, cucumbers, cauliflower, cabbage, summer savory
Bean (bush)	Sunflowers (provide partial shade & attract birds & bees for pollination), cucumbers, potatoes, corn, celery, summer savory
Bee Balm	Tomatoes (improves growth & flavor)
Beet	Onions, kohlrabi
Cabbage Family (broccoli, brussel sprouts, cabbage, cauliflower, kale, kohlrabi)	Potatoes, celery, dill, chamomile, sage, thyme, mint, pennyroyal, rosemary, lavender, beets, onions; (aromatic plants deter cabbage worms)
Carrot	Peas, lettuce, chives, onions, leeks, rosemary, sage, tomatoes
Catnip	Plant in borders to protect against flea beetles
Celery	Leeks, tomatoes, bush beans, cauliflower, cabbage
Chamomile	Cabbage, onions
Chervil	Radishes (improves growth & flavor)
Chive	Carrots; plant around base of fruit trees to discourage insects from climbing trunk
Corn	Potatoes, peas, beans, cucumbers, pumpkin, squash
Cucumber	Beans, corn, peas, radishes, sunflowers
Dead Nettle	Potatoes (deters potato bugs)
Dill	Cabbage (improves growth & health), carrots
Eggplant	Beans
Fennel	Most plants dislike fennel
Flax	Carrots, potatoes
Garlic	Roses & raspberries (deters Japanese beetle); plant with herbs to enhance their production of essential oils; plant liberally throughout garden to deter pests
Horseradish	Potatoes (deters potato beetle); around plum trees to discourage curculios
Lamb's Quarters	Nutritious edible weeds; allow to grow in modest amounts in the corn
Leek	Onions, celery, carrots
Lemon Balm	Scatter throughout the garden
Marigold	The workhorse of pest deterrents, plant liberally throughout garden; keeps soil free of nematodes & discourages many insects
Marjoram	Scatter throughout the garden

Mint	Cabbage family (deters cabbage moth), tomatoes
Nasturtium	Tomatoes, radish, cabbage, cucumbers (deters aphids); plant under fruit trees
Onion	Beets, strawberries, tomato, lettuce (protects against slugs), beans (protects against ants), summer savory
Parsley	Tomato, asparagus
Peppers, Hot	Cucumbers, eggplant, escarole, tomato, okra, Swiss chard and squash
Pea	Squash (follows peas up trellis), any vegetable; adds nitrogen to the soil
Petunia	Beans, scatter throughout garden
Potato	Horseradish, beans, corn, cabbage, marigold, limas, eggplant (trap crop for potato beetle)
Pot Marigold	Tomato, throughout garden (deters asparagus beetle, tomato worm & other pests)
Pumpkin	Corn
Radish	Peas, nasturtium, lettuce, cucumbers; general insect deterrent
Rosemary	Carrots, beans, cabbage, sage (deters cabbage moth, bean beetles, & carrot fly)
Rue	Roses & raspberries (deters Japanese beetle); keep away from basil
Sage	Rosemary, carrots, cabbage, peas, beans; deters some insects
Soybean	Grows with anything; helps everything
Spinach	Strawberries
Squash	Nasturtium, corn
Strawberry	Bush beans, spinach, borage, lettuce (as a border)
Summer Savory	Beans (deters bean beetles), onion
Sunflower	Cucumber
Tansy	Plant under fruit trees, roses & raspberries; deters flying insects, also Japanese beetles, striped cucumber beetles, squash bugs, ants
Tarragon	Scatter throughout garden
Thyme	Scatter throughout garden; deters cabbage worm
Tomato	Chives, onion, parsley, asparagus, marigold, nasturtium, carrot, limas
Valerian	Scatter throughout garden
Wormwood	As a border, keeps animals from the garden
Yarrow	Plant along borders, near paths, near aromatic herbs; enhances essential oil production of herbs

Chapter 7: Vegetables



In this section, you will learn:

- ✓ How to start seeds indoors.
- ✓ Which vegetables do well (and not do well) in our area.
- ✓ Some extraordinary benefits provided by common vegetables.
- ✓ When to plant vegetable varieties.

How to Plant

As a general rule, small seeds need to be started indoors while large seeds can be planted directly into the ground. When planting seeds, read the seed packages carefully for planting information like how deep and when to plant the seeds.

Small seeds need to be started in pots or trays in a well lit window sill or greenhouse. The soil needs to be kept warm and moist. Seeds started indoors need to be planted with sufficient time to allow plants to grow before transplanting them outside. Small seedlings are usually ready to plant outdoors when they have five or more leaves. Do not plant seedlings outside until the temperature is consistently 60°F and above and the last frost has passed in the spring. Once seedlings are ready to plant outside you must acclimate them from an indoor environment to the outdoors, or harden them off.

Hardening off begins 7 to 10 days before you transplant the seedlings outside. Begin by placing the seedlings for 3 to 4 hours in a shady, sheltered spot outside, like under a tree or on a protected porch. Increase the seedlings time outside by 1 to 2 hours each day. After 4 days, move the seedlings into a sunnier spot in the mornings and return them to the shade in the afternoon. After 7 days, the seedlings should be able to handle sunlight all day and stay out at night. At this point they are ready to plant. When you have transplanted the seedlings into the ground water them well.

Vegetable Seasonality

In southern New Mexico, you can grow vegetables during the entire year. The vegetables (and a few fruits) that can be grown in our region, and the season during which they can be grown, are described below. Even though you may be tempted to plant closer together, always remember to leave each plant plenty of space. Little seedlings make your garden look big—but they will fill out quickly. Knowledge of which varieties work well and which do not is only learned through time and experience.

The last section of this chapter provides suggestions for comprehensive resources that can help you select the perfect vegetable and fruit varieties for your garden. However, if you are part of a community garden group struggling to get a garden going, plant different varieties of a few vegetables the first year to learn for yourself what does well. Such an approach affords you the time you need to get more people involved while learning more about your soil and the vegetables that grow well in it. This will give you a great jumpstart on your second year. Be sure to document what and where you planted—there is nothing worse than forgetting which tomato varieties produced well and which did not.



Early Spring Planting: January to March

Vegetable	Days to Maturity	Plant Spacing	Helpful Tips	Health Benefits
Asparagus	2 years	12-15"	2 to 3 years before spears ready for harvest; can produce 15+ years.	Treats depression. Helps with menstrual cramps.
Bean (Garbanzo)	100	3-4"	Plant stays low to ground.	Stabilizes blood sugar. High in fiber.
Beets	50-60	2-4"	Tender tops can be eaten as greens.	Protects your heart & strengthens bones.
Broccoli	55-60	12-24"	Harvest before buds begin to open.	Controls blood pressure & benefits eyesight.
Brussels Sprouts	90	18-24"	Grow in partial shade.	High in protein & fiber. Anti-cancer properties.

Cabbage	65-75	12-24"	Be sure to thin. Heads form quickly.	Builds muscle, cleanses blood, & benefits eyes.
Carrots	70-75	1-3"	Slow to sprout. Planting with radishes improves germination percentage.	Benefits eyesight. Helps prevent cancer.
Cauliflower	50-70	18-24"	Fold leaves over exposed heads.	Combats breast cancer & banishes bruises.
Chard (Swiss)	60	4-15"	Pick outer leaves for continual harvest.	Promotes lung health & protects your heart.
Collard Greens	80	10-24"	All parts are edible and can be harvested at any time.	Help prevent cancer. A good source of fiber.
Kohlrabi	45-60	3-6"	Best flavor when bulbs are 2 to 3 inches apart.	Helps prevent cancer.
Leek	110-130	3-6"	Encourage long thin stems by planting close together; for thicker stems plant farther apart.	Help with digestion. High in fiber.
Lettuce	45-50	8-12"	Pick the outer leaves of leaf varieties & allow inner leaves to grow.	Aids digestion & promotes liver health.
Mustard Greens	35	5-10"	Harvest when leaves reach full size.	Helps with asthma.
Onions	80-115	2-4"	Harvest when tops die back.	Kills bacteria & fights fungus.
Parsnips	100-110	2-4"	Dig up before flower stalks form.	Great for digestion.
Peas	55-70	1-3"	Sweet when raw.	Good for bone health.
Potato	100-110	12"	Harvest when in full bloom.	Help prevents cancer.
Radish	20-25	1-2"	Check frequently as it matures quickly.	Helps maintain a healthy liver.
Spinach	40-50	2-6"	Bolts quickly in Spring.	Helps protect against osteoporosis, heart disease, & cancer.
Turnips	35-55	2-6"	Leaves are also edible.	Helps prevent cardiovascular disease.

Spring Planting: April (after last frost)

Vegetable	Days to Harvest	Plant Spacing	Helpful Tips	Health Benefits
Beans (Bush)	50-60	2-6"	Harvest when green and tender.	Lowers cholesterol & stabilizes blood sugar.
Beans (Pinto)	85	3-4"	Likes summer heat.	Combats cancer, lowers cholesterol, & stabilizes blood sugar
Cantaloupe	75-90	12"	Harvest when stem separates easily from fruit.	Supports immune system & eyesight.
Chile	70-80	12-24"	Harvest when green & firm or leave until red.	Treats asthma, blood clots, & arthritis.
Corn (Sweet)	70-80	8-12"	Harvest when silks are brown.	High in nutrients & fiber.
Cucumber	55-70	8-12"	Harvest frequently for best quality.	Beneficial for diabetes & arthritis.
Eggplant	60-70	18-30"	Must have full sun. Do not overwater.	High in fiber. Helps with digestion.
Okra	50-60	8-24"	Pick frequently to maintain production.	Good for pregnant women, rich in folic acid.
Peas	75	5-8"	Sweet when raw.	Good for bone health.
Pepper (Bell)	70-80	12-24"	Harvest when green & firm or leave until red.	Helps your heart.
Potato (Sweet)	130	10-18"	Sweet potatoes are grown from vine cuttings.	Help prevent diabetic heart disease & colon cancer.
Pumpkin	100-120	36-60"	Harvest before the first hard freeze.	Helps prevent cataracts & reduce the risk of muscular degeneration.
Squash (Summer)	42-55	24-48"	Pick frequently when young and tender.	Hydrates & protects skin.
Squash (Winter)	70-115	36-96"	Become sweeter the longer left on vine.	Promotes lung health.
Spinach (Summer)	70	24-48"	Bolts quickly in spring.	Benefits eyesight & helps prevent cancer.
Tomato (Large)	70-80	36-48"	Harvest when pink & firm.	Contain lycopene, a powerful antioxidant.
Tomato (Cherry)	60-75	24-36"	Produce in abundance.	Benefits the heart.
Melons	80-120	24-36"	Provide rich soil, lots of water & lots of space.	Aids digestion.

Summer Planting: July to August

Vegetable	Days to Harvest	Plant Spacing	Helpful Tips	Health Benefits
Beans (Bush)	50-60	2-6"	Harvest when tender.	Lowers cholesterol & stabilizes blood sugar.
Beans (Pinto)	85	3-4"	Likes summer heat.	Combats cancer, lowers cholesterol, & stabilizes blood sugar
Beets	50-60	2-4"	Tender tops can be eaten as greens.	Protects the heart & strengthens bones.
Broccoli	55-60	8-12"	Pick before buds begin to open.	Controls blood pressure & benefits eyesight.
Cabbage	65-75	12-24"	Be sure to thin. Heads form quickly.	Builds muscles, cleanses blood, & strengthens eyes.
Carrots	70-75	1-3"	Slow to sprout. Planting with radishes improves germination percentage.	Benefits eyesight & helps prevent cancer.
Cauliflower	50-70	18-24"	Fold leaves over exposed heads.	Combats breast cancer & banishes bruises.
Chard (Swiss)	60	4-15"	Pick outer leaves for continual harvest.	Promotes lung health & protects your heart.
Collard Greens	80	10-24"	All parts are edible and can be harvested at any time.	Help prevent cancer & good source of fiber.
Corn (Sweet)	70-80	8-12"	Harvest when silks are brown.	High in nutrients & fiber.
Kohlrabi	45-60	3-6"	Best flavor when bulbs are 2 to 3 inches apart.	Help prevent cancer.
Lettuce	45-50	8-12"	Pick the outer leaves of leaf varieties & allow inner leaves to grow.	Aids digestion & promotes liver health.
Mustard Greens	35	5-10"	Harvest when leaves reach full size.	Helps with asthma.
Squash (Summer)	42-55	24-48"	Pick frequently when young and tender.	Hydrates & protects skin.
Turnips	35-55	2-6"	Leaves are also edible.	Helps prevent cardiovascular disease.

Fall Planting: September to December

Vegetable	Days to Harvest	Plant Spacing	Helpful Tips	Health Benefits
Artichoke	60-90	3-4"	Harvest edible flower buds when 3" to 4" in diameter. After harvest, cut back 1/3 to promote budding.	High in antioxidants. Helps prevent heart disease, cancer, & birth defects.
Arugula	35	2-3"	May be planted thickly.	Rich in vitamins & minerals. An excellent source of antioxidants.
Beets	50-60	2-4"	Tender tops can be eaten as greens.	Protects your heart & strengthens bones.
Broccoli	55-60	8-12"	Harvest before buds begin to open.	Controls blood pressure & benefits eyesight.
Cabbage	65-75	12-24"	Be sure to thin. Heads form quickly.	Builds muscles, cleanses blood, & strengthens eyes.
Carrots	70-75	1-3"	Slow to sprout. Planting with radishes improves germination percentage.	Benefits eyesight & helps prevent cancer.
Cauliflower	50-70	18-24"	Fold leaves over exposed heads.	Combats breast cancer & banishes bruises.
Garlic	60-75	6"	Like many bulbs, garlic requires a cold period for healthy growth.	Helps prevent colds & the flu.
Kale	55-60	18-30"	Harvest after a frost for a sweeter taste.	Rich in vitamins A & C.
Lettuce	45-50	8-12"	Pick the outer leaves of leaf varieties & allow inner leaves to grow.	Aids digestion & promotes liver health.
Mustard Greens	35	5-10"	Harvest when leaves reach full size.	Helps with asthma.
Onions	80-115	2-4"	Harvest when tops die back.	Kills bacteria & fights fungus.
Spinach	40-50	2-6"	Bolts quickly in Spring.	Benefits eyesight & helps prevent cancer.
Strawberries	40-50	18"	Pinching off runners will give you larger plants with small yields of big berries.	Great source of vitamin C.
Turnips	35-55	2-6"	Leaves are also edible.	Helps prevent cardiovascular disease.

Vegetable Resources

NMSU Cooperative Extension Service has comprehensive information and publications on selecting appropriate vegetable varieties, planting, and harvesting for free on their website at extension.nmsu.edu, including "Vegetable Variety Recommendations for New Mexico Backyard and Market Gardens" by George W. Dickerson.

An exhaustive listing of free publications available through NMSU's College of Agriculture and Home Economics is compiled under "Home Food Gardening Publications" by the Doña Ana County Master Gardeners at aces.nmsu.edu/county/donaana/mastergardener/documents/nmsu_homefoodgardeningpublications.pdf

Doña Ana County Master Gardener **Darrol Shillingburg's Art & Gardens** website (www.darrolshillingburg.com) contains comprehensive local knowledge from an experienced gardener with suggestions of appropriate vegetable varieties, extensive guides, and local food resources.

Chapter 8: Herbs



In this section, you will learn:

- ✓ The difference between herbs and spices.
- ✓ Which herbs will do well (and not do well) in our area.
- ✓ How to harvest and use herbs, including medicinal herbs.

Herbs & Spices

What are herbs and spices?

Herbs and spices have been used for centuries for their culinary, decorative, medicinal, and aromatic qualities. In general, we grow herbs for their leaves and stalks, and we grow spices for their flowers, fruits, seed bark, and roots. Herbs and spices may be annuals, perennials, or biennials.

Annuals. Annuals complete their entire life cycle in one growing season.

Perennials. Perennials grow for many growing seasons. Often, the top portion of the plant dies in the winter then grows again in the spring from the same root system. Many plants, however, do keep their leaves year round, and make great decorative borders. (Many herbs behave either as an annual or perennial depending on climate and geography.)

Biennials. Biennials require two years to complete their life cycle. During the first season, leaves grow near the soil surface. During the second, the stem elongates and flowers and seeds form.

Harvesting Herbs

It is best to harvest on dry, sunny mornings just after the morning dew has dried, but before the heat of the sun causes the essential oils to lose their quality. Harvest herbs with sharp scissors or a garden knife. If you are collecting leaves, cut the whole stem before removing the foliage. If you are harvesting herbs that spread from a central growing point (parsley, sorrel), harvest the outer stems or leaves first. If you are harvesting leaves or flowers from bushy plants, collect from the top of the plant.

Perennials. During the first year of growth, harvest lightly and allow plants to become established. Once they are established, you can harvest up to two-thirds of the foliage once in the spring and once in the summer. In our warmer climate, you can harvest lightly into late fall.

Annuals and Biennials. When harvesting annuals and biennials for foliage, leave at least 5 ½ inches of growth. You may harvest most annuals and biennials several times each season.

Drying Herbs

Dry herbs in a warm, dry, and dark place with good ventilation. Wipe off any soil, but avoid washing leaves unless absolutely necessary.

Drying in bunches

- Dry long-stemmed herbs in bunches of about 1 inch in diameter.
- Remove any dead or wilted leaves.
- To organize, fasten bunches to wire clothes hangers and label each hanger.
- If you are hanging the bunches in a dusty room, place loose paper bags over them with the bottom end open.
- When the bunches are crispy dry, remove the leaves from the stem.

Drying on screens

- Dry herbs with short stems and small leaves, as well as loose herb blossoms and flower petals, on screens.
- Snip off foliage with scissors and spread it on a screen in a single layer.
- Herbs should be ready in 7 to 10 days.

Drying in the oven

- Spread herbs one layer deep on paper towels set on baking sheets.
- Bake the herbs at 80 to 100°F. (If you smell the herbs immediately, lower the temperature.)
- Stir once every thirty minutes.
- Remove herbs when they are crispy dry, but before they turn brown (3-6 hours).

Drying herb seeds (for the kitchen)

- Snip off seed heads when they have turned brown.
- Put seeds in cheesecloth and dip them in boiling water, or place seeds in a sieve and pour boiling water over them.
- Spread the seeds on paper or a fine-mesh screen to dry in the sun.

Drying roots

- Clean roots and remove fibers.
- Cut large thick roots in half lengthways and then into small pieces.
- Dry roots in the oven at 120-140°F, turning them regularly, until they are fragile and break easily.

Preserving and Storing Herbs

Store dried herb foliage, blossoms, roots, and seeds in air-tight glass containers in a dark place. Label your containers, since dried herbs tend to look the same. You can also use dried herbs to make herbal vinegars, herb-flavored oils, and herb-flavored honeys.

Medicinal Herbs

How to Prepare Herbal Remedies

Remedy	Preparation
Simple Tea	Put a rounded teaspoon of the herb in a tea bag or ball or loosely in a cup. Pour a cup of boiling water over the herb and let steep for 15 minutes. Remove the teabag or strain out the herb.
Cold Infusion	Suspend dried herbs (in a cloth, tea ball or teabag) in water overnight at room temperature.
Standard Infusion	Pour 2 cups boiling water over 2 Tablespoons dried herbs or 1 ½ cups packed fresh herb leaves or flowers. Allow it to brew for 15 minutes to several hours. Strain.
Herbal Decoction	Add 2 Tablespoons dried herbs, or 1 ½ cups fresh bark, roots, or stems, washed and dried well to 2 cups boiling water in an enamel saucepan. Simmer gently, without boiling, for 30 minutes. Strain.
Herbal Syrup	Combine ¼ cup herbs, 1 quart water and 1-2 Tablespoons honey in an enamel saucepan. Bring to a boil and continue at a slow boil until the liquid is reduced by half. Add the honey. Syrup may be stored in the refrigerator for up to a month.
Herbal Compress	Soak a towel in warm infusion or decoction. Wring it out and lay it on affected area. Cover it with a dry towel. As the compress cools, replace it with a warm one. Continue treatment for 30 minutes or until the skin is flushed or tingly.
Herbal Poultice	Mix one part of ground herb with one part flour, corn meal, or oatmeal. Add enough hot water to the mixture to give it the consistency of prepared mustard. Spread it between 2 layers of gauze or muslin. Apply to the area to be treated and cover with a towel moistened in fairly hot water.
Herbal Salve	Mix together beeswax and herbal oil. Store in a cool place for 1 week.
Herbal Tincture	Mix ¾ cup powdered dried herb and 2 cups brandy, vodka, or gin in a glass bottle and allow to steep for several weeks. Shake occasionally. Strain and store.

Medicinal Herbs Commonly Used in the Southwest

Medicinal Herb	Preparation & Use
Dandelion	Use simple tea as a blood thinner and laxative. Perennial.
Canaigre, Red Dock, Pie Plant	Combine the dried root with water and use as a mouthwash for pyorrhea and gum inflammations. Use the tea as a wash for acne. Perennial.
Chaparral	Use as a salve for skin sores, ringworm, bites, and saddle sores. Drink the tea for stomach and intestinal pain. Perennial.
Damiana	Use simple tea as a sexual stimulant and restorative for sexual debility. A good mood elevator for depression and anxiety. A gentle diuretic for water retention. Perennial.
Epazote	For chills, soak the tops in cold water for several hours. Strain and drink. Use tea as an effective menstrual stimulant. Annual or short-lived perennial.
Elder Flowers	Make a tea with equal parts of Poleo or Paleo Chino for fevers. To treat water retention, make a diuretic tea out of the flowers and/or dried berries. Perennial.
Chamomile, Manzanilla	Use tea to treat head colds, flu symptoms, and reduce fevers. A virtual cure-all for any illness accompanied by stomachache and sleeplessness. Also relieves dull, aching joints and menstrual cramping accompanied by scanty flow. Annual.
Bee Balm	Use as a cough and sore throat remedy. Drink as hot as possible and sip slowly. Perennial.
Wild Oregano	Drink tea to sweat. Boil flower balls and steep covered. Perennial.
Oshá	Use to treat colds, sore throats, and loosen phlegm. The root is an effective disinfectant and skin wash. Perennial.
Rosemary	Apply to windburns as a salve. Use tea to alleviate head and chest pain from colds. Perennial.
Spearmint	Drink tea to treat kidney and intestinal ailments. Perennial.
Mormon Tea	Use as a diuretic and for mild kidney inflammations, weak kidneys, and weak lungs. Perennial.
Lavender	Use as a tea for stomachaches and for alleviating gas and acid indigestion in adults. Perennial.
Ocotillo	Boil a 2 inch section in water for half an hour. Remove from heat and add whiskey. Steep the tea, covered, until it cools to room temperature. Use to treat lymph circulation, pelvic congestion, tonsillitis, and bladder infections. Perennial.
Sand Verbena	Boil whole dried plant into a tea for the stimulation of milk production in nursing mothers. Annual or perennial.
Thistle	Make a tea of the roots to cease childbirth and control bleeding. Also an intestinal astringent for diarrhea. Annual.

Chapter 9: Saving Seeds



In this section, you will learn:

- ✓ Why it is important to begin saving seeds.
- ✓ How to collect and save seeds from year to year.

Seed Saving

Saving seeds is an important way for conscientious gardeners to preserve local garden heritage and traditions while saving money. This is especially important since large corporations now control patented seed, gene material, and hybrid plant varieties. Many farmers have become dependent on agribusiness corporations for their yearly supply of seeds. These seeds, however, are costly and have been bred to generate seed that is not worth saving (see Chapter 11). Unfortunately, this has led to a decline in heirloom and other local varieties which have adapted to grow exceptionally well in particular conditions through years of careful cultivation and selection by gardeners and farmers without expensive research and development costs.

Seed saving is one technique that allows local gardeners to stop the cycle of dependence on large agribusiness corporations and continue to use seeds that have developed resistances to local diseases and pests, as well as adapting to local climate and soil conditions. Heirloom varieties contain priceless genetic information that can be lost when not replanted yearly. A number of grassroots organizations are fighting to save seeds and reestablish endangered plant species, such as Native Seed SEARCH in the Sonoran Desert and Mother Seeds in Resistance in Chiapas, Mexico. Organizations such as Seed Savers Exchange work diligently to encourage local farmers and gardeners to save their own seeds and contribute to seed banks. Large social movements, such as the women of Navdanya, India, have also formed to fight trade laws and seed patents that inhibit local farmers' abilities to save and plant seeds they have grown for generations. Many large corporations have bought smaller family-owned seed companies that specialize in regional and heirloom seed varieties, like the Santa Fe-based company Seeds of Change that is now owned by Mars, Inc. Seed exchanges, where gardeners trade seeds with other gardeners, are now happening in many places including Las Cruces (held in January at Mountain View Market). Many gardeners, farmers, and afore-mentioned groups

that save and sell seeds may be more than willing to donate seeds to a community garden project. Finally, by following a few simple steps seed saving can become a meaningful tradition for you.

Seed Harvesting

Seeds should only be harvested at the correct moment of maturity when, “The ripe flowers of herbs, ornamentals and many vegetables have exposed seeds emerging from capsules, or bracts, or from behind withering petals. The flowers will be faded in color and appear dried out, and, in the case of lettuces and daisies, a puff-like top such as is commonly seen on dandelions will appear” (Seeds of Change). When these signs are seen, the seeds can be picked and clipped, then laid out in a warm place to finish the drying process. It is important to prevent the mature seeds from falling to the ground or spending too much time exposed to the elements.

Seed Cleaning

There are two methods for seed cleaning: wet and dry processing. Wet processing is used for seeds that are found in the damp flesh of fruits and berries. This includes seeds of cacti, citrus, cucumbers, eggplants, melons, tomatillos, and some chiles. Many need to go through a fermentation process, which is necessary to eliminate seed-borne viruses. During this process, seeds remain at room temperature in their own juice, slightly watered down, for a period of one to four days. It is important to know which seeds need to go through the fermentation process. For example, watermelons, squash, luffas, cantaloupes and tomatoes can all be fermented. Chiles and peppers do not need to ferment, but need only to soak for 24 hours to release and separate the fertile seeds.

For large fruits, the seeds are scraped out; smaller fruits are crushed or mashed. This mixture of seeds and pulp is placed in a large bucket, which contains about twice as much water as seeds and pulp. The mixture is then stirred vigorously. The most viable seeds will sink to the bottom; the less viable seeds and debris can later be poured off the top of the mixture. This process continues until the seeds are cleaned. The seeds are then placed on a strainer and washed with cool water. Finally, the seeds are dried on a nonstick surface. Seeds should not be dried on paper surfaces, since they can be hard to remove. A fan can increase air circulation and facilitate quicker drying. Additionally, warm and wet seeds will often germinate or mold. Seeds should not be dried in excessively warm places, as temperatures in excess of 95°F can damage seeds.

The dry cleaning method is used to collect seeds from beans, corn, flowers, grains, herbs, mints, onion, umbels, and some berries. Some, including bean, pea or radish pods and carrot umbels are generally left to dry in the garden whenever possible, which facilitates the harvesting of the



seeds. Also, plants can be pulled and left to dry in a warmer place before a hard freeze. This allows the seeds to continue to develop before threshing.

Threshing involves breaking seeds free of their coverings. For small-scale seed saving operations, dry pods are placed in a feed sack or pillowcase, then beaten or stepped on. Pods can also be mashed between two boards. While this works well for smaller seeds, too much pressure can cause damage to larger seeds.

The seeds are then separated from the chaff through a process called winnowing. Seed, chaff and debris are poured from one bowl to another while a gentle breeze blows, thereby separating the heavier, viable seeds from the lighter chaff and debris. The breeze can come from common box fans, which work well except for the smallest of seeds. Whether using artificial or natural wind, a sheet should be used in case viable seed does not land in the second container. At the finish, the process should have produced a pile of darker, heavy and viable seed. The lighter seeds will still grow good plants, but of slightly lower quality.

Seed Saving Resources

Botanical Interests, Inc. is a Colorado-based seed company with several local distributors, including Sierra Vista Growers in La Union and Enchanted Gardens in Las Cruces. Botanical Interests also has an affiliate program where groups and organizations put a link to the Botanical Interests website on their webpage and receive a 20% commission on any sales from customers going to their site from your site. They also have a fundraising program through which groups and organizations receive 40% of seed collection sales. Botanical Interests can be reached @ (720)880-7293 or www.botanicalinterests.com.

Native Seed SEARCH (www.nativeseeds.org) is an organization based near Tucson, Arizona selling seeds of crops traditionally grown in the American Southwest. Their website contains a tremendous amount of information on native seed varieties and seed saving.

Seeds of Change, a Santa Fe based company owned by Mars, Inc., has a seed donation program through which they donate leftover seeds to community groups and organizations. To learn more about seed saving and their seed donation program visit www.seedsofchange.com.

Seed Savers Exchange is a membership organization based near Decorah, Iowa that specializes in saving, selling, and maintaining a seed bank of more than 25,000 endangered heirloom plant varieties. Their website (www.seedsavers.org) contains information about seed varieties, food heritage, and online forums discussing seed saving-related topics.

Other Resources

- *Seed to Seed: Seed Saving and Growing Techniques for Vegetable Gardens* by Susanne Ashworth and Kent Whealy.

Chapter 10: Edible Natives



In this section, you will learn:

- ✓ Extraordinary uses for common desert plants.

Edible Native Plants & Recipes

Agave, Mescal, Century Plant

The center stalk grows rapidly, sometimes as much as a foot per day, and eventually sends out lateral branches at the tip, each branch terminating in a large cluster of golden flowers. Flowering occurs in the late spring and early summer. The plant flowers once and then dies. Agave can live thirty to forty years. Agave is often pit-roasted for food, fiber, and medicine and used ceremonially by Apaches.



Agave Nut Butter Recipe. Mix ground sunflower seeds, piñon nuts, or black walnuts with baked, fresh mescal pulp that has been separated from the fiber. The proportion is 2 parts ground nuts to 1 part mescal pulp. A dollop of honey turns these nutbutters into a delicious breakfast spread that can be used on mesquite bread.

Baked Agave Recipe. *Agave palmerii* and *A. parryi* have fairly fleshy leaves. Use only these types as the other leaves are much too caustic. Starting at the bottom of the plant, cut off the long ends of the leaves about where they begin turning white. When you have cut off all the leaves, you should have a white-ish heart the size of a very large cauliflower. Rinse any accumulated dirt off the heart with water. Wrap the crown in aluminum foil and bake at 350° for about 10 hours, more if the heart is very large, depending on the size of the agave. When baking, place the foil-wrapped succulent in a

shallow baking pan, because as the heart cooks it begins to give off juice, which is better in the pan than on the bottom of your oven. The cooked heart is soft, mushy, and golden brown.

Place a leaf on a cutting board and run a dull knife down the leaf in the same direction as the fibers, pressing to force out the pulp. The very center of the crown is pure pulp. Scoop this out too. A medium-size agave will yield about 3 ½ cups of juice and pulp.

Barrel Cactus, Visnaga, Devil's Head, Compass Cactus

Barrel cactus fruits are yellow and form a circle on the crown of the plant. They have a sour but not unpleasant taste and can be eaten directly from the plant.



Cholla, Staghorn, Jumping Cactus

Cholla buds can be harvested in early spring before they open into flowers in April; fruits can also be gathered. Buds can be boiled or pit-roasted. A two (2) tablespoon serving contains 48 calories and more calcium than a glass of milk.

Cholla Buds Recipe. Remove thorns and put cholla in a saucepan. Add water, cover, and boil for 15 minutes or until tender. Drain. Cholla buds can be used as they are in green salads, potato salad, or meat stews. To preserve, set in the sun on trays to dry. To freshen dried buds, soak in water for 3 hours. Boil for ½ hour.

Ocotillo, Slimwood, Coach Whip

The seeds and flowers can be eaten.

Ocotillo Flower Punch

Recipe. Soak ½ bucket of ocotillo flowers in ½ bucket of cool water overnight. In the morning, strain the liquid to make a delicate juice.



**Prickly Pear, Tuna, Indian Fig (fruit)
& Beavertail (plant)**

Large, waxy flowers appear in the spring, followed by juicy red fruits. The pads, when prepared for eating, are called nopales.



Prickly Pear Fruit Juice Recipe. Using tongs, collect the pears. Usually the darker red ones are the riper and juicier, but the color of the fruit varies from species to species. You can tell if a fruit is ripe if the pulp looks red at the place you have detached it from the plant. At home, hold the fruit with tongs, and brush under running water with a stiff vegetable brush. Boil water in a medium-sized saucepan. Put six pears into the boiling water and blanch for about 10 seconds. Remove the pears with tongs.

Peel the tunas and discard the peels. Slice tunas in half and extract the seeds. Put the fruit in one bowl and the seeds in another. When you have about $\frac{3}{4}$ of a bowl of seeds, fill the bowl with water and, using your hands, break up the seed clusters so that the pulp clinging to the seeds will disperse in the water. Mash the other bowl of pure pulp with a potato masher and strain through a mesh strainer or colander lined with cheesecloth. After the seeds have soaked for a couple of hours, strain off the accumulated liquid and add to the liquid that has drained from the mashed pulp. Combine in a saucepan and simmer for 5 minutes. Pour into clean glass jars and refrigerate. Juice can be used to prepare jelly and can be mixed with other fruit juices for a tasty punch. Try it with 1 pint cactus juice, one pint cranberry juice, and 1 quart ginger ale.

Nopale Recipe. Using tongs, collect the new young pads in the spring. Those from 1 inch to 3 inches in diameter will be tender. Place the pads in a saucepan and cover with water. Boil for 20 minutes. A large clove of garlic and a slice of onion will add flavor. Drain. To clean the pads, place on a hard surface and, using a small, sharp knife, scrape off the stickers and the rubbery leaves. Rinse the pad well under water. A strong light is necessary in order to see if you have removed all the thorns. Scrutinize each pad carefully! Rinse the plate or cutting board before cleaning the next pad. Chop or dice the cleaned pads or cut them into thin strips of about $\frac{1}{2}$ inch. These can be covered with water and stored in the refrigerator for several weeks. Eat nopales over beans or in a casserole or tossed salad.

Yucca: Palmilla, Soap Tree, Our Lord's Candle, Narrowleaf Yucca

The flower, stem and fruit are edible. Roots can be pounded and soaked in water to make suds for washing hair and garments.



Yucca Flour Soup Recipe. This recipe yields five cups of soup.

- 3 cups petals from *Yucca elata*
- 2 Tablespoons butter
- 1 Tablespoon cornstarch
- 1 quart very rich milk, or milk combined with cream
- Salt
- Pepper
- Dash of nutmeg

Use only the petals of the flowers. Discard the centers, as they are very bitter. Wash the petals in a colander. Put in saucepan and cover with water. Boil for 5 minutes. Drain and return to pan. Mash the petals with a petal or food masher. Add butter and cornstarch and cook for 2 minutes. Slowly add milk and cook until mixture has thickened. Add nutmeg, salt, and pepper.

Yucca Hash Recipe. This recipe yields three cups.

- 2 cups petals of *Yucca elata*
- 1 tomato
- 1 onion
- 3 cloves garlic
- ½ green pepper
- 1 Tablespoon sugar
- ½ cup boiled sliced cholla buds or 1 small can peas
- Salt
- Pepper

Use only the petals of the flowers. Boil the petals in two cups of water for 15 minutes. Drain. Dice the tomato, onion, garlic, and green pepper, and simmer in a small saucepan until tender. Add sugar, salt, and pepper to taste. Combine sliced cholla buds or peas, yucca petals, and other vegetables and heat thoroughly. Serve on fried tortillas.

Mesquite, Honey Mesquite, Pechit

When the beans are fully ripe they are brittle and straw-colored. Some varieties have beans that are randomly streaked with red. The bean is a good source of protein, carbohydrates, and calcium.



Mesquite Bread Recipe. This recipe makes one 7-inch round loaf of mesquite bread.

- 1 cup finely ground and sifted mesquite meal
- 1 cup whole wheat flour
- 1 teaspoon baking powder
- 1 teaspoon baking soda
- 2 Tablespoons oil
- $\frac{3}{4}$ cup water

Combine dry ingredients. Add oil and water and mix until dough forms a ball and cleans the sides of the bowl. Lightly grease a cookie sheet or flat pan. Form the dough into a half-sphere loaf on the pan. Bake for 30 minutes at 350°.

Atole de Pechita. Yield: 1 cup

- 1 cup mesquite broth
- 1 tablespoon brown sugar or panocha (Mexican cone-shaped raw sugar)
- $\frac{1}{8}$ teaspoon cinnamon
- Sprinkle of ground cloves

Combine broth, brown sugar, and spices in saucepan. Heat and stir until sugar is dissolved. Serve warm or chilled.

Sunflower, Marigold of Peru

In southern New Mexico, sunflowers bloom from March through October. Seeds can be eaten raw, roasted, or ground. In the fall, heads can be broken off, dried, and beaten to release the seeds. Seeds are a good source of protein and vitamin B.



Sunflower Bread. This recipe will yield one loaf of bread.

- ¼ cup honey
- ¼ cup soft butter
- 2 eggs, beaten
- 1 cup whole wheat flour
- 1 teaspoon salt
- 1 Tablespoon baking powder
- 1 ½ cups ground sunflower seeds, shell and meat, or meat only
- 1 cup milk
- ½ cup whole or coarsely chopped sunflower meats

Beat together honey and butter. Beat in eggs. Combine flour, baking powder and salt and ground seeds. Add to honey/butter mixture alternately with the milk. Fold in whole sunflower meats. Pour into greased loaf pan and bake 1 hour at 325°. Cool on rack. This bread slices better when cool.

Chokeberry, Wild Cherry, Stone Fruit

The chokeberry tree bears small, sour fruits that vary from dark red to almost black when mature. Each cherry has one large bony seed. Fruit is ripe in July and August.



Cherry Corn Bread Recipe. This recipe yields one 9-inch round loaf of bread.

To prepare cherries:

- 1 cup whole chokecherries
- 1 cups water
- 2 Tablespoons honey

Place cherries and water in a saucepan. Bring to a boil and cook for 20 minutes. Drain juice from cherries and reserve. Squeeze each cherry and the pit will pop right out.

Combine pitted cherries and honey.

To prepare bread:

- 1 cup cornmeal
- 1 cup whole wheat flour
- 2 teaspoons baking powder
- 1 teaspoon salt
- 1 egg
- 1 Tablespoon honey

2 Tablespoons shortening or butter
Juice from 1 cup cooked cherries

Heat oven to 425°. Grease a 9-inch frying pan and put in oven to heat. Combine dry ingredients. Add egg, honey, and shortening or butter. Measure cherry liquid and add water to make $\frac{3}{4}$ cup. Add to other ingredients. Stir in sweetened cherries. Pour batter into hot pan and bake at 425° for 20 to 25 minutes.

Elderberry, American Black Elder

Elderberry is considered a medicinal plant, and the flowers and blue-black berries are edible. When the flowers are used as food, they are called elderblow. Elderberry trees usually flower and fruit during the summer.



Elderberry Pie Recipe. This recipe yields one 9-inch pie.

To prepare fruit:

2 $\frac{1}{2}$ cups dried elderberries
Water to cover
 $\frac{2}{3}$ cup sugar

Place berries and water in a saucepan and bring to a boil. Turn down heat and simmer until berries are soft. Remove berries and measure juice. If more than 1 cup, reduce. If less than 1 cup add water or another fruit juice to make 1 cup.

To make pie:

1 $\frac{1}{2}$ Tablespoons quick-cooking tapioca
2 Tablespoons water
Cooked berries
1 cup fruit juice
 $\frac{2}{3}$ -1 cup sugar
 $\frac{1}{2}$ teaspoon cinnamon
2 Tablespoons butter
Pastry for 2-crust pie

Combine the tapioca and the water. Combine berries, juice, tapioca and water mixture, sugar and cinnamon. Let stand 10 minutes before filling unbaked pie shell. Dot the filling with butter. Cover with top crust, crimp edges and cut slits for steam to escape. Bake pie in a 450° oven for 10 minutes. Then reduce the heat to 350° and bake about 40-45 minutes.

Desert Hackberry, Granjeno

Desert Hackberry has fleshy, orange-red berries with large seeds that ripen in late September. The berries can be eaten fresh or ground or mashed into cakes and dried for winter use. Sun-dried hackberries make crunchy, sweet snacks.

Hackberry Jam Recipe. Yields about 1 to 1½ cups of jam.

- 1 ½ cups desert hackberries
- 1 Tablespoon lemon juice
- ½ cup white sugar
- 2 Tablespoons water

Combine the ingredients in a heavy saucepan. Mash the berries with a potato masher to release the juice. Bring to a boil, and reduce heat so the mixture simmers. Cook and stir often for 10 minutes or until the mixture has boiled down and is quite thick.

Manzanita, Bearberry

The red berries look like very tiny apples. They can be eaten raw or cooked, made into jelly, or crushed for a beverage. A decoction of both the fruits and leaves can be used for bronchitis.

Wolf Berry, Box Thorn, Tomatillo, Desert Thorn, Rabbit Thorn, Squawberry

All species of the many-seeded red to dark red berries are edible, but some are juicier and fleshier than others. The berries ripen around the middle of May.



Wolf Berry Sauce. Recipe makes 1 cup of fresh wolf berry sauce.

- 1 cup fresh wolf berries
- ½ cup sugar
- ½ cup water
- Flour or cornstarch

Combine berries with sugar and water in saucepan. Cook slowly until berries are tender. Mash a few with a spoon. Thicken the mixture with a little flour or cornstarch.

Cota, Indian Tea, Greenthread

Cota has been used extensively for tea by most Southwestern Native American groups for centuries. It can be found from May to October.

Lamb's Quarter, Goosefoot, Pigweed, Wild Spinach

Lamb's Quarter is one of the mildest-tasting wild greens. It can be used in soups and stews. Very young leaves are good to eat raw in salads. The black seeds can be ground for breads.



Pima Vegetables Stew Recipe. This recipe yields 3 to 4 servings of stew. Soak $\frac{3}{4}$ cup dried baked cholla buds for 3 hours. Boil for 30 minutes. During the last 5 minutes of the boiling time add 2-3 cups chopped lamb's-quarter. Drain the vegetables when they are tender. In a frying pan, sauté very tiny pieces of meat (1/4-1/2 pound) in animal fat. Add the cooked vegetables and very gently sauté all the ingredients until they are warm and well combined.

Pigweed, Careless Weed, Red Root, Bledo, Quelite, and Chili Puerco

Pigweed usually appears after the summer rains. Leaves are mild-tasting, but must be gathered while young and tender, before the plant blooms. The tiny seeds can be harvested after the flowers have dried and turned a straw color. Ground seeds can be used for flour or mixed with other seeds and grains for mush.

Purslane, Pigweed, Portulaca

Purslane is usually found in disturbed earth, such as a garden, in the early fall after the summer rains. It has a slightly sour taste and crunchy texture.

Tumbleweed, Russian Thistle

Tumbleweed greens must be picked and eaten when the first shoots are only 2 to 3 inches tall. The new sprouts usually appear after the first summer rains and grow quickly. Tumbleweed sprouts can be boiled and eaten alone with butter or combined with other vegetables. Very young sprouts can be chopped raw into salads.



Edible Native Plant Resources

All photographs of native plants in this chapter were taken by **Patrick Alexander and used in accordance with the "Use of Images" terms at www.polyplloid.net.

The **Native Plant Society of New Mexico** (NPSNM) has local chapters in El Paso and Las Cruces. The Native Plant Society educates about local flora, coordinates field excursions and workshops, and holds plant sales. The NPSNM website (www.npsnm.unm.edu) has useful articles, images, publications, and species checklists. To learn more about the NPSNM contact Nancy Schuller from the El Paso chapter at (915)351-6046 or Carolyn Gressitt from the Las Cruces chapter at (575)523-8413.

The Chihuahuan Desert Gardens at the University of Texas El Paso has over 600 species of plants from the greater Chihuahuan Desert region. The Centennial Museum and Chihuahuan Desert Gardens are open to the public. Their website (museum.utep.edu) contains species identification and basic information, recommended native plants for our area, and news on their annual native plant sale held in April.

Other Native Plant Resources & Recipes

- The Chihuahuan Desert Education Coalition's website at www.chihuahuandesert.org has useful field guides, teacher resources, and links to other Chihuahuan Desert resources and websites.
- *Medicinal Plants of the Desert and Canyon West* by Michael Moore.
- NMSU's Cooperative Extension Service has information on "Low Water Use Landscape Plants" at aces.nmsu.edu/pes/lowwaterplants/index.html
- *The Prickly Pear Cookbook* by Carolyn Niethammer and Robin Stancliff.
- *The Tumbleweed Gourmet: Cooking With Wild Southwestern Plants* by Carolyn J. Niethammer.
- The University of Arizona Horticulture Publications website at ag.arizona.edu/maricopa/garden/html/pubs/pubs.htm contains a "Desert Adapted or Native Plants" section with free resources.

New Mexico Food Heritage Resources & Recipes

- *Artisan Farming: Lessons, Lore and Recipes from New Mexico* by Richard Harris, Lisa Fox, and Trent Edwards.
- *Foods of the Southwest Indian Nations* by Lois Ellen Frank.
- *Gardens of New Spain: How Mediterranean Plants and Foods Changed America* by William W. Dunmire.
- *Good Life: New Mexico Traditions and Food* by Fabiola Cabeza De Baca Gilbert.
- *La Cocina de Flora: Recetas de una Familia de Nuevo Mexico* by Regina Romero.
- *Red or Green: New Mexico Cuisine and New Mexico Cuisine: Recipes from the Land of Enchantment* by Clyde W. Casey.

Chapter 11: Local Food Systems



In this section, you will learn:

- ✓ The links between food, health, and local economies.
- ✓ The benefits of a localized food system.
- ✓ The difference between industrial and organic farming philosophies.

Organic Farming & Border Health

Health Concerns in the Borderlands

Public health should be a key driver for developing good food policies, but currently, few food policies have an explicit objective of improving our health. Many of these policies were created decades ago, before policymakers understood the impact of food policy on public health. Consequently, decades of misguided food policies have been devastating to public health.

Obesity is a national epidemic. The percentage of adults and children suffering from obesity is higher in New Mexico than the nation as a whole. In New Mexico, 58 percent of adults are overweight or obese, as are 24 percent of high school students. Being overweight or obese increases the risk of a number of serious illnesses and health conditions, including: hypertension, diabetes, coronary heart disease, and strokes. A 2004 study of our region found that 16 percent of border residents had diabetes, and an additional 14 percent had pre-diabetes or elevated blood sugar levels. According to the Centers for Disease Control, "The essential elements to prevent chronic disease (such as Type 2 Diabetes) and obesity are physical activity and good nutrition, particularly a diet rich in fruits and vegetables."



Farming Organically is Healthy

What does it Mean to Grow Organically? Gardening organically involves an understanding of nature's systems and a commitment to work within those systems. Many organic gardeners recognize that we should not try to control nature; instead we should work in harmony with our local environments. Permaculture, or permanent agriculture, is another form of agriculture which mimics nature's diversity, stability, and resilience. Organic gardeners emphasize soil and water conservation and grow produce without chemical pesticides or genetically modified seeds.

Organic Gardening Encourages Biodiversity. Encouraging life of all kinds to flourish creates much healthier gardens. Plant all classes of plants, especially native and well-adapted plants and plants that attract bugs and birds. Having a diversity of life in the garden mimics nature by creating self-sustaining and resilient mini-environments that are healthy, encourage interaction, and inspire creativity.

Why Not Pesticides? Humans, animals and plants can be poisoned. Pesticides can cause a wide array of neurological, hormonal, and immune illnesses. Farming with chemical pesticides and herbicides especially harms farmworkers through direct exposure. Pesticides can increase the risk of cancer and decrease fertility. They contaminate streams and groundwater, and they kill the beneficial insects that provide natural pest control.



Why Not Genetically Engineered (GE) Crops?

What is genetic engineering? Genetic engineering (GE) is the process of transferring specific traits, or genes, from one plant or animal into a different plant or animal. The result is called a genetically modified organism (GMO). Unlike traditional plant breeding, genetic engineering is a newer process that involves direct manipulation in the laboratory and allows genes from completely different plant and animal species to be inserted into each other. Seventy percent of processed foods in American supermarkets now contain genetically modified ingredients.

Concerns Regarding Genetic Engineering

Terminator Gene. The ultimate unnatural product of genetic engineering is a "terminator gene" that prevents plants from reproducing seeds. In many parts of the world, saving seeds from one season to another is the only way farmers survive and continue to grow produce. Now, with the process of genetic engineering, some farmers are being forced to rely on seed companies for their livelihood, an expense many cannot afford, and a patenting of life forms and processes that many people find unethical.

Life Patents. The transnational companies that produce genetically engineered food crops profit from controlling life patents, in denying consumers their right to know when food is genetically altered, and in creating a system that requires farmers to sign a contract to purchase the company's seed and use the company's pesticide made specifically for that seed. In essence, they move production control from the farmer to the corporate seed company.

Allergic Reactions. People with known allergies may not be aware that the genetically engineered food they are eating contains substances to which they are allergic. New combinations of genes and traits may cause allergic reactions and health issues that did not exist before or which are not readily apparent.

Gene Mutation. Gene mutation is a concern because scientists do not know if the forced insertion of one gene into another might destabilize the entire organism and encourage mutations and abnormalities. There is a possibility that mutated food may affect the DNA of its consumers.

Antibiotic Resistance. Almost all GE food contains antibiotic resistance marker genes that help producers know whether the new genetic material has been transferred to the host plant or animal. GE foods may make disease-causing bacteria even more resistant to antibiotics, which might increase the spreads of disease throughout the world.

Damage to the Environment. Insects, birds, and the wind can carry genetically altered pollen to neighboring fields and forests, randomly pollinating plants and creating new species that will carry on the genetic modifications. Unlike chemical or nuclear contamination, which can be contained, genetic pollution cannot be separated from the environment.

An industrial food system controlled by corporations that create terminator seeds and toxic pesticides has been sold for generations as the way to end world hunger. As the system has

taken hold, we have learned that it is no more than a profit-driven machine controlled by very large and powerful transnational corporations. This system has done little to help solve world hunger and has likely contributed to it. It promotes policies that displace traditional small-scale farmers in favor of a few large industrial farms and replaces diverse systems of production with mono-cropping and factory farms. These changes have forced people off of their land, eradicated some fruit and vegetable varieties, added to rates of unemployment, and contributed to world hunger as numerous former small farmers have found themselves unemployed, without land, and unable to feed their families.

Growing Locally

What is a Locally-Organized Food System?

A localized food system considers everything connected to the production of food. It includes the growing and cultivation of food, as well as its processing, distribution, and trade. Everyone involved—from producers to suppliers to consumers—benefits from the system. It respects people, animals, and the environment and is self-sustaining.



While fostering a southern New Mexico regional food system will require tremendous investments of time and energy from both the private and public sectors, it will result in important health and economic benefits. Vibrant regional food systems create sustainable local jobs, stronger communities, and healthier environments. In a vibrant regional food system, school districts, hospitals, and governmental bodies also buy produce from area farmers that is packaged and processed in local packing houses rather than shipped across the country or world.

How is a Local Food System Different than the Industrial Food System?

Proximity. Most produce in the United States is picked 4 to 7 days before being placed on supermarket shelves! Picking produce a week before it is to be sold at our local grocery stores means produce, out of necessity, must be picked before it is ripe. Locally grown produce is often allowed to ripen on the vine, or picked just as it begins to ripen, no more than a day or two before it is to be sold.

Fruits and vegetables sold in our supermarkets travel an average of 1500 miles before being sold! This uses valuable non-renewable petroleum resources, contributes to air pollution

through transportation, and generates trade agreements that impact our health and environment. While modern transportation has made possible the purchase of avocados from Mexico and Chile, it has also led to less desirable changes in the make-up of fruits and vegetables themselves. Many of the fruit and vegetable varieties sold in local farmers' markets and cooperative stores are varieties that have been grown locally for years or generations and that have adapted to our local soils and climate. These are considered locally-appropriate varieties that have extraordinary flavor and grow exceptionally well in southern New Mexico because, with time, they have adapted to our local environments.

Productivity. Traditional and small-scale intensive agricultural practices are generally more productive than large scale production. The per-acre profit actually declines as farm size grows. According to USDA records from the 1990s, farms less than four acres in size had an average net income of \$1400 per acre. Farms above a thousand acres had an average net income of \$40 per acre. In the Mesilla Valley, where we can grow year round, there are some producers that make a living producing on five acres or less.

Smaller farms are more productive and profitable because they use each parcel of land more intensively and are concerned with soil health, grow a selection of produce that is more appropriate to local food preferences, and sell directly to consumers, therefore receiving more of each dollar spent on food.

Local Control. Ownership and control of all aspects of the system are retained by and benefit the people in the area. This means money and resources re-circulate within the community, helping secure sustainable jobs and businesses. Buying produce at a local farmers' market or cooperative grocer (such as Mountain View Market in Las Cruces) keeps our money local—multiplying the effect of that single dollar by 300 percent on the local economy!

Currently, for every one dollar spent on produce at a supermarket, the industrial producer receives a meager 18 cents that must cover inputs, labor, and profit. On the other hand, for every dollar spent at our local farmers' markets, the producer receives the entire dollar to cover their costs and profit. The money is not split between a wholesaler, a distributor, transportation companies, and the supermarket chains.

When you purchase food from other countries, only a small fraction the money goes to the farmers who grew it (the exception is Fair Trade). The main beneficiaries of large-scale global production are processors, brokers, shippers, supermarkets, and oil companies.

Respect for People, Animals, & the Environment. Most large-scale production has profitability as the bottom line. Everything, from consumer health to environmental degradation, ultimately comes down to money. Large producers, seed companies, and supermarkets necessarily place profitability before everything else because they are responsible to their shareholders. As every corporation is ultimately concerned with their profit, each works exceedingly hard to get as much from every dollar spent on food as it can. This has led to a precarious industrial food system reliant on cheap oil and monetary subsidiaries.

Many smaller producers, who may describe themselves as local producers, family farmers, or gardeners, are often concerned about their own health and nutrition, and the community's health. They often place the health of the local community above all else because their living depends directly on ensuring the health of their land and producing quality produce for people that trust their ability. For this reason, they are more concerned with working within nature's systems and forming relationships with neighbors and community members who rely on them for good produce.

Direct Marketing Venues

Local Markets and Venues for Garden Produce

Weekly Farm Stands. Weekly farm stands allow gardeners to sell garden produce in or near their garden, not necessarily at set times.

U-pick. At U-pick operations, gardeners welcome members of the community to the garden to harvest in-season produce at a reduced price.



Farmers' Markets. Farmers' markets allow gardeners to sell produce at markets organized by a larger entity. Farmers' markets are held at a set time and not necessarily in the community of the garden. (See below for a list of farmers' markets in our region).

CSAs. Community Supported Agriculture is gardening or farming in which a community of individuals pledges to support a farm operation (as shareholders) so that the farmland becomes, either legally or symbolically, the community's farm. The partnership between the farm and the community provides a direct link between the production and consumption of food. As a result, growers receive better prices for crops and gain some financial security.

Local Stores & Cooperatives. Local stores and cooperatives provide secure markets for gardeners and farmers but often require a commitment of quantity and duration that can be hard for gardeners to meet. In Las Cruces, Mountain View Market and Toucan's buy and sell local produce.

Donations. In addition to or instead of selling a portion of garden produce, community gardeners may decide to donate produce to a local food bank or soup kitchen. Fairlight Community Gardens at the Community of Hope in Las Cruces, for example, is partly maintained by volunteers who donate produce to the El Caldito Soup Kitchen.

Food System Resources

Farmers' Markets

For direct marketing information and assistance visit the New Mexico Farmers' Market Association website at www.nmfma.org.

Chaparral:	Chaparral Farmers' Market 101 County Line	Saturdays 10am to 3pm May to October
Doña Ana:	Doña Ana Farmers' Market Doña Ana Plaza (Cristo del Rey St.)	Saturday 8am to 2pm July to October
Las Cruces:	Las Cruces Farmers' & Crafts Market Downtown Mall Mountain View Farmers' Market 1300 El Paseo	Wednesday & Saturday Mornings Year Round Sunday Mornings June to October
La Union:	La Union Farmers' Market Corner of Telles & Campo Santo	Sunday Mornings July to September
Mesilla:	Mesilla Farmers' Market Historic Mesilla Plaza	Thursday & Sunday Mornings Year Round
Sunland Park:	Sunland Park Farmers' Market 1 Ardovino Dr. (off of McNutt)	Saturday Mornings June to October

Local Stores

Las Cruces:	Mountain View Market 1300 El Paseo, Suite M Toucan Market 1701 E. University #1	www.mountainviewmarket.com www.toucanmarket.com
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Purchasing Produce from a Supermarket

- Conventionally grown produce is labeled with a 4-digit PLU code (ex. 4011 for bananas).
- Organically grown produce is labeled with a 5-digit PLU code that begins with the number 9 (ex. 94011 for organic bananas).
- Genetically engineered (GE) produce is labeled with a 5-digit code that begins with the number 8 (ex. 84011 for GE bananas).

Genetic Engineering (GE) Resources

- *Biopiracy: The Plunder of Nature and Knowledge* by Vandana Shiva.
- The case of canola farmer Percy Schmeiser at www.percyschmeiser.com.
- Additional information and resources can be found at www.safe-food.org.

Local Food System Development

- Doña Ana County Master Gardener Darrol Shillingburg's *Art & Gardens* website (www.darrolshillingburg.com) has a Local Foods page with extensive resources.
- Farm to Table (www.farmtotablenm.org) has extensive experience providing assistance with local food system development throughout New Mexico.
- Additional information and resources can be found at www.localfoodsystems.org.

Appendix 1: Community Garden Budget

Realistically, it may take a couple of years to get your community garden going depending on participation, access to land, and the availability of other resources required to start. Do not despair. Be patient and grow your garden little by little. Starting small will work wonders, allowing you to work out kinks, establish a visible presence, and attract future members. Before you know it, the garden will take on a life of its own.

The cost of starting a community garden varies greatly depending on size and design, so plan your garden accordingly. A community garden can easily cost between \$2,000 and \$7,500 initially and \$300 to \$700 annually in maintenance costs. It is possible to build a small community garden for much less if you are creative, use found materials, seek donations, and ask members to supply tools. Starting compost is one of the most cost efficient things you can do because healthy soil sustains the garden with minimal costs. Annual maintenance costs can often be offset by membership fees or produce sales at the farmers' market. The information below will help calculate your costs. Your initial budget should include:

- Site preparation, including trimming & clearing
- Materials to construct gardens & raised beds, if necessary
- Bulk compost for the garden beds
- Mulch
- Drip irrigation system and water connection
- Garden tools, wheel barrow, cages, hoses, & gloves
- Seeds and plants
- Fish emulsion (or other organic fertilizer)
- Fencing (optional)
- Storage shed (optional)
- Cold frame or greenhouse (optional)
- Instruction & Coordination (if necessary)

Garden Beds

Garden beds can be tilled and prepared by a tractor in some areas. A local farmer may be willing to do this for you. You can also rent a tiller locally at an equipment rental business. In locations where raised beds are required, the bed can be any length, 3 to 4 feet wide, and from 12 to 24 inches high. A bed made from concrete block 20 feet long by 4 foot wide and 16 inches high will cost you roughly \$80 plus delivery. A bed constructed from hay or alfalfa bales 20 feet long and 4 feet wide will be 18 inches high and cost you between \$65 and \$110. This type of bed will provide added nutrients but will need to be replaced after a few years.

Compost for the Garden

To calculate the amount of compost needed for your garden, measure the length and width of your raised bed or the garden area. Then measure the depth of your raised bed or calculate the number of inches of compost you want to add to your garden (adding 4 inches will give

your garden a great jumpstart initially). Multiply the length x width x depth and then divide by 27 feet in a cubic yard (3 x 3 x 3) to find the number of yards you need.

Example: 20 feet x 20 feet x .33 feet (4 inches) / 27 = ~5 cubic yards.

In our example above, we would need roughly 5 yards of compost. The price of high quality compost from Sierra Vista Growers is (as of March 2010) \$30 per yard. Thus, it would cost roughly \$150 to amend your garden bed with 4 inches of compost (this does not include any delivery costs). Purchasing compost from the City of Las Cruces at \$14 per yard would cut this cost in half. Adding compost to your soil initially is costly, but it is not a substitute for building soil health through composting and amending the soil over time.

Mulch

Mulch comes in many shapes and materials. The City of Las Cruces offers free mulch for pick up through the Foothills Landfill, although it may contain weed seed and other unpleasant things. Coco shell, pecan shell, and wood chip mulches for pathways are available in bulk through Sierra Vista Growers in La Union. Cemex sells rocks and gravel that act as mulch in landscaping. Sheet mulching with recycled cardboard, dead plant material, and hay may be a cheaper and much better alternative for your garden beds that builds soil fertility as it breaks down. The cost of mulch varies depending on the material. To determine the amount of mulch you need for your garden, use the same formula provided above in the compost section.

Drip irrigation and Water Connection

As noted in Chapter 4, an inexpensive drip irrigation system for a 20' x 20' garden bed will cost roughly \$75. For a ½ acre community garden the cost will be several hundred dollars. After you have developed a garden design, contact DripWorks (www.dripworks.com) and work with them to design an appropriate drip system that is within your budget.

Finding a good water source can be difficult for a community garden. If your garden is on private land, you will have to negotiate and develop a written contract with the property owner stating how much water you can use, how often you can use it, and what the cost of this will be. Often, community gardens are forced to pay for their own water connections, especially in urban areas. This can be a costly investment but will give you complete control over your water. A new water meter can cost \$1500 or more. In addition, your monthly water bill will likely be \$50 to \$150 per month, depending on the garden size and season.

Garden Tools

A couple of good quality hoes, spades, pitch forks, rakes and shovels cost about \$15 to \$20 each. Pruning shears (about \$50 for high quality shears), loppers (\$20) and saws (\$20) are great for pruning fruit trees. You will likely need \$75 to \$200 worth of cages, stakes, and trellising materials. A good wheel barrow, with durable and thick tires, will cost well over \$100. Durable tires are essential given all the stickers, thistles, and glass around newly started garden sites—a wheel barrow with a flat tire is useless. Garden hoses (\$30 to \$50 for a durable 100' hose), quality hose nozzles (\$25), and quality garden gloves (\$8 to \$12 per pair) are also necessary.

Seeds, Transplants & Fruit Trees

Seed and plant costs vary greatly depending on what you choose to plant and where you choose to buy your seed and plants. Quality seed packets can cost from \$1.50 to \$4 per packet. Quality vegetable seedlings can cost between \$1 and \$10 depending on the plant size, age, and variety. Fruit trees cost from \$10 to \$60 each. You may have seeds from your own garden or find someone who does and would be willing to donate them to your community garden. Nurseries and seed companies are often willing to donate leftover seed at the end of the growing season. Remember to save your seeds beginning the first year of your garden.

Fertilizers & Pest Repellants

There are several good organic fish emulsion fertilizers which will cost from \$20 to \$30 a gallon. To mix and spread the fish emulsion you will need an inexpensive watering can (\$5 to \$10) or a much more expensive attachment for the drip system.

Fencing

A fence with a locked gate is sometimes an essential component for your community garden. Think about whether a 4 foot chain link fence may be adequate or a 6 foot fence will be necessary. Fencing costs vary substantially and can only be estimated on a case by case basis.

Storage Shed

At some point, your community garden will likely need to add some sort of storage shed. This can be a costly but necessary addition. If you are fortunate enough to have construction savvy garden members willing to help build a shed, your costs will be less than purchasing a finished shed. Costs vary considerably depending on size and material. You will want a sturdy wooden shed rather than a flimsy metal shed that may not hold up to high winds. An 8' x 10' shed will cost between \$800 and \$1200.

Hoop House or Greenhouse

Again, having construction savvy garden members willing to help build a hoop house or greenhouse will save a great deal of money. The materials for a 400 square foot cold frame built with PVC piping and plastic will cost around \$800. The materials for a similar size greenhouse with a heating and cooling system can cost between \$4500 and \$6500. The plumbing and electric work necessary to operate the system can run from several hundred to several thousand dollars depending on location, existing plumbing, gas, and electric lines, and the amount of labor involved. Plan accordingly.

To learn more about hoop house construction, you can access the free publication "Hoop House Construction for New Mexico: 12-ft. x 40-ft. Hoop House" by Del Jimenez, Ron Walser, and Reynaldo Torres at aces.nmsu.edu/pubs/_circulars/CR-606.pdf

Appendix 2: Sample Community Garden User Agreement

User Agreement for the ## Community Garden

The ## Community Garden consists of family plots, a youth garden, and a communally worked garden. The 15 family plots are divided into three groups of five plots each. Each group will elect a group leader to act as their representative every 18 months. The three group leaders form the Committee of Responsibility. The Committee will work collaboratively in the interest of the community garden to maintain finances, make thoughtful decisions, help coordinate workshops, and enforce garden policies.

If someone does not abide by the rules, that person will receive one warning from the Committee of Responsibility. If the problem persists, that person will lose their garden plot and the plot will be worked communally for the remainder of that growing season; it will then be reassigned to another individual or family.

Ground Rules:

- I will NOT use chemicals or pesticides in the garden.
- I will work collaboratively with the other members to maintain an atmosphere of respect, safety, and community.
- I commit to learning about, and helping monitor and maintain the drip irrigation system. I will pay attention while I water and I will not use more water than is necessary.
- I will plant appropriately and maintain my plot at least once every two weeks. If I need to clean my plot, the group leader will notify me and I will have one week to clean it. I will keep the tools, rows, walkways and perimeters clean. I will clean and put the tools back in the shed after each use.
- I will put all organic material (like dead plants and appropriate food waste) in the compost area. I will help maintain the compost according to the compost schedule.
- I will attend garden workshops, activities, and meetings to learn and stay informed.
- I will harvest only the produce from my assigned plot.
- I agree to contribute one hour per week, depending on the needs of the communal garden, to assist in the maintenance of the communal garden. Half of the produce harvested from this garden will be donated to the elderly, churches, or others in need of healthy produce. The group leaders will oversee the donation of produce.
- Member dues are \$5 fee per month per family plot. The money is used to pay for water and inputs. We use the money collectively.

I have read the membership agreement and agree to abide by the ground rules.

Name: _____ Date: _____

Plot Number: _____