

# food safety

FOR  
SCHOOL +  
COMMUNITY  
GARDENS



## A HANDBOOK FOR BEGINNING + VETERAN GARDEN ORGANIZERS: **HOW TO REDUCE FOOD SAFETY RISKS.**

Creating and maintaining community and school gardens has been identified as an effective strategy to increase healthy food awareness and consumption. Fresh fruit and vegetables have unfortunately been linked to over 450 outbreaks of foodborne illness in the U.S. since 1990. In commercial food production, employing a set of risk-reduction steps, known as good agricultural practices (GAPs), has been pointed to by the U.S. Food and Drug Administration as the best prevention against foodborne illness-causing pathogens.

The Centers for Disease Control and Prevention estimates that there are 48 million people who are sickened with foodborne illness in the United States each year. While most people who become sick from foodborne illness recover quickly, there are on average almost 130,000 hospitalizations annually and 3,000 associated deaths. Contamination may come from many sources including physical contaminants, (metal, stones or glass) and chemical contaminants (runoff from parking lots or pesticide drift).

While much of the attention for GAPs implementation, as well as the outbreaks and recalls, has focused on commercial production, the use of steps to reduce contamination risk are also applicable to community and school gardens. The steps presented in this guide are rooted in science, practical and presented in a context suitable for the passionate organizers and volunteers associated with community gardens.

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**As bacteria and viruses are not easily washed off of fresh produce, limiting contamination is the best practice.**

By preventing the introduction of pathogens into the garden, risks of foodborne illness are minimized, increasing safety of the final products.

Good agricultural practices are the basic environmental and operational conditions necessary for the production of the safest possible wholesome fruits and vegetables. The purpose of GAPs is to give best management practices that will help to reduce the risks of microbial contamination of fruits and vegetables.

Using research-based knowledge from community members, extension agents, food scientists, multiple state agencies, teachers, and students, this document compiles the best practices for garden management, complete with accompanying food safety infosheets that can be posted online, given out in the classroom or volunteer trainings, or even kept, laminated, in the garden itself.

While quantifying any illnesses that may originate from school and community gardens is difficult, employing the strategies that support GAPs is possible and a good idea. Every garden is unique so recommendations in this document will need to be adapted for each site. Special care should be taken when dealing with children as they are more susceptible to foodborne illness than healthy adults.

This document provides a blueprint for making a garden as safe as possible, marked with best practices to do so, and provides some tips on how to make already-established gardens safer.

This handbook should be helpful whether you are just starting out, taking over the garden for someone else, or have been gardening for decades. The material in this manual highlights the best practices, explains steps for risk reduction and notes poor practices.

## FOOD SAFETY IN THE GARDEN

There are 4 topics to think about as you design your safety procedures.

1. Clean and sanitized hands.
2. Safe soil amendments.
3. Safe water.
4. Clean and sanitized surfaces.

**Risk reduction involves addressing each of them.**

This document outlines the recommended agricultural practices for food safety in gardens.

THE BEST PRACTICES ARE NOTED IN GREEN, WITH MINIMUM STANDARDS EXPLAINED BY THE YELLOW DOT.

## Below are some key words and microorganisms used throughout this document.

**Bacteria:** single-cell microorganisms without distinct nuclei or organized cell structures.

**Campylobacter:** bacteria that is often linked to animal production, especially poultry. Most people who become ill from *Campylobacter* get diarrhea, cramping, abdominal pain, and fever within two to five days after exposure to the organism.

**Contamination:** the unintended presence in food of potentially harmful substances, including microorganisms, chemicals, and physical objects.

**Control Measure:** any action or activity that can be used to prevent, eliminate or reduce an identified hazard.

**Cross-Contamination:** the transfer of harmful substances or disease-causing microorganisms to food by hands, food-contact surfaces, sponges, cloth towels and utensils that touch raw food, are not cleaned, and then touch ready-to-eat foods. Cross-contamination can also occur when raw food, chemical containers or soil amendments touch ready-to-eat foods.

**Cryptosporidia:** a microscopic parasite that causes the diarrheal disease cryptosporidiosis. The parasite is protected by an outer shell that allows it to survive outside the body for long periods of time and makes it very tolerant to chlorine disinfection. *Cryptosporidium* is one of the most frequent causes of waterborne disease among humans in the United States.

**E. coli:** a large and diverse group of bacteria. Although most strains of *E. coli* are harmless, others can make you sick. Some kinds of *E. coli* can cause serious illness marked with bloody diarrhea and abdominal cramps.

**Foodborne Illness:** sickness resulting from the consumption of foods or beverages contaminated with disease-causing microorganisms, chemicals, or other harmful substances.

**Hazard:** a biological, physical, or chemical property that may cause a food to be unsafe for human consumption.

**Hepatitis A:** a contagious liver disease that results from infection with the Hepatitis A virus. It can range in severity from a mild illness lasting a few weeks to a severe illness lasting several months.

**Listeria:** a bacteria that in some cases causes a serious disease called listeriosis. The disease primarily affects older adults, pregnant women, newborns, and adults with weakened immune systems.

A person with listeriosis usually has fever and muscle aches, sometimes preceded by diarrhea or other gastrointestinal symptoms. Almost everyone who is diagnosed with listeriosis has "invasive" infection, in which the bacteria spread beyond the gastrointestinal tract.

**Microorganism:** a form of life that can be seen only with a microscope; including bacteria, viruses, yeast, and single-celled animals.

**Norovirus:** the official genus name for the group of viruses previously described as "Norwalk-like viruses" (NLV). The most common symptoms are diarrhea, vomiting, and stomach pain. Noroviruses spread from person to person, through contaminated food or water, and by touching contaminated surfaces.

**Pathogen:** a microorganism (bacteria, parasites, viruses) that causes disease in humans.

**Personal Hygiene:** individual cleanliness and habits.

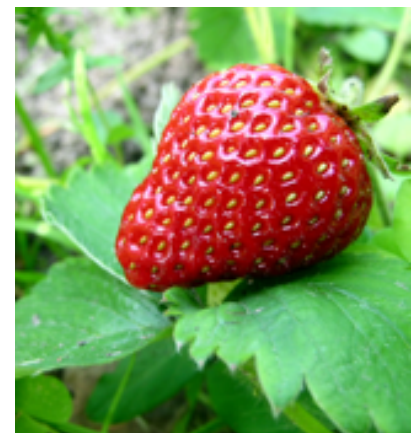
**pH:** the measure of the acidity of a product.

**Risk:** an estimate of the likely occurrence of a hazard.

**Salmonella:** bacteria that in some cases cause a serious disease. Most persons infected with *Salmonella* develop diarrhea, fever, and abdominal cramps 12 to 72 hours after infection. The illness usually lasts 4 to 7 days, and most persons recover without treatment. However, in some persons, the diarrhea may be so severe that the patient needs to be hospitalized.

**Shigella:** an infectious disease caused by a group of bacteria called *Shigella*. Most who are infected with *Shigella* develop diarrhea, fever, and stomach cramps starting a day or two after they are exposed to the bacteria.

Special care should be taken with regard to food safety when it comes to children. They are more susceptible to foodborne illness than healthy adults as their immune systems are still developing.





## SITE SELECTION

## WHAT'S THE SAFETY RISK?

There are many risks that come from not knowing the history of the site, including the proximity to other risks: flooding, animal crossing, chemicals and metals in the soil, and run-off.



## What's the best way to lower the risk?

- The best practice is to obtain the history of the site from planning officials and determine whether the garden site is suitable.
- If it is unavailable, ask the community. Cooperative Extension Agents and community members might be able to help.

Selecting a site for the garden can be challenging. Access to clean water sources, soil composition and the history of the land need to be considered. By knowing the land use history, unforeseen problems are less likely to occur. The history of the site could divulge the potential for flooding or past struggles with growing vegetables on the land.

The history of the site can provide insight into whether hazards exist in the soil. If the garden was once a parking lot or industrial site a risk of contaminated soil may be likely, or if neighboring industries might be a source of polluted runoff. With a land use history, the proximity to other risks can be mitigated. It is often helpful to make a checklist of the risk factors so that they can be monitored once the garden is in place. A visual site assessment can enable an organizer to see animal tracks or if the garden is in an area likely to flood. Each site carries some food safety risks and the garden managers and coordinators should recognize and mitigate them.

Establishing a long-term lease or arrangement for a garden minimizes food safety risk over time, since production practices can be documented. If a land arrangement is temporary, it is even more difficult to establish good practices. A well-supported garden is likelier to have longevity. Before securing a site, organizers should research local laws and regulations regarding urban agriculture, especially regarding domestic livestock, like hens and goats.



North Carolina Cooperative Extension agents are great resources for assistance in your community on garden food safety issues.

## SOIL: PESTICIDES + FERTILIZER.

### What's the safety risk?

Soils can be contaminated with heavy metals which can cause health complications. Testing the soil can ensure the safety of all gardeners.

## What's the best way to lower the risk?

-  The best practice is to conduct a soil nutrient test before the garden is built, testing for levels of plant nutrients and micronutrients, pH, and soil class. This information helps when deciding about soil amendments. Specific tests for heavy metal presence and concentration could also be conducted.
-  If the garden is already in operation, a soil nutrient test can still be done; it will provide gardeners recommendations for soil amendments. Soil testing is free in the state of North Carolina and can be accessed by contacting your [local county Cooperative Extension office](#).

### SOIL TESTING AND FERTILIZERS.

The U.S. Department of Agriculture states that a soil test is essential prior to creating a garden. The test is used to find out if nutrients are lacking in the soil, determine the necessary amount of fertilizer, measure pH, and find out if lime or other amendments are needed (and recommendation on how much to apply).

Before cultivating a new site, gardeners should rule out the presence of contaminants that could affect the health of those working in the garden or eating its harvest. Urban gardens should test for lead and arsenic, among other heavy metals, as they can transfer into the crops. Metals like copper and zinc are not a risk to people eating food from the garden, but can be toxic to the plants and affect the garden's productivity.

If soil amendments are necessary, consider these factors: persistence of the amendment in the soil, soil texture, salinity, salt content, and pH of the amendment. The Rodale Organic Gardening Basics series—2nd volume is full of suggestions on non-chemical fertilizers and soil amendments. Compost can be a pathogen-free source of plant nutrients, provided the composting process is complete.

Soil amendments, pesticides, and any other chemicals should be kept away from children and the instructions posted on the package should always be followed. Soil amendments, even when organic, should not be over-applied.

### PESTICIDES.

A number of community and school gardens practice pesticide-free methods, as they perceive an increased health risk towards foods produced utilizing pesticides. While there is not consensus that organic produce is microbiologically or chemically safer than conventionally produced, there is evidence regarding pesticide exposure and worker health. The risk of worker poisoning and illness has been shown to increase with the level of pesticide exposure.

Keep soil amendments, pesticides, and other chemicals locked and stored away from children. Apply using the instructions on the containers and with clean water. Wear appropriate personal protective equipment when making applications. Be careful not to over-apply pesticides, herbicides, or fertilizers (even organic ones). Deviation from the labels could contaminate the environment, imperil worker and food safety, and is a violation of the law.

### BEST PRACTICES in SOIL TESTING:

1. Take a soil sample a few months before any landscaping, building the beds, or planting.
2. Sample each section of the area you intend to garden. Sample the already-established growing areas (trees, shrubs) every 3-4 years.
3. Use clean equipment so the sample will not be contaminated.
4. A sample of an appropriate depth is 4-6 inches.
5. Place samples from one unique area into a plastic bucket and mix thoroughly. You need approximately one pint for a soil test.
6. Label the box and complete the [Soil Sample Information Form](#). You can obtain sample boxes from your county Cooperative Extension office or the NCDA&CS Agronomic Division headquarters in Raleigh.
7. The state will perform the test at "no direct cost" to any N.C. resident. Additional tests for heavy metals can be done by the [ENCO labs in Cary](#) or [Microbac Labs in Wilson](#) for a relatively inexpensive cost to the garden.

## WHAT'S THE SAFETY RISK?

Spreading potentially harmful microorganisms and cross-contamination.

U.S. Centers for Disease Control and Prevention estimate that over 50% of foodborne illnesses are linked to poor handwashing. In the garden, hands are used for most tasks. Pathogens are easily spread through direct contact with hands, but it's easy to lower the risk.

Handwashing is essential to preventing foodborne illness, as hands are the most commonly used utensils in food preparation. Wash hands after using the toilet, after touching the garbage or compost, before and after treating a cut or wound, and whenever hands might be dirty.

Washing hands with soap and water is the best way to reduce the number of microorganisms on them. If soap and water are not available, use an alcohol-based hand sanitizer that contains at least 60% alcohol. Alcohol-based hand sanitizers can quickly reduce the number of microorganisms on hands in some situations, but sanitizers alone do not eliminate all types of microorganisms, nor are they effective when hands are visibly dirty. Alcohol-based hand sanitizers are not effective in reducing Norovirus, one of the most common foodborne illness causing viruses. If sanitizer is the only option, make sure to rub the product over all the surfaces of one's hands and fingers until they are completely dry for best effects.

If running water is not available, you will have to bring it with you. This could be as simple as a jug of potable water and a roll of paper towels. Many options are available for portable and temporary handwashing units—from home made low cost sinks to commercial-grade units with higher price tags. The type of unit that is appropriate for your site will depend upon your ingenuity, the number of people using it and the resources available. Regardless of size, cost or scale, all of these units consist of the same basic features, potable running water, soap, and single use towels.

If you cannot bring water to the site, the gardeners should wear disposable, single-use gloves while harvesting; it's acceptable to wear the traditional garden gloves while maintaining the garden, but they do not prevent the spread of pathogens when harvesting.

## What's the best way to lower the risk?

- The best practice is to wash your hands with soap and clean, running water and dry using single-use towels.
- If running water is not available, wear disposable, single-use gloves while harvesting. If the task is maintenance-only, traditional gardening gloves are recommended.



Be sure that gardeners of all ages are washing their hands properly.

- The best way to wash hands is to first scrub nails and fingertips with a brush full of soap and clean water.
- Wet hands with clean running water (warm or cold) and apply soap.
- Rub hands together to make a lather and scrub them well; scrub the backs of hands, between fingers, and under nails.
- Rinse hands well under running water.
- Dry hands using a single-use towel.





## WATER + IRRIGATION.

### What's the safety risk?

Non-potable water (water that is unsafe to drink because of contamination) can introduce pathogens.

## What's the best way to lower the risk?

-  The best practice is to use a regulated, treated water source. Water authorities employ filtration, chlorination and testing to ensure it meets EPA drinking water standards.
-  If you are using or intend use another source, such as a well, have the water tested and make sure it is up to EPA standards before you use it for watering or washing (things like hands, equipment and food).

By ensuring the use of safe water for irrigation, the potential of microbial contamination of fruits and vegetables is reduced.

Begin by determining the source of the garden's water and collecting information on risk-reduction measures used on the water. Frequently, the same municipal source that services a school is used for irrigating the garden, but in a community garden, irrigation could be more complex. The best practice is to obtain water test results either from the water provider or have the water source tested at a reputable lab facility for coliform and generic *E. coli*, as an indicator of potential fecal contamination.

Know the water source. Without knowing the safety of your water source, you could be introducing heavy metals, chemicals, or pathogens into your garden. Water can be easily contaminated by a number of biological and chemical hazards including bacteria, viruses, domestic waste, nitrate nitrogen, combustion products from roadways, petroleum residues and heavy metals. Most public water systems provided by cities or other municipalities should be safe, but testing facilities can give the best information on what is coming out of the spigot. An inexpensive test can be obtained from a single sample at the point of use (or end point), which can account for the whole system.

Avoid unregulated sources such as rivers, streams, irrigation ditches, wells, or ponds. The water could be a source of contamination for the crops; the best practice is to use water consistent with [EPA restrictions](#).

If the garden is already using a water source that is untreated, such as a river, pond or rain barrel, be sure to have the water tested regularly, including water captured from rain barrels and cisterns. Contaminated or untreated water is a frequent source of Hepatitis A, *Giardia*, and *Shigella*, and the Centers for Disease Control and Prevention (CDC) state that *E. coli*, *Salmonella*, *Cryptosporidia*, *Toxoplasma*, and Norovirus bacteria can spread via water as well.

Uncontaminated water ensures a good quality harvest. Clean water is also needed for applying chemicals, irrigation, good hygiene and handwashing, and processing or washing the harvest.

**If you wouldn't drink the water, do not apply to your edible plants.**

## What is the best way to water?

Using drip irrigation or watering at the base of plants is the best way to water to reduce water and soil splash on the edible portion of the plant, minimizing risk.

Drip irrigation is more efficient than hand watering, as it can be timed and rationed, but when it is impractical or cost-prohibitive, traditional hand watering is acceptable.

### TAKING RESPONSIBILITY FOR THE GARDEN.

The garden manager typically in charge of the garden has left you to run things. Don't panic. It's all ok. If you have questions about food safety that have not been unanswered here, contact the Food Safety Extension Specialist at N.C. State University, Benjamin Chapman, at [benjamin\\_chapman@ncsu.edu](mailto:benjamin_chapman@ncsu.edu).



## What about using rainwater for watering the garden?

There is a growing interest in collecting water in rain barrels or cisterns for watering the garden, especially during drought and in gardens without a nearby water source. Rain barrels and cisterns also effectively manage stormwater runoff, thereby minimizing soil erosion and maintaining better water quality. In North Carolina, a garden might be unable to meet irrigation demands with its barrel, but it is still an excellent way to supplement other water. There are various factors that go into making sure your roof runoff is safe: climate, age of roof, materials used, air quality, slope of the roof, and even its temperature. Roofs with metal surfaces need more water safety consideration; including the coating used on the heavy metal surfaces and using non-metal gutters and downspouts. It is a good idea to collect rainwater for watering your plants, but it should be treated to reduce microorganisms before applying to the edible portion of plants, or used on ornamentals.

While harvesting rainwater in barrels can be fine for watering the plants, it must be treated for microorganisms or even mercury before the gardeners should drink it or use for washing. If the water comes back positive for pathogenic *E. coli*, that water should not touch edible crops. Likewise, many gardeners choose to use the rainwater only for irrigating ornamental plantings due to its risky nature. Additionally, it is necessary to check out state and local laws before you build a mechanism for rainwater collection; in some states, a permit is necessary for a cistern. Lastly, if water is coming from an untested source, the water must be deemed as safe before a person should use it.

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### ALSO: ALLERGENS AND GARDEN ACTIVITIES.

The gardens are not all the same and neither are the gardeners. Some gardeners have food allergies, which are considered to be a major food safety issue. It's a good rule overall to not bring any products with allergens in the garden to prevent cross-contamination.

Keep activities with foods like peanut butter out of the garden. To be even safer and respectful of the fellow gardeners, do not grow crops of well-known allergens, such as peanuts or soybeans. Through the implementation of good agricultural practices, the garden can be a safer place.



## COMPOST

WHAT'S  
THE SAFETY  
RISK?

Compost that has not registered above 130°F for at least 5 days can be full of pathogens.

Additionally, the location of the compost bin can pose problems.



## What's the best way to lower the risk?

- The best practice is to put the bin as far from the garden as possible, downhill. Additionally, use a long-stemmed thermometer to check that compost has been over 130°F for at least 5 days before using in the garden.
- If the compost is already in use, create barriers to keep the contents from getting into the garden until they are ready, with careful attention to flooding.

Research shows that composting can reduce your environmental impact, making it a great step to have in the garden process. By properly managing air, moisture and nutrients, the composting process can transform large quantities of organic material into compost in a relatively short time. The process should generate temperatures high enough (over 130°F) for at least 5 days to kill pathogens such as *E. coli* and *Salmonella*. It will be necessary to take the temperature of the compost to be sure, so the garden should keep a long-stemmed thermometer on hand. The thermometers are easy to obtain in gardening stores, as well as online. Additionally, organic matter should be fully composted before adding to the garden, or it will compete for the nitrogen in the soil with the plants and their roots.

Start the compost with shredded leaves, yard trimmings, and fruit and vegetable scraps, depending on what material is available. The literature is diverse as to what has been deemed proper to compost; included in a variety of sources are leaves and lawn clippings, fruits and vegetables, eggshells, coffee grounds and filters, tea and tea bags, and hay and straw. Citrus rinds, corn stalks, and nutshells are all compostable but take a much longer time to break down.

While animal manure has long been considered an acceptable material to compost (the Environmental Protection Agency includes it on a list of safe materials), it is not recommended due to its strong connection to pathogens like *E.coli*. Extra steps must then be taken to guarantee the safety of the finished compost. If the garden accepts compost from another source but wants to maintain an organic garden, it is imperative to ask what kinds of materials are in the mixture.

Composting is the process of treating solid waste (manure and/or plants) for beneficial use, destroying pathogens and undesirable weed seed.



The compost will need to be turned approximately once per week. Turning it too often does not allow the microorganisms to really heat up; they are constantly regrouping after each turn. Do not leave food scraps lying on top of the pile, as they will rot or mold and not break down into compost if you do not turn it. They should be 2 inches or smaller.

Research on composting mostly focuses on its environmental impact and chemical composition. In an attempt to understand the fate of pesticides during composting, researchers have not been able to claim that pesticides break down entirely, and also explain that pesticide residues in a typical compost pile have not shown to be a concern. If the garden decides to purchase compost, obtain it from a reputable source who can guarantee that proper steps have been taken. If there is a question regarding pesticide carryover in the compost, do not use it for fresh fruit and vegetable gardens.

## SAFE COMPOST LOCATION:

How to keep the unfinished compost out of the garden is a major concern. There are many kinds of compost containers, from manufactured tumblers to aerated plastic bins to those made from pallets. The tumblers decrease the chance for the components to get into the garden during a rainstorm, as they are fully enclosed, but they are costlier than other receptacles.

The compost bin should be on a flat surface not too near the garden. While there are no official regulations as to how far away, it should be as far from the garden as possible. If the property is on a slope, the compost should be downhill from the garden. The gardeners should consider where the contents of the compost bin might go in the event that it is full, it rains, or the bin overflows before the compost is ready for use. Place the bins away from the fence line to help keep rats away from it. Vermiculture (composting with worms) presents the same issues as other compost with respect to placement.

Adequate moisture is necessary for microbial activity. The compost should be damp, but not soggy. Add water **ONLY** if you could squeeze the compost with your hand and not see any moisture, much like a damp sponge.

In-depth instructions for composting, as well as materials to include, can be found [here](#).

Additionally, the Environmental Protection Agency (EPA) has a great [site](#) for composting, among other things.

Uh oh! The compost is in the wrong place.

If the compost has already been built and it is an imperfect location, there are remedies. If there is regular flooding, find a way to divert any compost runoff from the garden, like a trench or a French drain. The local Cooperative Extension Agent is an excellent resource for garden design details.

## GARDEN DESIGN + ANIMALS

### What's the safety risk?

Animal feces can bring pathogenic *E. coli*, *Campylobacter*, *Shigella*, and *Salmonella*, among other foodborne illness-causing microorganisms.

### What's the best way to lower the risk?

- The best practice is to use a fence to keep out animals, like deer. Electric fences keep out many kinds of pests, but are more expensive.
- If a fence is out of the question, use repellents and sprays to keep out the known pests, be it rabbits or deer or birds. Maintain records and attempt to prevent any animals from entering the garden.

### WHAT TO THINK ABOUT WHEN YOU THINK ABOUT GARDEN DESIGN.

When designing the garden, one should consider ways to keep animals out of the garden, both domestic and wild. Animals can be a problem in eating plants, fruits and vegetables and they can be the source of foodborne illness-causing contamination. Animal manure is a major source of foodborne illness causing pathogens (*Salmonella*, *Campylobacter*, *E. coli*, *Cryptosporidia*) and keeping animals, from deer to birds, out of the garden is the best way to prevent such an event.

Just because the animals are not visiting the garden during the harvest does not mean they are not in the garden. Take precaution. Even domestic pets, like dogs, should also be kept out of the garden as they can carry and shed pathogens like *Salmonella*. While scarecrows are considered to be helpful, they can only keep out birds.

Deer droppings have been the source of pathogenic *E. coli* outbreaks—specifically on small farms. A tall fence is likely the best way to keep out deer, but opossums, chipmunks, squirrels, and raccoons will be much more difficult. Given the opportunity, birds will nest, leaving their droppings in the garden. Take steps to keep them from residing nearby, by trimming overhanging branches and making it in an unattractive place for birds to nest.

Keeping the compost bin covered and well-maintained is another good measure to keep the pests out of your garden. If animal tracks or droppings are found, organizers should figure out the kind of animal that left them and take steps to keep them out. Tracks are particularly helpful as following them can provide you with an idea of how the animal has entered the garden. Cooperative Extension personnel can also help with these tasks. You can use modern repellants and sprays in the mitigation of any pests, as well as trapping.



Rodale's *Ultimate Encyclopedia of Organic Gardening* has well-detailed, easy-to-read, non-chemical, specific practices concerning deer, mice, squirrels, moles, rabbits, skunks, and birds, among other creatures. The Rodale Gardening Basics Series has lovely and informative individual pamphlet-like documents on soil + composting.

For detailed problems and solutions for all kinds of pests, consult the *Complete Guide to Pest Control With and Without Chemicals*, 2nd ed., by George W. Ware. and *Common Sense Pest Control* by William Olkowski.



# SANITATION + TOOLS

## WHAT'S THE SAFETY RISK?

Cross-  
contamination.



## What's the best way to lower the risk?

- The best practice is to wear one-use only gloves when harvesting and put the harvest into clean, sanitized containers.
- Equally as effective is to wash hands before harvesting and if contaminated. If you are unsure when the containers were last washed, put the harvest into new plastic bags.

### THE TOOLS.

While many gardeners just use their hands for harvesting, some use scissors, knives and other tools to remove fruits and vegetables from plants. If there happens to be a pathogen on the crops and the scissors go unwashed, it will likely be passed onto the next vegetable it touches. If a site lacks a kitchen or sink facility, the garden coordinator or manager might need to designate a person to wash and sanitize tools at home. Clean tools and containers should be stored in a place where animals cannot get to them such as a locked shed.

### THE HARVEST.

The containers for the harvest should be regularly washed and sanitized. Use containers that will not cross-contaminate the fruits and vegetables. Do not re-use plastic bags or harvest into wooden boxes or unwashed buckets. The containers should be protected while in storage so that they cannot be contaminated in-between uses. Clean off as much dirt and debris as possible while still in the field, so as to reduce the risk inside.

For immediate consumption: In school gardens, it is very common to eat fruits and vegetables right after they are harvested. All harvest should be washed and/or processed in a space with a clean and sanitized work surface, utensils, and hands. If linked to a school or institution, a good relationship with cafeteria staff, for example, can lead to help with food preparation or even just permission to wash the harvest in the kitchen.

For later consumption: In community gardens, most likely, the gardeners are going to take the produce home or donate it to a non-profit organization. The lowest risk "best practice" in terms of contamination is not to wash the harvest until it is time to be consumed. The harvest should be stored in a cool, pest-free area in separate containers (or new plastic bags) for each crop, away from any household chemicals. However, it must be washed before eating.

Pathogens can hang around on equipment for days.

Wash and sanitize tools using a bleach solution (50-200 ppm, or about 1 teaspoon to 1 tablespoon of bleach per gallon of water).

A great garden is chock full of capable gardeners—smart, hard-working people who spend their free time in the soil. Everyone in the garden should follow food safety guidance, and stay home if they are sick.

**REMEMBER:**  
**CLEAN HANDS.**  
**CLEAN WATER.**  
**CLEAN SOIL.**  
**CLEAN SURFACES.**

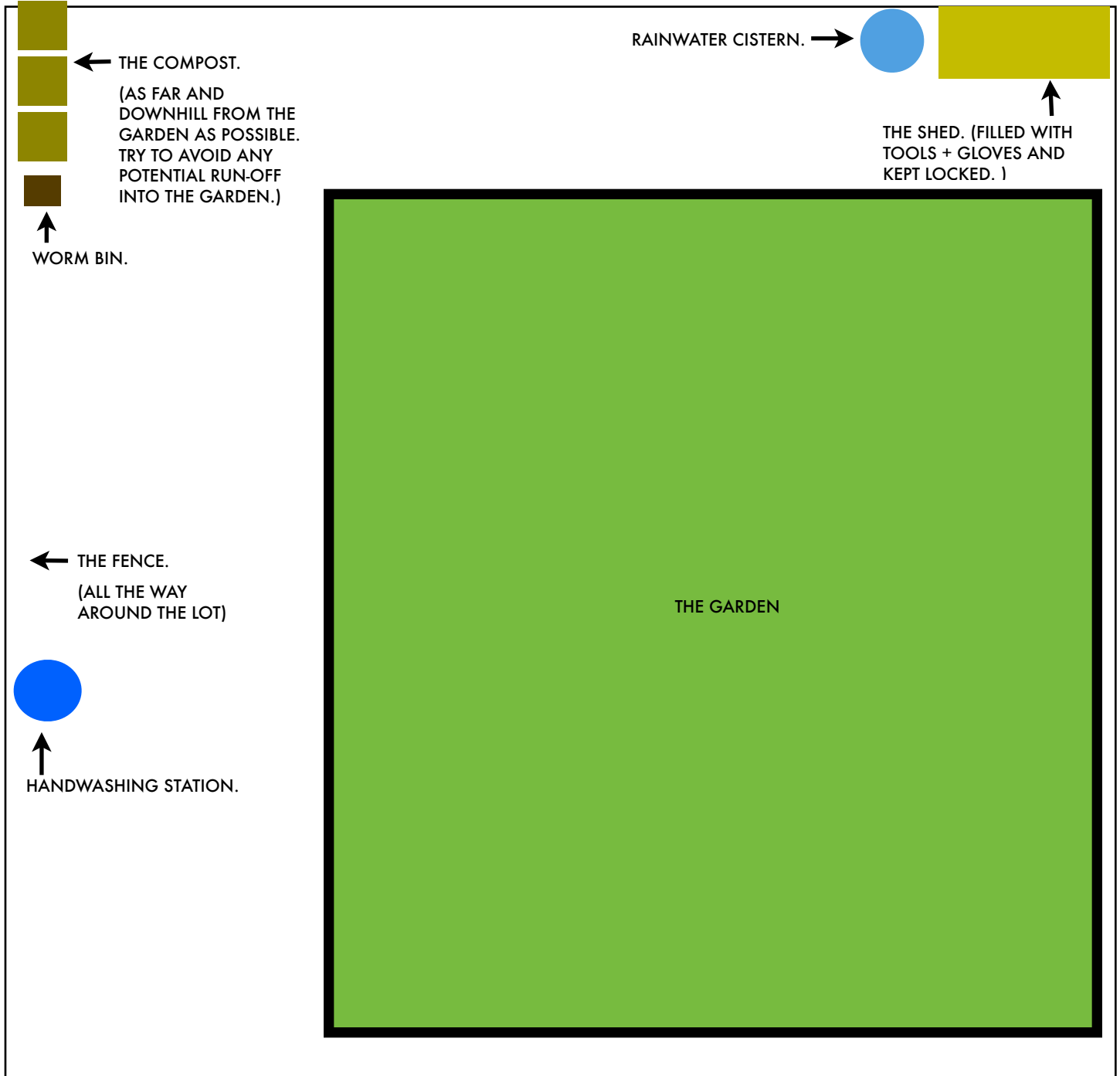


## VOLUNTEER MANAGEMENT.

- Develop safety procedures specific to your garden and regularly remind everyone of them.
- Prepare an orientation. When there are new volunteers or students or gardeners, explain the procedures before they get started. By starting with handwashing on the first day, he or she will likely continue to wash with each visit.
- Consider the differences. Various ways to learn exist; some people are better hands-on, while others are auditory learners, for example.
- Explain why. The best way to make sure food safety procedures are enacted is to explain why they must be done. Explain the history and the mission of the safety plan.
- Make it easy to follow the procedures and obtain answers to any questions. Post the standard operating procedures (or Food Safety InfoSheets) throughout the garden so that everyone can see them. Also, create an accessible binder of the procedures so that when the garden manager is not there, the volunteers and gardeners have a reference manual of sorts.
- Set the standard. The garden managers and coordinators must show their commitment to the procedures. If they wash their hands, the others are likely to do so as well.
- It is completely acceptable to tell the gardeners that the rules are required. Safety rules are much like government regulations. The GAP Guidelines require farms to post signs and provide training; a garden is much like a small farm and should take similar measures to stay safe.

# SAMPLE COMMUNITY GARDEN MAP.

REMEMBER: IT'S OK IF YOUR GARDEN IS DIFFERENT AS LONG AS THE SAFETY MECHANISMS ARE IN ORDER.



ALSO.

The [USDA](#) and [Penn State University](#) provide documents online to help farmers self-audit for GAP (Good Agricultural Practices) certification. Readily available are lists of simple things to be done to help prevent foodborne illness.



## FREQUENTLY ASKED QUESTIONS.

**Does it matter if the beds are raised or if the crops are in the ground?**

In terms of food safety generally, your garden should be designed in whatever way makes sense for you. However, if there is the potential for flooding in the garden, raised beds are preferable. They would be more likely to be kept out of stagnant water and less likely for compost or animal excrement to be swept into them.

**I've got hens. I've heard they carry *Salmonella*. How do I stop that from impacting the garden?**

If there are hens at your garden, there are quite a few things to consider. First, they must be kept in an enclosed area separate from the garden. Like the compost, the coop and hen area should be downhill from the garden, for similar reasons. It should be difficult for chicken excrement to get into the garden, which also might mean having separate footwear for those entering into the area with the hens.

**We intend to preserve the harvest. What is the risk?** Any sort of preservation, from drying to canning, has its own risks and participants in those activities should take precaution for other food safety issues, like botulism. Check out [this document](#) from the University of Georgia for great information on preservation.

## ADDITIONAL RESOURCES.

There's a good chance we didn't answer all of your questions. There are a lot of smart people who wrote great, detailed books about all aspects of gardening, including safety. We read loads of them and picked out the best of the best. The books on school gardens are applicable to those with community gardens, and vice versa. In North Carolina, the [N.C. Botanical Garden Library](#) has books (for use by anyone, 7 days per week) on various gardening issues, with a knowledgeable staff who will even answer questions by phone.

## BOOKS.

A great resource for composting: *Urban/Suburban Composting: The Complete Guide to Backyard, Balcony, and Apartment Composting*, by Mark Cullen + Lorraine Johnson, St Martin's Press, 1992.

The Rodale Gardening Basics Series has lovely and informative individual pamphlet-like documents on soil and composting, among other topics, as well as the following gem. Included is an entry for everything under the sun, including remedies for various pests. *Rodale's Ultimate Encyclopedia of Organic Gardening*, edited by Fern Marshall Bradley, Barbara W. Ellis, + Ellen Phillips, Rodale Inc, 2009.

This book is not really about safety, but gives lots of assistance for small plot gardening. *Grow Great Grub*, by Gayla Trail, Clarkson Potter Publishers, 2010.

This book answers only a few safety questions, but explains various garden matters, from composting to ducks, with examples of smart garden layouts. *Your Farm in the City*, by Lisa Taylor + Seattle Tilth, Black Dog and Leventhal Publishers, 2011.

The Contemporary World Issues Series is easy to read. They are great books for short answers to critical questions. *Food Safety*, by Nina E. Redman, ABC-CLIO, 2000.

For a history of community gardening, this is your book. *City Bountiful: A Century of Community Gardening in America*, by Laura J. Lawson, University of CA Press, 2005.

This book has MANY pest solutions. *Complete Guide to Pest Control With and Without Chemicals*, 2nd edition, by George W. Ware, Thomson Publications, 1988.

For gardening in the desert, this book is geared towards school gardens but can be used for any type. *Success with School Gardens: How to Create a Learning Oasis in the Desert*, by Linda A. Guy, Cathy Cromwell, + Lucy K. Bradley, Arizona Master Gardener Press, University of AZ Extension, 1996.

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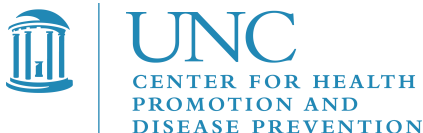
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THANK YOU to all of the nice garden managers and coordinators who let us ask thousands of questions about garden practices.

## INTERNET SOURCES.

The Cooperative Extension offices across the nation have great materials posted online. Some of the best and least complex documents come from extension offices in [Hawaii](#), [New Hampshire](#), [New York \(Cornell\)](#), [Maryland](#), and [California](#). But, all of them have a variety of materials specific to each area.

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FOR  
SCHOOL +  
COMMUNITY  
GARDENS

NORTH CAROLINA STATE UNIVERSITY  
+ NC COOPERATIVE EXTENSION