

CLIMATE RESILIENCY GARDENING GUIDE

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Creating a Climate-Resilient Planet with Maps, Apps, and Data. ESRI, 2014.

CLIMATE RESILIENCY

Climate resiliency involves adapting, coping, and managing the impacts of climate change. Additionally, climate resiliency aims to mitigate and prevent future impacts of climate change from worsening.

What Does Climate Resiliency Look Like?

Climate resiliency has two aspects: mitigation and adaptation. **Mitigation** means cutting carbon emissions down significantly. By lowering carbon emissions, as well as utilizing carbon sequestration, we can halt the early effects of climate change already here, such as global warming. The main mitigation tactic is lowering carbon emissions. To do this, there has been a large push away from fossil fuels, such as coal and oil, and towards renewable energy sources, such as solar and wind.

Adaptation aims to combat climate change effects that are already present and that are coming in the near future. Climate adaptation is broad and touches on many aspects of life. Climate adaptation can include planting more trees, reinforcing electrical grids to be protected against extreme weather, and investing in weather and flood resilient housing and infrastructure.

What is Climate Change?

Climate change refers to the long-term changes in temperature and weather patterns. Although the Earth's climate naturally shifts, since the 1800s the changes in temperature and weather patterns have largely been driven by human influence.

The top contributor of human-driven climate change is the burning of fossil fuels, such as oil and coal. Climate change can be dangerous because it can strengthen storms, cause ocean temperature to rise, harm different habitats, and much more.

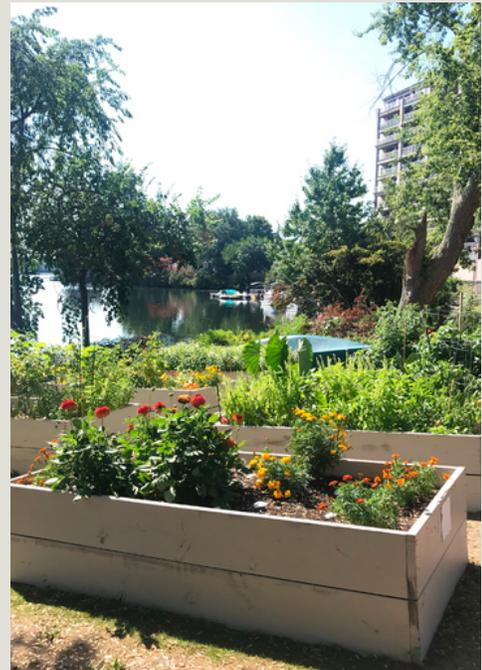
PEOPLE'S GARDEN

A People's Garden is a broad classification of gardens that are utilized by communities. People's Gardens are specifically geared towards individual community needs to benefit those within the community, foster collaboration, incorporate sustainability, and provide education for the public about various aspects of gardening and food health.



What can be a People's Garden?

People's Gardens are built to serve the community they are in and come in different sizes and types. Gardens can include school gardens, community gardens, urban farming, and agricultural projects. People's Gardens cannot be located on private property. A People's Garden can support the local ecosystem rather than community members; for example, conservation projects and wildlife habitat projects that are geared towards providing food, water, and shelter for wildlife are considered People's Gardens. Additionally, beautification projects that prioritize planting native species, enhancing biodiversity, and building a healthier ecosystem are People's Gardens. Lastly, educational gardens and programming focused on providing the next generation with gardening knowledge, forestry, landscaping, culinary arts, and other related agricultural lessons are considered People's Gardens.





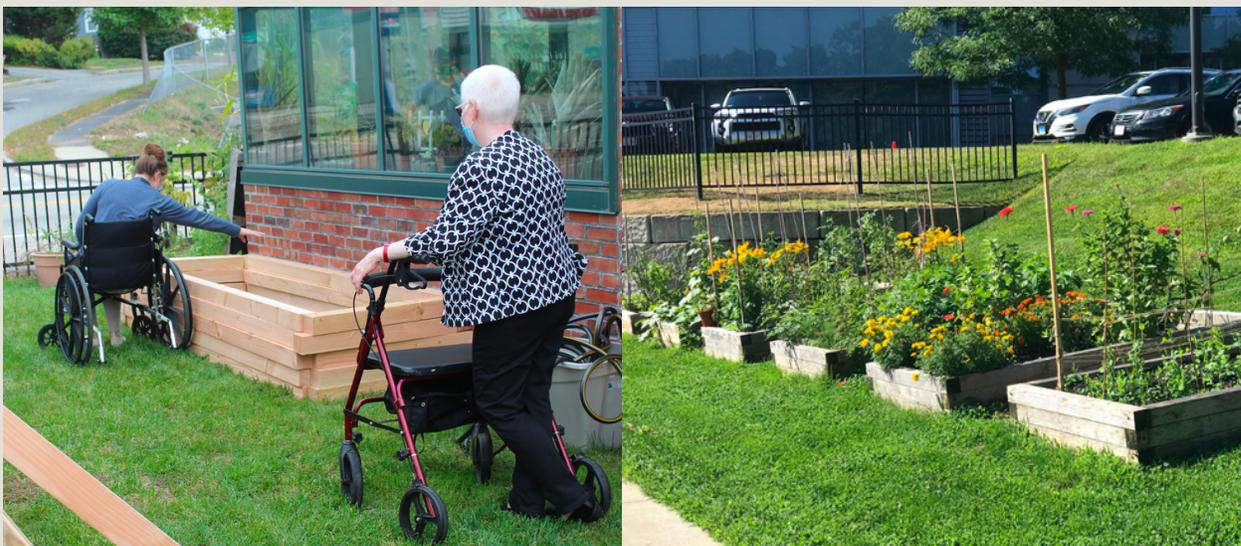
CONTAINER GARDENING

Container gardening is simply planting in a container rather than directly in the ground or in a raised garden bed. Containers can include repurposed milk jugs, metal drums, or terracotta pots. Container gardening can be beneficial for those who live on properties with no yard space for a garden bed. Container gardening can be designed to fit in any space limitation. Container gardening can take up as little space as a windowsill or as much space as a rooftop.

How to Build a Container Garden:

First you need a food safe container, such as a planter pot or ceramic pot, that has drainage holes in the bottom. You will also need soil, which can be purchased at a local gardening store, or compost from a local source. It is best to place your container in a location where the plant will receive 6-8 hours of sunlight each day. Watering your container will depend on the level of moisture that your plant needs and how long it takes for your soil to dry out. Many crops can grow in containers, but it is important to look for crops that can grow in the specific area your container will be in. Containers in shady areas can grow leafy crops like spinach. Containers in high sun areas can grow crops such as tomatoes and cucumbers.





RAISED GARDEN BEDS

A raised garden bed describes a structure that is raised above the ground level and holds soil. Raised beds are designed to be small enough that you do not need to step into the box.

Raised Garden Beds and Soil:

Since a raised bed is a contained unit, the enclosed structure helps to prevent soil erosion through loss of soil and water movement. Raised beds also have less soil compression which increases the water and airflow within the bed, allowing for free movement of nutrients. In areas with soil contamination, raised garden beds are beneficial since they require soil to be filled in. If your ground soil is contaminated, you can purchase or collect clean soil fill from a retailer or local supplier.

Raised Garden Beds and Plants:

The enclosed structure makes it easier to tailor the amount and type of soil that is within the raised bed. By adjusting the soil quantity and type, you can better support the plants in which you are growing. Plants can be planted in higher densities within garden beds, directly increasing the yield of produce while simultaneously reducing the number of weeds that are able to grow in the bed.

Personal Benefits:

The raised aspect of the bed allows for enhanced accessibility. Since raised beds can be designed at different heights and styles, raised beds can be built to suit individuals that use wheelchairs or other mobility aids, those with physical disabilities, and can accommodate other physical needs.

COMMON SOIL CONTAMINATES

CHEMICAL WASTE	BIOLOGICAL WASTE	PETROLEUM PRODUCTS
<ul style="list-style-type: none"> Chemical spills Buried chemicals Improper disposal Industrial practices 	<ul style="list-style-type: none"> Fungi Viruses Parasites Allergens 	<ul style="list-style-type: none"> Gasoline leaks/spills Heating oil leaks/spills PAHs Benzene
PESTICIDES/ HERBICIDES	TOXIC HEAVY METALS	INDUSTRIAL SITES
<ul style="list-style-type: none"> Overuse Runoff 1910-1950 farmland with a buildup lead-arsenate pesticides 	<ul style="list-style-type: none"> Pollution Lead Arsenic Nickel 	<ul style="list-style-type: none"> Landfills Waste disposal sites Manufacturing sites Highway corridors

How do Contaminants Get into Soil?

Different contaminants are often deposited into the soil in different ways. Petroleum products most often cause contamination through accidental spills or runoff. Pesticides and herbicides may be carried by the wind to non-target areas, causing contamination far from the intended treatment area. Additionally, pesticides and herbicides can be carried through runoff water causing contamination of a larger water source or soil in a different location. Toxic heavy metals are typically a result of manmade infrastructure and industrial processes. These heavy metals can enter the atmosphere, waterways, or soil through leaching or improper disposal, negatively impacting air, water, and soil quality.

SAFE SOIL

Safe soil is a term that describes soil that is not contaminated and is deemed safe to use for agricultural purposes. Common chemical soil contaminants include lead and other heavy metals, petroleum hydrocarbons, and pesticides. Other contaminants include biological wastes such as bacteria, fungi, parasites, and other pathogens.

Why do I need Safe Soil?

Certain crops, such as collard greens and lettuce, have a high affinity for the intake of heavy metals through their root systems. This intake results in the edible portions of the plants containing heavy metals, posing a risk to the consumer. Toxic concentrations of contaminants in soil can pose severe risks to individuals. Each contaminate has a different threshold for what is considered toxic. To ensure you are using safe soil for agriculture, get your soil tested. Even if you are not growing food in your soil, some contaminants can still cause harm. Heavy metals, such as lead, can cause harm to adults, children, and unborn children even without consuming it. In Worcester, common soil contaminants include lead, arsenic, and petroleum products.

For information on getting soil tested in Worcester County, see the [additional resources page](#).

MULCHING

Organic mulches are materials that used to be living, such as leaves, straw, wood, bark, and others, that are chipped and used for gardening and other landscaping needs.

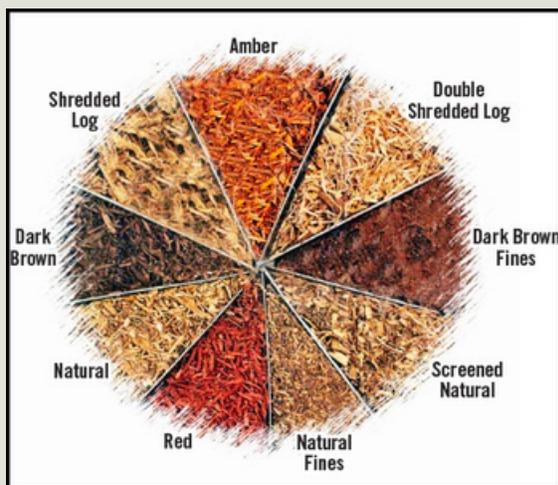


Why is Mulch Beneficial?

In gardening, mulch is typically spread around crops or other plants to serve as a protective covering. Mulch helps to retain soil moisture and water, protects the area from erosion, maintains and moderates soil temperature during periods of extreme temperatures, and can help deter weed growth. Mulch helps both soil and plants to be balanced and healthy.

Types of Mulch:

There are a number of different types of mulch that offer different benefits. There are organic types, such as wood chips, shredded bark, shredded leaves, straw or hay, rocks or gravel, and dried bark. There are also synthetic mulch types, such as landscape fabric and plastic sheeting. Organic mulches are better used in gardens and landscaping that are intended for consumption. Synthetic mulches are typically used for aesthetic purposes and need to be checked for safety before being used in an agricultural garden.



Mulch IS the Answer! Cornell University, 2015.



COMPOSTING

Composting describes the aerobic process of recycling organic materials into a nutrient rich material that can be mixed into planting soil to maintain a healthy soil balance. Composting balances carbon materials (browns), such as dry leaves or shredded paper, and nitrogen materials (greens), such as vegetable scraps or yard trimmings.

How Does the Process Work?

The composting process starts with mixing brown and green materials in a pile in about a 1:1 ratio. Water and air then circulate through the pile to promote decomposition of the organic materials. As the material decomposes, the pile increases in temperature. Decomposers, such as fungi and bacteria, help to break down sugars, starch, cellulose, hemicellulose, fats, and proteins. After the materials are broken down, nutrients are released in a form that are absorbable and usable by plants. The final product, known as compost, is a nutrient rich, soil-like material that can be used for gardening, planting, and the maintenance of healthy soil. More detailed information about what composting is, how to start a compost pile, and more can be found in the [Additional Resources](#).



Compost Guidelines. Portage Recycles.

Why is Composting Beneficial?

Using compost helps to improve soil structure by enriching the existing soil with nutrients as well as aiding in nutrient absorption and water retention. Compost acts as a natural fertilizer, incorporating helpful microorganisms, such as fungi, and nutrients, such as nitrogen, phosphorus, and zinc. The addition of these microorganisms and nutrients increases soil fertility and productivity. Using compost creates healthier soil which can also aid in the reduction of disease risk within the soil.



SHADE GARDENING

Shade gardens may have different definitions based on which resources you are using, but simply put, a shade garden is a garden that is primarily in the shade instead of sunlight. There are different classifications of shade, such as part-shade, full-shade, dappled shade, edge shade, and others that categorize and define different types of shade. Shade types are relevant when planning a shade garden's location and plant species.

What Grows in a Shade Garden?

There are many different types of plants that thrive in various levels of shade. Some flowers that grow well in shade include Bleeding Heart, Solomon's Seal, Dianthus, Violets, and Ferns. There are also numerous vegetables that grow well in shade, including root crops like potatoes and radishes, leafy greens like lettuce and kale, climbing vegetables like peas and beans, and cold crops like broccoli and cabbage. There are also a number of fruits such as blackberries, currants, pears, and rhubarb.

Benefits of Shade Gardens:

Shade gardens tend to be less labor intensive and require less maintenance. Due to the shade itself, weeds are less likely to grow, resulting in less work that is needed to maintain the garden space. Many species of shade tolerant plants require less water than their full-sun counterparts, resulting in less resources needed to keep the plants thriving. Shade gardens support a variety of different flowers, fruits, and vegetables, resulting in a beautifully diverse gardening space. Lastly, the shade itself provides a more comfortable working environment, suitable for all ages and abilities.

Making a Shade Garden:

A shade garden can be in the ground, containers, or raised beds. It is best to work with the space and area that you have available. Take a visual survey of your workspace and make a plan for where you would like your shade garden to be. Then, find plants that are adequate for the shade type and level of your area. Building a shade garden can be tailored to your needs, abilities, and space.

NATIVE PLANTS

Native plants are naturally occurring species of plants that have co-evolved with the natural environment over thousands of years to adapt to the specific environment in which they live. Due to co-evolution, native plants play a vital role in maintaining a healthy and fully functioning ecosystem.



**Monarch Nectar Plants for Massachusetts.
Gardenia.**

Why are Native Plants Important?

Over millennia, insects and animals have co-evolved with native plants to form unique relationships with one another. Some species have co-evolved so closely that both species must be present for survival. For example, monarch butterflies have co-evolved with milkweed to the point where their entire lifecycle is based around the one plant. Without milkweed, monarch butterflies would not have a place to lay eggs and feed as caterpillar larvae and adults. Without adequate populations of native plants, insects and animals that rely on them may lose the food and habitat they need to survive. Native plants have adapted to the specific climate and resources that are available in the area that they live. Native plants aid in stabilizing soil and preventing erosion through their extensive root systems, as well as preventing nutrient runoff. Additionally, these root systems assist in filtering groundwater. Non-native plants cause a break in the natural food web that has evolved over thousands of years. Many native species of insects and animals cannot use non-native plants as food sources, resulting in a lack of adequate food for the natural ecosystem. Some non-native plants may also carry non-native pests and diseases which can be detrimental to the native ecosystem.



Benefits of Native Plants:

Native plants are considered extremely low maintenance since they have evolved to live within the native climate. Additionally, native plants do not require artificial fertilizers, synthetic pesticides, or herbicides, thus creating an overall healthier local environment. By eliminating the use of herbicides, fertilizers, and pesticides, you are eliminating your contribution to toxic runoff and promoting a healthier environment for the native animals and plants in your local area. Native plants help to support the overall ecosystem in your local environment by providing housing, food, and stability for local wildlife.



Relax, rejuvenate: 7 Massachusetts gardens worth a walk.
MetroWest Daily News, 2021

PERENNIAL PLANTS

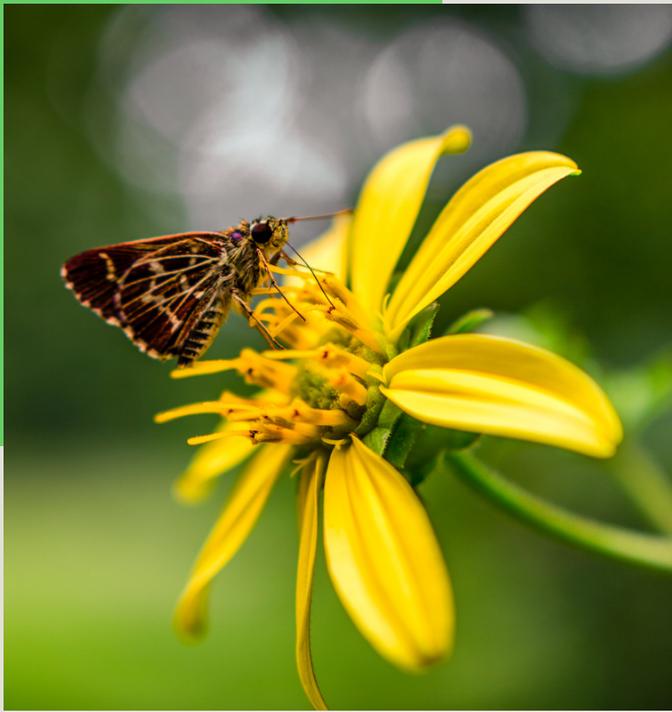
Perennial plants are, generally, plants that are expected to live at least three years. Perennials typically bloom in the spring, die back in the winter, and re-bloom the following spring. Although perennials can come back each spring, it is important to note that not all perennials can survive in any area. Perennials need a general range of temperature, moisture, soil type, and other growing conditions. Perennials can include anything from ornamental grasses to trees to shrubs to certain vegetables and more.

Importance of Perennial Plants:

Perennials play an important role in keeping gardens and green spaces healthy. Perennials help to maintain soil structure, limit soil disturbance for microorganisms, and sequester carbon. Additionally, many perennials have deep root systems which can help limit erosion, improve soil health, filter water, and bring nutrients closer to the soil surface. Lastly, since perennials tend to come back for multiple years, they require less maintenance and energy, saving time, money, and energy.

Perennial Plants Native to Massachusetts:

- White yarrow
- White snakeroot
- Blue star
- Meadow anemone
- Eastern red columbine
- Butterflyweed
- Shrubby St. John's wort
- Lobelia
- Feathery false Lily of the valley
- Creeping phlox
- New England aster
- American Holly
- Black walnut
- Red pine
- Eastern Hemlock



POLLINATORS

Pollinators are insects, such as bees and butterflies, and animals, such as bats and hummingbirds that move between flowers of the same species to promote fertilization and fruit production. Many species of insects and animals feed on the nectar of flowers, a sweet liquid secreted within the flower. When insects and animals retrieve nectar from flowers, they inadvertently collect pollen on their beaks, wings, or body, and then carry the pollen to other flowers, thus pollinating the flowers they visit.

Who Are Pollinators?

Most famously, honey bees are an important pollinator, but there are also over 360 other species of bees that have been documented in Massachusetts that pollinate flowering plants. Additionally, young wasps pollinate flowering plants while foraging. Lesser known, many species of flies and beetles consume nectar and pollen from flowers, in turn pollinating other flowers as they move. Both butterflies and moths have developed relationships with flowering plants that supports both the insects and plants. Young caterpillars consume the plant in which they live on, while adult butterflies and caterpillars feed on the nectar from the plant, pollinating the flowers as they move from plant to plant. Lastly, Massachusetts is home to the Ruby-Throated Hummingbird, which consumes nectar from plants and transfers pollen from flower to flower.

Why is Pollination Important?

Flowering plants require pollination in order to produce fruits. Worldwide, there are roughly 1,400 species of crops grown for uses in food, beverages, medicine, and fiber production, 80% of which require pollination by insects or animals to reproduce. Pollinators directly impact the success and reproduction of flowering plants. Flowering plants help maintain soil integrity by preventing soil erosion through their root systems and support the water cycle by recycling moisture back into the atmosphere. Similar to other plant species, flowering plants have a respiration process in which the plant takes in carbon dioxide and releases oxygen. This process helps to replenish breathable oxygen that is needed in the atmosphere.

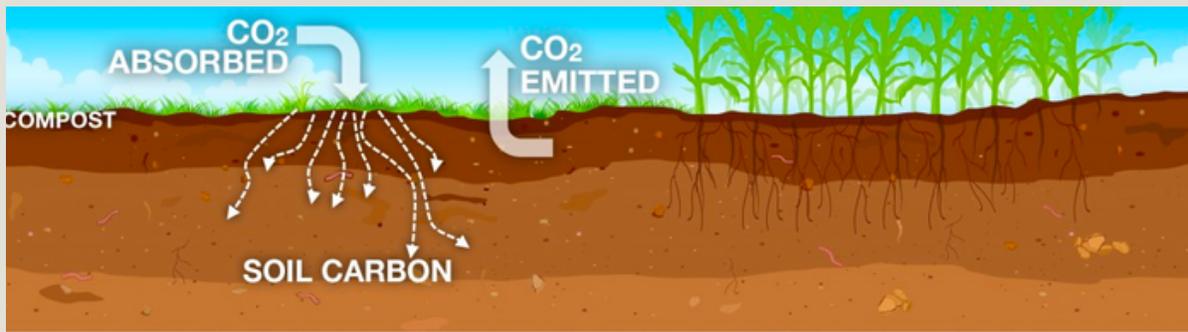


Illustration by The Context Network, adapted from Bay Nature and Whendee Silver, UC Berkeley

CARBON SEQUESTRATION

Carbon sequestration is a process in which carbon dioxide in the atmosphere is captured and stored. The carbon dioxide may either be stored underground in geologic formations or in biological reservoirs such as plants, soil, wood, or aquatic environments.

How does Carbon Enter the Atmosphere?

Carbon dioxide is released into the atmosphere through both natural and human processes. Carbon dioxide naturally enters the atmosphere when most animals, including humans, exhale. Carbon dioxide is the predominant greenhouse gas, making up about 79% of all greenhouse gasses in the United States. The leading cause of carbon dioxide production in the United States is directly related to the production and burning of fossil fuels: only 8% of carbon dioxide emissions are unrelated to the production and burning of fossil fuels.

Why is Carbon Sequestration Beneficial?

Carbon sequestration helps to reduce the amount of carbon dioxide that is within the atmosphere. Carbon sequestration is an important method for reducing greenhouse gas emissions because the natural carbon cycle cannot maintain the levels of carbon dioxide that are being emitted by man made processes. Carbon sequestration has the potential to reduce the overall carbon dioxide emissions, limiting further global warming and climate change, stabilizing droughts, and limiting extreme weather events caused by climate change.

Carbon Sequestration in Farming:

Crops and plants uptake carbon dioxide from the atmosphere to use in photosynthesis. Once the plant has taken in the carbon dioxide, it is used in an internal process, and any remaining carbon is stored within the soil. The sequestering of carbon dioxide within both crops and soil does not interfere with the yield of production.

COVER CROPS

Cover crops are primarily planted to slow erosion, improve soil health, help control weeds, pests, and diseases, replenish nutrients, fix nitrogen, and sequester carbon. Many different crops can be used as cover crops, and each offer different benefits. Some examples of cover crops include mustard, alfalfa, and oats. Cover crops are different than ground cover, which can be found [here](#).



What do Cover Crops do?

Cover crops are chosen specifically for their beneficial inputs to an agricultural area. Grains help to build biomass, break-up compressed soil, and improve water infiltration by slowing water movement. Legumes aid in nitrogen fixation. Broadleaves are best at suppressing weeds and replenishing nutrients within the soil. Since different cover crops offer different benefits, a garden or farm can tailor their cover crops to be precisely what they need. When harvestable crops are planted, they draw a great deal of nutrients, such as nitrogen, from the soil. If the nutrients are not replenished, the next crop will be less successful. Some cover crops have the ability to harness atmospheric nitrogen and fix it within the soil, allowing for readily available nitrogen for the next round of crops. Since the cover crops are replenishing the soil nutrients, the need for synthetic fertilizers, chemical herbicides, and pesticides is reduced. In turn, gardens and farms that utilize cover crops have less water pollution and soil erosion.

Types of Cover Crops:

There are four basic categories of cover crops: grasses, brassicas, legumes, and non-legumes. Grass cover crop can include barley or winter wheat. Brassica cover crops can include radishes or mustards. Legume cover crops can include red clover or alfalfa. Non-legume cover crops encompass all cover crops that are not categorized as legumes.



WHAT IS TILLING?

The act of tilling turns over soil 8-10 inches into the ground. This turn over switches the deep-soil with the top-soil. Although tilling may introduce nutrients to the soil, it detrimentally impacts the soil itself. Tilling practices break the natural soil structure, increasing the levels of erosion and surface water runoff. Tilling also reduces the amount of leftover crops from prior years, causing rain and waterfall to hit the soil and seedlings harder, which can cause further erosion and damage young plants. This means that each year you will need more resources to maintain a healthy and thriving garden plot.



LOW TILLAGE

Low tillage involves disrupting, or turning over, only the first few inches of topsoil in a garden bed or farm. Low till methods leave a portion of crops on the topsoil, which become partially incorporated into the soil as the land is tilled.

What Does Low Tilling do?

Low tilling methods often leave about 30% of the soil's surface covered with crop residue. The leftover crops help to reduce soil erosion and runoff.

NO TILLAGE

No tillage is a gardening and farming method in which no tillage is required, meaning you do not turn the soil. No till methods leave a majority of crops on the surface of the soil.

What Does No Tilling do?

The no till method provides high levels of protection for soil erosion and reduces runoff. No tillage is a very low cost and low energy method, being the most economical method of tillage. Since the crops are left on the surface, biological soil activity is encouraged, increasing the availability of nutrients.

GROUND COVER



Ground cover is a simple and broad classification of plants, usually low-lying plants that tend to spread, that cover an area of the ground. Common turf grass is the most common ground cover you may see in your area, but there are a number of other ornamental, perennial, and native plants that can be used as ground cover and in landscaping. Ground covers can be seamlessly intertwined with gardens, or become the garden themselves by choosing more fruiting and edible plants.

What Plants are Used as Ground Cover?

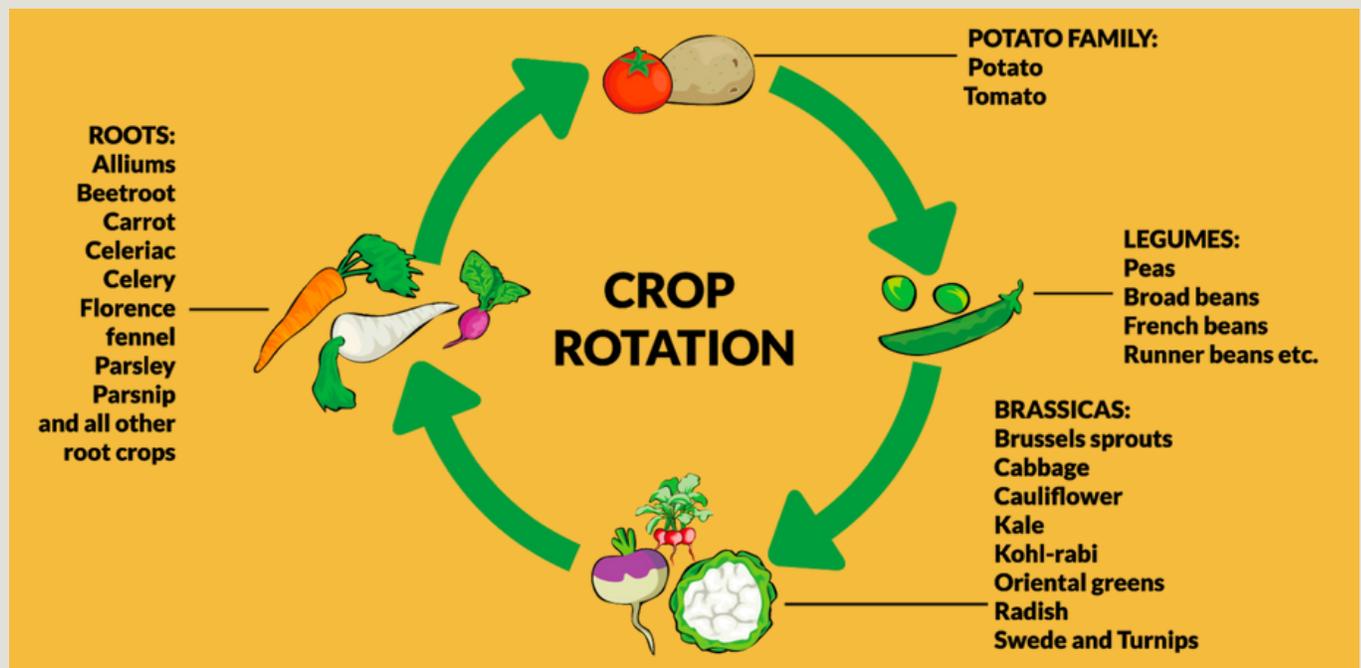
There are several plants native to Massachusetts and the Northeastern US that can be used as ground cover. For landscaping planning, you may choose to plant a variety of heights and densities of plants. For ground cover only, Pennsylvania Sage, Bloodroot, Canada Mayflower, Ovate-leaved Violet, and Wintergreen are a few options.

How to Create a Ground Cover Lawn:

There are a number of key steps to be followed when creating a ground cover lawn. First and foremost, you want to aim to keep as much existing landscaping as possible; this might include waterways, rocks, tree-lines, native plants, and healthy soil. A soil health test may be needed to ensure the soil in your lawn is safe and healthy for plants. If you choose to add landscaping aspects to your lawn, plan to have a seamless transition from the natural vegetation to the landscaped area. Identify and remove any invasive species of plants. When planning your plants, look for native plants that are an appropriate match for your soil type and moisture, climate, and sun-shade level. Drought tolerant plants will help reduce the water needed for your lawn. For the maintenance of your lawn, you can make an integrated pest management plan to limit or eliminate the need for chemical pesticides, utilize mulching techniques, and use compost or other natural products to eliminate the need for chemical fertilizers. You may also use trellises, raised beds, planters, patio stones, rocks, or landscaping designs to create a unique and beautiful design for your lawn.

How is Ground Cover Beneficial?

There are numerous benefits to planting a ground cover lawn opposed to a traditional turf grass lawn. When native plant species are used, the local habitat is better by providing native animals and insects with native plants they need to survive. Many native plants have a deeper root system than some traditional turf grasses, allowing the plants to filter water better, maintain ample soil structure, fight erosion, limit stormwater runoff and the movement of pollutants into waterways, and bring nutrients from deep in the ground closer to the soil surface. Additionally, due to the deeper root systems, ground cover plants often do not need to be watered, even during drought conditions, saving money and resources. The need for chemical pesticides and fertilizers is eliminated with ground cover plants, lowering the maintenance costs of your lawn, stormwater runoff pollutants, and detrimental impacts to your local ecosystem. Lastly, depending on which ground cover plants are chosen, you may see an increase of birds and butterflies in your area to observe, or you may have fruiting trees and bushes for food.



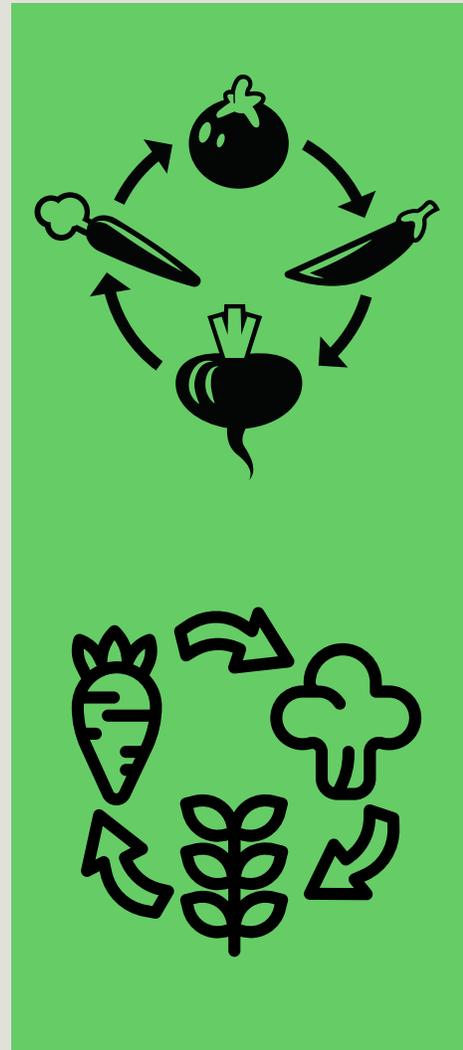
AGRICULTURE Crop Rotation. PSCI, 2020.

CROP ROTATION

Crop rotation is a practice in which you plant different crops in a plot of land year to year.

Why is Crop Rotation Beneficial?

Crop rotation helps improve soil health, replenishes soil nutrients, and can help deter pests and weeds. Since different plants are susceptible to different pathogens, pests, and weeds, rotating crops makes it less likely for a pathogen, pest, or weed to establish itself and become a problem. Additionally, crop rotation can disrupt the natural cycle of pest and disease cycles, stopping the problem at the source. Different crops also uptake different nutrients from the soil and replenish the soil with different nutrients. By rotating crops, you are ensuring that nutrients are being put back into the soil for later use, and that all of one nutrient is not being squandered. Lastly, crop rotation helps support greater yields of crops by increasing the biomass of root structures which in turn supports healthier crops.



INTEGRATED PEST MANAGEMENT

Integrated pest management (IPM) is a broad set of practices that help control insects without relying on the use of pesticides. IPM strategies are tailored to fit your garden and specific needs. IPM strategies include practices that identify the problem areas, prevent problems, and treatment or management of the problem areas.



IPM Integrated Pest Management Process. Nature Pest.

What are Some IPM Practices?

Planting healthy, non-infested plants is the first step in controlling insects in your garden. By keeping the garden area weeded and using clean tools you decrease the likelihood of accidental contamination or movement of pests from one area to another. Planting flowering plants, such as marigolds, that attract beneficial insects, such as ladybugs, can help control populations of aphids. Ladybugs eat a number of garden pests including aphids, mites, mildew, and fungi to mention a few. Lastly, by keeping a record of frequently occurring pests, such as insects, animals, plant diseases, and weeds, you can better plan control methods to protect your garden.

What is Biological Control?

Biological control is an IPM practice that involves using natural predators, parasitoids, or pathogens to control pests or disease in your garden. Natural predators serve to control the population of a pest. For example, certain nematodes can be used to combat Japanese beetle larvae. Parasitoids are specialized insects that attack other insects and eventually kill them. For example, common braconid wasps parasitize tomato hornworms, killing the hornworm in the process. Lastly, pathogens and microorganisms such as bacteria, fungi, nematodes, protozoa, and viruses can cause disease and harm gardens. Pathogens are primarily controlled by microbial insecticides, bio-insecticides, and botanical solutions.



EATING ROOT TO STEM

Root to stem is a practice in which you use or consume as much as possible from the root of a plant to the stem. Looking at a pumpkin for example, you can roast the seeds, use the leaves in soups, consume the flowers in salads, use the pumpkin fruit for pies, and roast the pumpkin skin for chips.

Why is Eating Root to Stem Beneficial?

Eating root to stem helps to limit food waste. By finding uses for every part of a plant, you can reduce the amount of food that ends up in landfills and ultimately uses fewer resources that would otherwise be used to discard usable food. Not only is root to stem eating beneficial for the environment, it is also nutritious for your body.



- Broccoli stems are chock-full of vitamin-k and vitamin-c. They can be used in pesto, soup, or prepared and eaten on their own.
- Broccoli leaves are vitamin and nutrient dense and add flavor to many dishes. They make a great addition to soup or pesto, or can also be sautéed and enjoyed on their own.
- Broccoli florets are packed with vitamins and nutrients and help create a balanced meal. There are many ways to prepare and enjoy broccoli florets: soup, salad, steamed, sautéed, fried, grilled, and more.

To ensure food safety, always check that the plant parts you are interested in cooking are edible or if they need to be prepared in a certain way.



Insight Food forests. Wunderman Thompson, 2021

FOOD FORESTS

A food forest utilizes fruiting trees, such as apple, peach, and fig trees, to create a diverse forested ecosystem that supports both the local community and the local wildlife.

Why are Food Forests Beneficial?

A diverse food forest can provide fruits, mushrooms, berries, and herbs for both people and animals alike. Food forests provide much more than food for human consumption. Food forests also provide local wildlife with habitats, food sources, and shade. Additionally, the trees present in food forests help to improve the air quality of the local environment and help control water retention of groundwater.

Food Forest Plant Ideas:

- Daylily
- Wild garlic
- Kale
- Parsnip
- Alpine strawberry
- Raspberry bush
- Blueberry bush
- Huckleberry bush
- Pear tree
- Apple tree
- Japanese plum tree

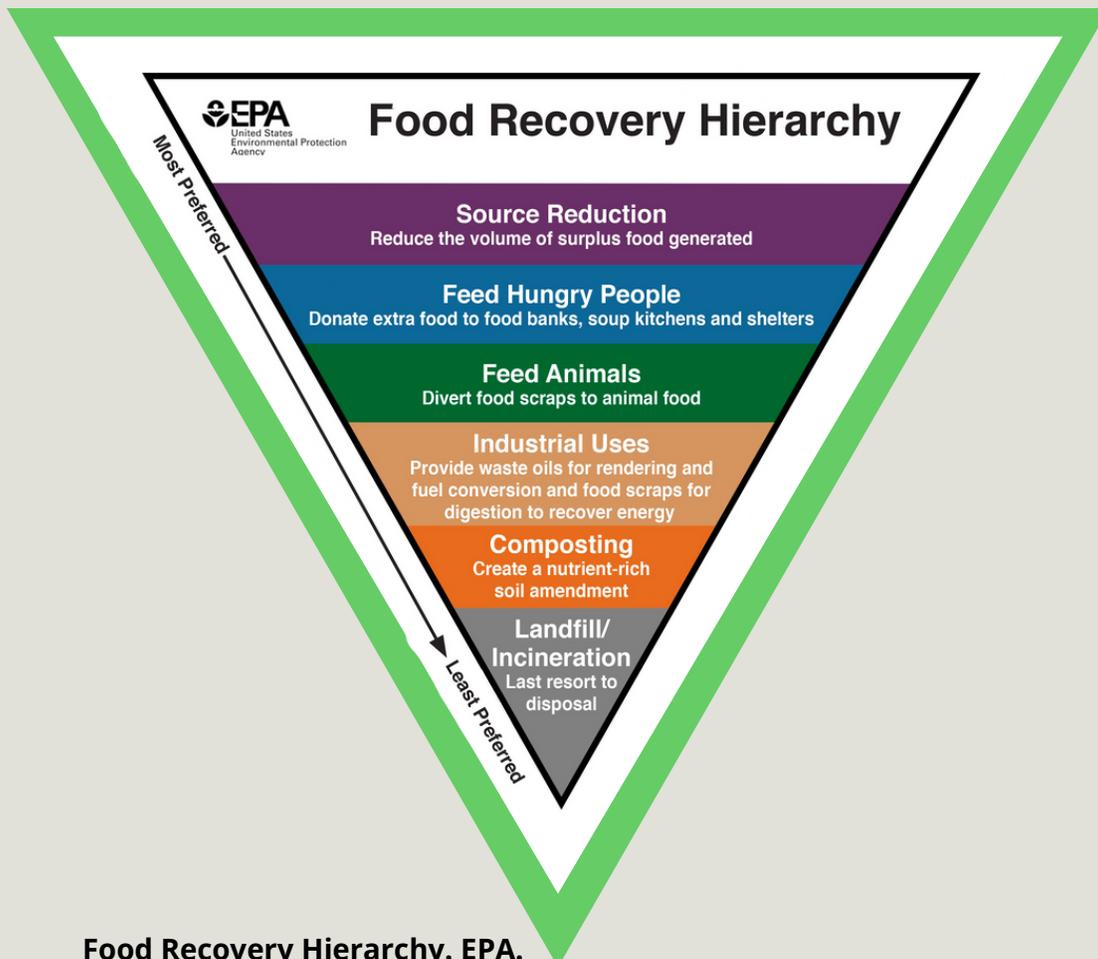


FOOD WASTE

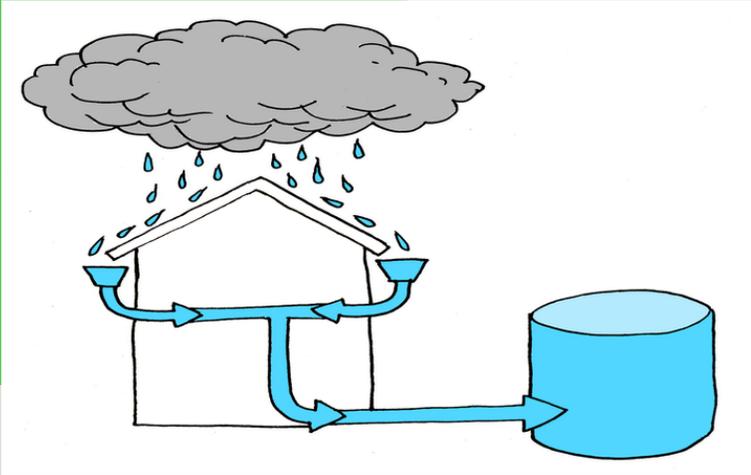
How Can You Reduce Food Waste?

Food waste describes food that has been thrown away even though it is usable. It is estimated that in the United States, 30-40% of food is wasted. That means, food that could be consumed or donated is thrown out and eventually ends up in landfills.

The USDA and EPA have created a food recovery diagram to explain the most effective ways to reduce and eliminate food waste. First and most preferred is source reduction; this means only purchasing the amount of food that is needed for you and your family so that you do not need to throw away food. Secondly, feed those who are hungry; this can be accomplished by donating food or meals. After those two most preferred practices comes feeding animals, industrial uses, and composting. Lastly, the least preferred practice is incineration or landfilling food. By utilizing the first two most preferred practices, you can reduce the amount of food that you are wasting.



Food Recovery Hierarchy. EPA.



Rainwater Harvesting. Venture Well.



What Is a Rain Barrel? Lawn Love, 2022.

RAINWATER COLLECTION

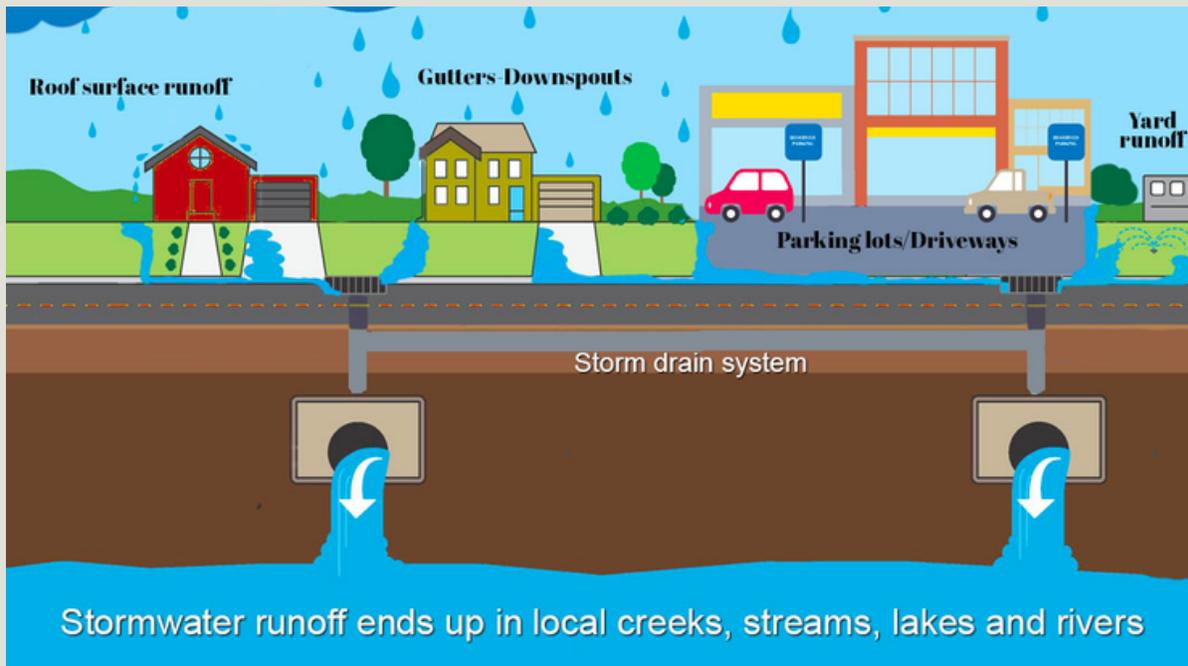
Rainwater collection is the process in which you collect rain run-off from a structure, such as a house, or other surface to store and use later.

What are the Benefits of Rainwater Collection?

By implementing a rainwater collection system, you can take control of your usable water supply for gardening, farming, or recreational use. Additionally, rainwater collection systems take advantage of self-sufficiency, sustainability, and environmental responsibility.

How does a Rainwater Collection System Work?

Rainwater collection systems vary in both size and complexity. On the most simple end of the spectrum, a rainwater collection system consists of a barrel with a meshed or slotted lid. The barrel is placed in a location that receives a high load of run-off or rainwater, such as the corner of a house or an existing gutter downspout. The mesh or slotted lid helps to filter out large debris, such as twigs and leaves, and protects the collected water from insects, such as mosquitos. Many rainwater collection systems also have a spigot attached to the barrel so that it is easier to access the collected water for use. Larger collection systems consist of various components, such as the collection system, multiple filters, storage and overflow tanks, controls, pumps, and water level indicators. These larger systems are typically installed in large-scale operations and irrigation systems, federal facilities, and for uses in ponds and fountains.



Stormwater Utility Program. Albemarle.

STORMWATER RUNOFF

Stormwater runoff describes rain that falls onto the streets, paved areas, grassy areas, and other developed areas and then flows into nearby water sources, such as ponds and rivers.

Why can Stormwater Runoff be Detrimental?

When rainwater falls onto developed areas, such as paved roads and parking lots, the water mixes with components on the ground, such as oils, grease, fertilizers, bacteria, and soaps. The stormwater runoff then flows into storm drains and bodies of water, carrying the pollutants. Stormwater pollutants can cause an array of issues with water systems, such as decreasing water quality, harming fish and wildlife, inducing toxic algae blooms, and increasing flood risks.

How can I Help Reduce Harmful Stormwater Runoff?

Native vegetation, such as trees, shrubs, and tall grasses, may help to serve as a capture and filter system, limiting the effects of stormwater impacts. Additionally, utilizing green lawn-care methods, such as reducing fertilizer usage and conserving water, will help protect water quality and limit your impact of stormwater runoff on the local ecosystem. Lastly, if it is a feasible option, replacing paved and asphalted areas with gravel or vegetation will help mitigate polluted runoff, erosion, and local flooding.

ADDITIONAL RESOURCES

If you are interested in learning more about any of the topics discussed in this resource guide, the linked websites may be a good place to start. Thank you for reading and happy gardening!



- 01.** Climate Resiliency
[Resilient MA Action Team](#)
[US Climate Resiliency Toolkit](#)
- 02.** People's Garden
[What is a People's Garden](#)
[Creating Community Gardens/Expanding Urban Agriculture](#)
- 03.** Container Gardening
[Vegetable Container Gardening for Beginners](#)
- 04.** Raised Garden Beds
[How to Build a Raised Garden Bed](#)
- 05.** Safe Soil
[USDA Soil Health](#)
[Soil Sampling](#)
- 06.** Mulching
[Mulching 101: When, Why & How to Mulch Your Garden](#)
- 07.** Composting
[Composting At Home](#)
- 08.** Shade Gardening
[Best Perennials for Full Shade Gardens in New England](#)
- 09.** Native Plants
[Massachusetts Native Plants](#)
- 10.** Perennial Plants
[Native Plant List](#)
- 11.** Pollinators
[Choosing Pollinator-Friendly Native Plants in Home Gardening or Landscaping](#)
- 12.** Carbon Sequestering
[Soil-Based Carbon Sequestration](#)
[What is Carbon Sequestration?](#)
- 13.** Cover Crops
[Cover Crops and Green Manures](#)
- 14.** Low & No Tillage
[Reduced Tillage](#)
[Advantages And Disadvantages Of No Till Farming](#)
- 15.** Ground Cover
[Native Ground Cover \(MA\)](#)
- 16.** Crop Rotation
[Vegetable Garden Crop Rotation | An Easy Garden Guide](#)
- 17.** IPM
[Integrated Pest Management \(IPM\) Principles](#)
- 18.** Eating Root to Stem
[40+ Root to Stem Recipes to Cut Food Waste](#)
- 19.** Food Forests
[Creating a Food Forest - Step by Step Guide](#)
- 20.** Food Waste
[Preventing Food Waste At Home](#)
- 21.** Rainwater Collection
[How to Make a Rain Barrel From a Garbage Can in 5 Easy Steps](#)
- 22.** Stormwater Runoff
[Think Blue Massachusetts](#)