the big garden 10

TEN YEARS & GROWING

GROW YOUR OWN!

A Sustainable Agriculture Curriculum for Children & Youth

2015 – 2016 Edition

GROW YOUR OWN!

A Sustainable Agriculture Curriculum
for Children & Youth
2015 Edition

Table of Contents

Lesson Four – Garden Companions
Permaculture Principles

Lesson Five – The Food Chain
Food Systems, Food Deserts & Food Justice

Lesson Six – Farm to Table
Local Food & Farmer Visit

Lesson Seven – Harvest Party
Cooking & Preserving from the Garden

<u>Autumn/Fall Lessons (ADDED IN 2016)</u>

Lesson Eight – Put It Up!
Food Preservation

Lesson Nine – From Seed to Seed
Seed Saving

Lesson Ten – Goodnight Garden
Garden Clean-up & Extending the Growing Season

<u>Alternate Lesson(s) for more experienced gardeners:</u>

To Market
Host your own Farmer's Market!

Welcome!

How To Use This Curriculum –

The Big Garden Children & Youth "Grow Your Own! A Sustainable Agriculture Curriculum," is a toolkit that provides basic education and lesson plans in sustainable agriculture practices for for garden educators. This toolkit can be used at urban and rural garden sites and can be adapted for all types of community garden sites --

school gardens,
neighborhood gardens,
non-profit agency gardens,
church and faith community gardens,
group home gardens,
or in your backyard home garden.

This curriculum is meant to be active and engaging, as well as informative in areas relating to sustainable agriculture practices. The lessons in this curriculum are designed to appeal to ages three through eighteen, with alternative activities within each lesson catered to the specific age groups.

Each lesson includes the following sections –

Lesson Overview
Lesson Objectives
Key terms
Lesson Introduction
Activities
Garden Care
Handouts and Resources

We hope you have fun using "Grow Your Own! A Sustainable Agriculture Curriculum for Children & Youth." Please feel free to contact us if you have questions or would like further support.

Cait Caughey
Education & Programming Coordinator
The Big Garden
www.gardenbig.org

GROW YOUR OWN!

LESSON ONE - I LOVE DIRT!

Lesson Overview:

This lesson covers the properties of soil, how to take care of the soil in their garden, how to build soil, and most of all how to have fun in the dirt.

Lesson Objectives:

Participants will learn what soil is, about soil structure, soil health, and composting.

Key Terms

Soil
Soils are complex mixtures of minerals, water, air, organic matter, and countless organisms that are the decaying remains of once-living things. It forms at the surface of land – it is the "skin of the earth."

Soil Horizons
There are different types of soil, each with its own set of characteristics. Dig down deep into any soil, and you'll see that it is made of layers, or horizons (O, A, E, B, C, R).

Humus
The organic component of soil, formed by the decomposition of leaves and other plant material by soil microorganisms.

Dirt
Loose soil or earth

Compost
A mixture that consists largely of decayed organic matter and is used for fertilizing and conditioning land

Earthworms
A burrowing annelid worm that lives in the soil. Earthworms play an important role in aerating and draining the soil and in burying organic matter. ***Castings*** A cylindrical mass of earth voided by an earthworm

Vermi-Composting
The use of earthworms to convert organic waste into fertilizer.

Soil Compaction
Soil compaction occurs when soil particles are pressed together, reducing pore space between them. Heavy equipment and tillage implements can cause damage to the soil structure. Soil structure is important because it determines the ability of a soil to hold and conduct water, nutrients, and air necessary for plant root activity.

Double-digging
Double digging is a gardening technique used to increase soil drainage and aeration. It involves the loosening of two layers of soil, and the addition of organic matter.

Introduction to Lesson One

This lesson is all about soil. It literally starts at the bottom of everything (our dirt!), building a strong foundation for all young urban gardeners and farmers. Our soil must be healthy and protected in order to grow or produce anything.

Every participant should leave this lesson with the knowledge that soil is alive, and that we can build healthy soil.

Every participant should also know the three elements that make up all soils — sand, silt and clay.

At the beginning of all the first class ask these questions and give participants time to answer in their own words.

What is soil?
What is dirt?
What is in the soil?
How do we keep our soils healthy?

Explain what soil is --

Soil is a living organism. It is a mixture of minerals, water, air, organic matter, and organisms. It forms the surface of land and it is the "skin of the earth."

Explain what is in soil --

All soils are different, because they include different amounts of sand, silt, clay, and bits of decaying animal and plant tissue. There are different layers of soil. The very top of the soil is called humus. It is a thin layer and very dark in color. Below is called the A horizon which is made of minerals. Next is the B horizon, C horizon, and R horizon which is the lowest and is a solid rock layer.


Clay
Compost
Worm CASTINGS
Silt
Farm Soil from
Potting
Sand

I Love Dirt! Spring

EXPLORE ACTIVITIES

The Big Garden Children & Youth Sustainable Ag Curriculum

Materials

A table for setting out your materials, glass jars with lids, hand trowels, garden gloves, different types of soil in labeled glass jars (examples: potting soil, soil from the garden, sandy soil, silty soil, and clay soil)

Activity: Discovering Soil 15 minutes (All ages)

Have participants go out into the garden and fill their glass jar with soil, leaving a little room at the top. Return back to the group or if you have a larger group (20 or more) split into two groups. Have participants compare their soil and invite them to use their senses –

"What does it smell like? Feel like? Look like? Taste like? What is in the soil? Do you see anything living?"

Talk about the characteristics of soil. All soil is made up of sand, silt, and clay *--Have each participant put some soil in their hand and try to form a ball.* Show them the separate jars of sand, silt and clay.

Talk about soil and water retention. *"Our ideal soil for growing will hold the water, but will also drain well. We don't want standing water in our garden, which could mean that our soil is too thick or heavy to absorb the water. We need good drainage and porous soil that will absorb the water."*

Have participants pour a little bit of water into some of the jars and see how the soil responds. At the end of the lesson check the jars again to see which jars dried out and which jars are still moist. Also note if you can see the different layers of the soil in their jars.

Finally, go over what is needed for healthy soil. **Use Handout 1.0 Making Healthy Soil**

Activity: Soil Has Layers (Ages 10 – 18)

Teach about the different “soil horizons.” Use a Soil Horizon visual-aid. Explain that soil is made up of distinct layers, called horizons. Each layer has its own characteristics that make it different from all of the other layers. These characteristics play a very important role in what the soil is used for and why it is important.

O HORIZON- This is the top layer of soil that is made up of living and decomposed materials like leaves, plants, and bugs. This layer is very thin and is usually pretty dark.

A HORIZON- This is the layer that we call "topsoil" and it is located just below the O Horizon. This layer is made up of minerals and decomposed organic matter and it is also very dark in color. This is the layer that many plants roots grow in.

B HORIZON- This is the layer that we call "subsoil" and it is located just below the A Horizon. This layer has clay and mineral deposits and less organic materials than the layers above it. This layer is also lighter in color than the layers above it.

C HORIZON- This is the layer that we call "regolith" and it is located just below the B Horizon. This layer is made up of slightly unbroken rock and only a little bit of organic material is found here. Plant roots are not found in this layer.

Materials

Different types of soils (potting soil, compost, garden soil, soil from a farm), seed trays, seeds, popsicle sticks for marking the seed trays

What Soil Do Plants Like? (All Ages)

Provide participants with a few different types of soil and seed trays, such as –
Potting Soil
Straight Compost
Soil from the garden
Soil from a local farm.

Have the participants fill the seed trays with dirt. Place seeds in the holes and mark which type of soil is used. Bring the seed trays back to the garden in a week and two weeks to observe how the seedlings are growing.

Materials

Hand trowels and small buckets, jars with different nature/garden items, vermicomposting bin with red wigglers (if you have one), produce scraps for the kids to feed the worms.

How Many Worms? (Ages 3 – 5)

Have an area where little ones can dig with trowels in the soil looking for worms. When someone finds a worm talk about why worms are important and what they do.

"Earthworms are so important because they organically fertilize the soil with their droppings (poo) which are called castings!"

Additionally, have glass jars filled with different garden items such as – twigs and bark, mulch, pebbles, seeds, small tools, leaves, roots, soil, etc. Let the kids explore the different items.

Bring a vermicomposting bin for the participants to dig around in and learn how the worms can eat food scraps from the kitchen or lunchroom and turn them back into soil. Invite the participants to feed the worms.

Materials:

Garden forks, rakes & shovels

Double-digging 20 minutes (Ages 15 - 18)

Tell the participants that it is really important for the soil we grow our food in to have air and to not be compacted – that way the roots can grow down deep and make healthy plants!

If our plants are growing in packed soil, what will happen to them? Can you think of ways we can loosen hard, packed soil? We are going to learn a method called double digging. There are many different methods used to prepare a garden plot. Our two steps will be loosening the soil and adding nutrients to the soil.

If the garden in a raised bed garden, explain that we already added compost to the soil mixture, but that compost should be added every year at the garden site to increase soil health and organic matter. Demonstrate double digging using a flat filled with soil, two spoons, and one fork, before getting started in the real garden.

METHOD Double digging instructions:

- Dig out a trench across the width of one end of a bed about one foot deep and one food wide. Pile this soil at the end of the bed, not on the bed. This soil will be used later.
- Standing on the un-trenched part of the bed, try to dig the digging fork into the trench another 12 inches. Put the fork down as far as it will god and wiggle it, trying to loosen the subsoil, but not remove it. Do this across the entire trench.
- Dig another trench behind the first one.
- Use this soil to fill the first trench.
- Loosen the subsoil.
- Continue along the bed until it is complete.
- When you have emptied the very last trench and loosened the subsoil, fill that trench with the soil you laid aside from the first trench.

Materials:

Cover crop seed, cover crops planted into a seed tray or two pots (buckwheat and peas work great), seed tray with mulch on top, an empty seed tray, plastic bowl, cover crop seed.

All About Cover Crops

Ask “Has Anyone Heard of Cover Crops?”

Explain -- A cover crop is something we plant to cover our soil when it is bare (not planted). We plant cover crops in early spring if we will not plant until mid-Spring or Summer. We plant cover crops when our plants are done producing in late Summer, or we plant cover crops right before winter. When we have our soil covered, the roots work to hold down the soil.

Pull out buckwheat plant and pea plant.

Hold over a plastic bowl and pour water on it. Note how the water looks like.

Try to pull out a block of empty soil, note that it just falls apart. Pour water over it in your hand. Note what the water looks like.

Say “This is why we don’t want our soil to be bare or naked. It will just wash away. This is called erosion. When our soil erodes it gets in our waterways and causes flooding. We also lose the soil we need to grow food to eat.”

We need roots in the soil to keep it in place. We need a cover of plants or mulch over our soil to keep it in place and safe. If we have bare soil it has the potential to wash away or “erode.” Our goal is to create more soil by

1. Keeping our soil in place and
2. Building organic matter

Show the different types of cover crops

Buckwheat and Field Peas

Show participants how to broadcast cover crop seed. Seed in center of palm, palm up, circular motions over the soil. Let participants take turns trying this technique over the soil bin. If there are empty spaces in the garden sow some cover crops.

I Love Dirt! Spring

MOVE ACTIVITIES

The Big Garden Children & Youth Sustainable Ag Curriculum

Materials

Large 5-gallon buckets or laundry baskets, laminated "Compostable" and "Not Compostable" sheets, Compostable items: soil

What Goes In The Compost Game (Ages 5 - 18)

Ask participants if they know what compost is. Say "*Did you know you can actually build soil?*" Explain that composting is creating new soil.

Have them play the "What goes in the compost?" game. Have two large buckets, bins, or laundry baskets that are labeled – A "Yes, Compost Me" bucket and a "No, Don't Compost Me" bucket. Have a blanket, grassy space, or table and lay out all the items you brought. Work together or if you have a larger group split into two groups. Have the groups toss items into the "yes" bucket or the "no" bucket depending on what they think. If you have two sets of items and two groups you can make it a race to see who finishes first. After all items are in the buckets go through each one to discuss why or why not that particular item goes in the compost.

Let participants use the "Can You Compost It" spinning chart for help, if they need it.

Inchworm Walk/Relay (Ages 3-10)

Have the participants stand in a line. If you are doing a relay split them into two or three teams, depending on the number. Have every participant put their left hand behind their back, the person behind them holds that hand with their right hand. When given the signal they have to run to the other end of the relay space. The first team who is intact like an inchworm wins!

I Love Dirt! Spring

CREATE ACTIVITIES

The Big Garden Children & Youth Sustainable Ag Curriculum

Materials

Bucket, dirt, waxed paper, five gallon buckets, large sheet of drawing paper, paint brushes, glue

Mud Pies! (Ages 3 – 5) and Soil Painting (All Ages)

You heard it. Use a bucket and mix with dirt. Make mud pies on waxed paper. Flatten them out and stick twigs, leaves, beads, whatever you like in the mud pies. Lay them out to dry in the sun. Make muddy hand print art on large pieces of paper.

Different soils vary in color and texture. Invite students to bring in a small amount of soil from their yards or from places around their communities. Make sure they label where they got the soil. Divide the students into small groups and have them compare and contrast the soil. Why might one soil be darker than the other? What might make one soil reddish in color? Where in the community might you find drier soil or sand? Have students discuss and write down their ideas.

Then have students create soil paintings. They can use glue and their soil samples to create landscapes, abstract paintings, or even portraits. Encourage them to be creative! Then have students share their artwork at the end.

Materials

Hand trowels, large poster board with labeled earthworm, colored construction paper, rulers, markers and pens.

Earthworm Fun Facts & Earthworm Prints (Ages 5-10)

Show participants a large picture of an earth-worm with labeled body parts. Describe the functions of an earthworm while showing the visual-aid.

Share these awesome earthworm facts from **Handout 1.1 Earthworm Fun Facts**. Ask if there are any questions.

Then go digging for earthworms!

When you find earthworms, take construction paper and gently make earthworm prints that the kids can take home, or measure the earthworms and see who can find the longest one. Make sure you are digging in a spot that will not disrupt the roots of your plant (if the garden is already planted).

Materials

Two five gallon buckets, compostable browns — mulch, small twigs, hay or straw, brown paper, cardboard, compostable greens - food scraps, lawn clippings, plant matter, wooden spoons, watering can with water.

Cooking Up Compost

Set out all the materials needed & the "compost recipe" cards. Have the browns (carbon) in one box and the greens (nitrogen) in one box. Follow the recipe on the card. Let each participant "cook compost" or put the recipe together. This will help them remember exactly how compost is made. At the end, have them water what is in their bucket, then add it to the actual compost area.

Compost Recipe

1. Start with Sticks (Place a layer of sticks on the ground to maintain airflow underneath the pile.)
2. Scoop Some Soil (Even a small scoop of soil helps populate the pile with beneficial decomposers.)
3. Break Down Browns (Chop/shred brown matter, like leaves or paper.)
4. Make a Super Bowl (Place a layer of brown matter—2x the amount of greens you are going to add—on the pile. Arrange it like a bowl or a nest.)
5. Fill with Greens (Fill the bowl created in step 4 with kitchen scraps, etc.)
6. Cover with Browns (Cover the greens-filled bowl with more browns.)
7. Keep it Damp (Water lightly. It should feel like a wrung-out sponge.)

Materials

2 dark, plastic, non-transparent 10 gallon storage bins, a drill with ¼ and 1/16 bits, bedding = shredded paper and newspaper, torn up cardboard & some dried leaves, small amount of compostable food scraps, one pound red wriggler worms, a few full newspaper sheets, 4 equally sized wood blocks or bricks, small plastic spray bottle.

Build A Vermicompost Bin 20 minutes (All Ages)

Building a worm compost or "vermicompost" is a great way to have fun with worms and expand the composting operation at your garden. **Use Handout 1.2 Taking Care of Your Worms,** which will provide you with all the information needed to care for you vermicomposting bin.

METHOD

- Drill 20+ ¼ inch holes into the bottom of both bins for drainage. Drill 1/16inch holes along the top side of both bins. Drill 30+ 1/16inch holes in the lid of one of the bins. Leave one lid without holes.
- Put a brick in the bottom of the non-drilled bin and stack the drilled bin on top.
- Place shredded paper and newspaper in one bin leaving the other empty. Mix this "bedding" with a shovel full of black dirt and spray with water to lightly dampen. Add a little bit of compostable food scraps buried into the bedding (no meat, dairy, oils, and be careful with citrus).
- Add your worms. Lay a few pieces of wet newspaper on top of the bedding. Create a seal by tucking the wet newspaper around the edges of the bin.
- Cover with the ventilated lid and put the non-ventilated lid upside down. Place four wood blocks or bricks on top of the lid and prop the two buckets on top.

Materials

Four wood pales, hand drill, about 20 screws, shovels, finished compost in a bucket

Build A Compost Area (Ages 10 - 18)

If you garden doesn't already have a composting area, put one up! The easiest way to build a compost is by using (1) metal or wooden t-posts and fencing around the posts with the front side open.

Another option is (2) Use four wood pallets. Lay one on the ground and drill the three other pallets together to create the frame, leaving the front open. Dig the three standing pallets into the ground a little bit so they are sturdy.

If you already have a compost area explore it! Put the items you brought for the “What Goes In The Compost?” game into the compost pile, add both nitrogen & carbon elements demonstrating the “lasagna” method. Show participants how to turn the compost. If you have compost ready to go on the garden, now is the perfect time. Spread and mix compost into your garden beds before planting using pitch forks This is what we call “top dressing.”

Show participants what Finished Compost looks like. Ask them to describe it.

Materials

5 gallon bucket, finished compost, watering can with unchlorinated water, cheesecloth OR a compost tea brewer

Make Compost Tea (All Ages)

*Adapted from homecompostingmadeeasy.com

Step 1
Fill a bucket 1/3 full of quality finished compost
Step 2
Add water to the top of the bucket (unchlorinated is best, or good well water).
Step 3
Let the mixture steep for 3-4 days. Stir it now and then.
Step 4
Strain the mixture through cheesecloth or other porous fabric (burlap, old shirt) into another bucket. Add the remaining solids to your garden or compost bin.
Step 5
Dilute the remaining liquid with water so it's the color of weak tea (use a 10:1 ratio of water to tea).
Step 6
Use tea immediately for optimal absorption into the soil around plants.

HOW TO USE COMPOST TEA

AS A ROOT DRENCH
Can be used unfiltered by applying directly to the soil area around a plant. The tea will seep down into the root system. Root feeding is not affected by rainy weather.

AS A FOLIAR SPRAY
Strain tea thru a fine mesh cloth (cheesecloth, burlap, even an old shirt). Then dilute it with dechlorinated water, if possible, or good quality well water. Use a ratio of 10 parts water to 1 part tea. The color should be that like weak tea. Add 1/8 tsp vegetable oil or mild dish-washing liquid per gallon to help it adhere to leaves.

Method of application and weather - A pump sprayer or misting bottle works better than hose-end sprayers for large areas or for foliar feeding as they don't plug up as easily. The beneficial microoorganisms are somewhat fragile so it is important to note you should avoid very high pressure sprayers for application. Re-application after rain is necessary and one should avoid applying to the leaves during the heat of the day.

EAT ACTIVITIES

The Big Garden Children & Youth Sustainable Ag Curriculum

Spring Garden Snacks

Radishes & Ranch
Baby Carrots
Sugar Snap Peas
Another fun eating activity is bringing toothpicks and seeing what creations you can build and design with the vegetables you harvest from the garden! Garden food art.

GARDEN CARE

Preparing the Garden for Planting

It is most likely Spring or early Summer at your garden site. Now is time to start preparing the soil for planting and planting. In the next lesson we will cover more on proper planting techniques and plant science. Here is an easy step-by-step guide on preparing your garden soil

- Remove any large clumps of dirt, rocks, or debris from your garden bed
- Rake your garden or raised beds smoothly and evenly with a fine rake
- Make a garden map to determine adequate spacing for all your seedlings or seeds

Planting - Sowing Seeds & Transplants

Here is a list of crops that are ideal to plant in early Spring, Spring, and early Summer. Use the seed packets as a guide for sewing your seeds and for transplants. Make sure everything that goes in the garden beds is watered deeply and regularly as it is either germinating or growing. --

Plant in Early Spring:

Roots:	Radishes, Daikon Radishes, Leeks, Onions, Carrots, Beets
Brassicas	Broccoli, Cauliflower, Cabbage
Greens	Loose-leaf Lettuce, Head Lettuce, Kale, Swiss Chard, Collard Greens, Arugula, Mizuna

HANDOUTS & RESOURCES

HANDOUT 1.0
MAKING HEALTHY SOIL

Follow these steps, and you are sure to have healthy soil in your garden!

- **Keep your soil living.** To grow food you need microorganisms & worms in your soil

- **Do not use synthetic chemicals,** including lawn chemicals

- **Do not compact the soil** (don't run heavy equipment over your garden area). The soil needs good air flow for roots to grow, and water to be absorbed properly. Garden soil should not be walked on regularly or have any other heavy equipment run on top of it regularly.

- **Use compost** -- Create a compost area for all your greens & brown (plant matter, veggies scraps, leaves) This will decompose & create rich soil for your garden

- **Use mulch & cover crops!** We don't want the soil to be bare, instead we keep it covered with mulch like wood chips, hay, leaves, or grass clippings (chemical free) and we plant cover crops when we are not using our garden.

HANDOUT 1.1
EARTHWORM FUN FACTS

*adapted from SF Environment curriculum

- First, worms have 5 hearts!
- Worms don't have eyes; a worm "sees" by feeling things with hairs/bristles on its body.
- Worms don't have ears.
- Worms don't have lungs like we do that breathe in air for oxygen. Instead, worms breathe through their skin. It's important that a worm's skin stays wet in order for it to breathe.
- Worms need oxygen just like us, but without moisture, their bodies don't allow gas exchange or breathing to happen.
- Worms don't have any bones. That's why they are squirmy when they move.
- Worms have both male and female parts. This means that all worms can reproduce and have babies.
- Worms eat with a mouth that is a flap. Just like an elephant's trunk, a worm uses it's flap to scoop up their food.
- Worms don't have teeth. Instead, they grind up their food through their gizzard, which is like a stomach that has tiny pieces of sand and minerals in it. These tiny particles grind up the food in the gizzard so the worm can digest or get nutrients from what it has eaten.
- Whatever food the worm can't digest ends up passing on through the body as "castings." That's a fancy word for worm poop! These castings are what eventually become compost.

HANDOUT 1.2 TAKING CARE OF YOUR WORMS

Here are important steps you need to take care of your vermicomposting bin…

Worms need oxygen and ventilation

Make sure the holes are big enough in the bin for the worms to get adequate air flow.

Worms need bedding

Bedding can be created by using shredded newspaper or shredded cardboard or leaves. Maple leaves are best, do not use Walnut leaves.

Keep the bedding wet

Use a spray bottle to wet the bedding as needed. It should be as damp as a wrung-out sponge. Worms breathe through their skin and need to remain wet in order to breathe.

Feed the worms

Worms prefer a vegan diet — this means they only want to eat plant-based foods like fruit, vegetables, beans, nuts, seeds and grains like rice, pasta and bread. Add small amounts of food at a time in one corner of the bin.

Check on the worms occasionally & harvest the compost

After about four months you can harvest the castings, the easiest way to do this is to push everything to one side, add new food and bedding for the worms to eat on the other side, and watch them migrate (this might take a few days) then remove the castings and sprinkle around your garden. You can also make compost tea using the castings.