



Composting



WASTE REDUCTION AND RECYCLING

Project Guide

Waste Reduction And Recycling

Generation Earth Program

Generation Earth is a Los Angeles County Public Works environmental education program presented by TreePeople. Our goal is to educate and empower youth in Los Angeles County to be an active part of the solution to environmental concerns in their community. We offer do-it-yourself environmental projects that help youth make a positive difference at school, at home and out in the world. Our programs are built to support the needs of teachers, students, schools and community youth groups.



Generation Earth Project Guides

Generation Earth Project Toolkits are designed to assist teachers and students in the completion of an environmental project. These guides provide the instructions, tools and support materials needed for students to learn about important environmental subjects and to take steps necessary to complete projects that will positively impact the community.

Waste in Los Angeles

Waste is a vital issue in Los Angeles County. Each person generates an average of five pounds of waste per day. This may not sound like much, but when multiplied over a period of a year, the amount of waste each person creates is staggering.¹ Waste is transported to one of ten solid waste landfills around Los Angeles County. It costs money to dispose of it and valuable open space is used to create landfills to store waste.

Food Waste

In the United States, food waste is estimated at between 30-40 percent of the food supply.² In 2018 alone, the Environmental Protection Agency estimates that about 63 million tons of wasted food was generated. More food reaches landfills and incinerators than any other single material in our everyday trash, constituting 24 percent of the amount landfilled.³ Instead, it could be composted for fuel or soil amendments to grow more food.

Food Rescue Laws in California

In California, laws were passed to fight food waste. Effective January 1, 2016, Assembly Bill (AB) 1826 Mandatory Commercial Organics Recycling Law requires businesses, larger residential complexes and schools that generate organic waste (food or landscape) to arrange for it to be donated, recycled or composted.⁴ In September 2016, Governor Brown signed Senate Bill (SB) 1383, setting statewide targets to reduce the amount of organic waste disposed of in landfills, such as food and plant materials to 50 percent of the 2014 level by 2020 and to 75 percent by 2025.⁵

Food Waste at School

Since April 1, 2016, a commercial or public entity (such as a school or hospital) that generates a specific amount of organic waste, is required to divert its organic solid waste. Reducing the amount of organic materials sent to landfills and increasing the production of compost and mulch are part of Assembly Bill (AB) 32 (California Global Warming Solutions Act of 2006) Scoping Plan.⁶ Schools are an ideal setting for food recovery efforts. Even with careful planning, cafeterias have leftover food that cannot be diverted and can be composted on site instead.

Composting Project Guide

This guide explores compostable food and green waste at a typical school campus. This exploration helps recover food waste on campus by creating a plan, establishing relationships with key stakeholders, installing compost bins and implementing a composting program.

Next Generation Science Standards (NGSS) in Action

This project guide provides students an opportunity to explore the fourth Environmental Principle and Concept “The exchange of matter between human societies affects the long term functioning of both”. Through the exploration of composting, this project guide supports the development of students’ understanding of the crosscutting concept “Energy and Matter” for grades 6 through 12.

The Steps

1. Check This Out

Students explore the subject of food and green waste by working in teams to learn a specific topic related to food and green waste reduction and share what they have learned through the creation of an infographic.

2. Create a Plan

Students work through a variety of questions to create a draft plan for an on-site compost program. This includes mapping the proposed location and determining what to know to share with stakeholders.

3. Get More Information

Students gather more information by conducting interviews with key stakeholders, including the Principal, Cafeteria Manager and more.

4. Getting Permission

Using the information gathered, students update the draft plan for consideration. Permission may be from the school principal or another entity responsible for the site.

5. Compost Bin Installation and Maintenance

Once permission is given, students install the compost bin(s) and set up the program.

6. Evaluation

Students answer questions that serve to evaluate the process and offer next steps for potentially taking on additional waste reduction projects.

7. Resources

Resources are provided for materials and support.

CHECK THIS OUT

Students explore the subject of food and green waste by working in teams to learn a specific topic related to waste reduction and share what they have learned through the creation of an infographic.

Procedure

1. Divide students into four working groups. Groups should be as close to equal in size as possible.
2. Pass out a different topic sheet to each group.
3. Each group has 15 minutes to:
 - Learn and discuss the topic
 - Use poster paper and markers to create an infographic answering the questions listed on the topic sheet
4. Each group shares and explains its infographic with the rest of the class.
5. As a class, discuss the need for food and green waste reduction at home and in the community.



Materials

- Topic sheets (pages 5 - 8)
- Poster paper or dry erase board – one per group
- Markers – one set per group

NGSS in Action

This activity can be used to:

- Support the development of students' understanding of the crosscutting concept "Cause and Effect" and "Systems and System Models" for grades 6 through 12.
- Directly support the science and engineering practice "Obtaining, Evaluating, and Communicating Information" for grades 6 through 12.

Food Waste in the Environment

Start Here!

Organic waste, such as fruit and vegetable scraps, accounts for more than a third of the material in California's waste stream.⁷ In fact, up to 40% of all the food produced in the United States goes uneaten. That is on average 400 pounds of food per person every year!⁸

Create an infographic that answers the following questions:

- How does wasting food affect the environment?
- What is an example of food waste?
- What is something that can be done to reduce food waste?



- When food is thrown in the trash, we dispose of much more than food. Wasting food wastes the water, gasoline, energy, labor, pesticides, land and fertilizers used to make the food.⁹
- When you waste food, you waste tons of water. Agriculture is the biggest user of freshwater and accounts for 70 percent of all use around the world. Twenty four percent of our freshwater use goes to grow food that will end up wasted.¹⁰
- Food waste includes perishables that get discarded because they are inexpensive and quickly spoil. Pound per pound, fruits and vegetables are among the least expensive and fastest spoiling foods, constituting over 40% of total food waste.¹¹
- Composting is recommended on the EPA's Food Recovery Hierarchy of actions that can be taken to prevent and divert wasted food. Composting these wastes creates a product that can be used to help improve soils, grow the next generation of crops and improve water quality.¹²

Green Waste

Start Here!

Organic waste, such as fruit and vegetable scraps, accounts for more than a third of the material in California's waste stream.⁷ In fact, up to 40% of all the food produced in the United States goes uneaten. That is on average 400 pounds of food per person every year!⁸

Create an infographic that answers the following questions:

- What is green waste?
- What are issues related to green waste?
- What is something that can be done to reduce green waste sent to the landfill?



- Green waste is anything that grows from the soil. This includes grass, fruits, vegetables, herbs, flowers, trees, shrubs, bushes and other plants. Items that are made from organic materials, such as paper (from a tree) or clothing (from cotton) are also green waste.
- Much of this green waste is sent to landfills. Collectively, residents and businesses in Los Angeles County sent 557,000 tons of green waste to landfills for recovery in 2012. This amount is enough to fill the Staples Center three times.¹³
- Puente Hills Landfill (closed in 2013) received 42% of the County's green waste. It was anticipated that residents and businesses need to pay higher costs for managing their green waste. This is due to higher fuel costs for transporting the green waste to more distant locations.¹³
- Methane is another issue. When tiny bacteria break down green waste, gasses are produced and escape into the air. Most of this gas is methane. Methane is a potent greenhouse gas—about 28 times more powerful than carbon dioxide at warming the Earth, on a 100-year timescale, and more than 80 times more powerful over 20 years.¹⁴ Landfills are the third-largest source of human-related methane emissions in the United States, accounting for approximately 15.1 percent of these emissions in 2018.¹⁵
- Green waste is used to make compost, a decomposed organic matter that is part of a natural process of recycling organic material into a rich soil amendment. Composting helps create healthy soil for growing food and supports overall garden health.

Food Waste at School

Start Here!

Organic waste, such as fruit and vegetable scraps, accounts for more than a third of the material in California's waste stream.⁷ In fact, up to 40% of all the food produced in the United States goes uneaten. That is on average 400 pounds of food per person every year!⁸

Create an infographic that answers the following questions:

- How many pounds of food is wasted every year?
- How do schools play a role in food waste?
- What is something that can be done to reduce food waste at school?



- Approximately 72 billion pounds of perfectly good food—from every point in the food production cycle—ends up in landfills and incinerators every year.¹⁶
- Most of this food waste comes from the consumer level. Reasons for this waste include spoilage, uncertainty of expiration dates, food packaged in bulk, oversized portions served and undervalued foods due to cheap prices.
- An estimated \$1.2 billion dollars' worth of school lunch food is wasted nationally every year.¹⁷
- The USDA Secretary announced in September of 2015 nationwide food waste reduction goals aiming to reduce food waste by 50% by the year 2030.¹⁸ Schools can play a vital role in meeting this goal.
- School food waste, such as fruit and vegetable scraps, can be used to make compost. Composting helps create healthy soil for growing food and supports overall garden health.

Degraded Soils

Start Here!

Soil degradation, a decline in soil quality caused by human activities, has been a major global issue during the 20th century. The importance of land degradation among global issues is enhanced because of its impact on world food security and quality of the environment.¹⁹

Create an infographic that answers the following questions:

- What are the components and benefits of healthy soil?
- What happens when soil is degraded?
- What is something that can be done to improve degraded soil?



- Healthy soil supplies clean air and water, bountiful crops and forests, productive grazing lands, diverse wildlife and beautiful landscapes. It does this by regulating water, filtering pollutants, cycling nutrients, sustaining plant and animal life and providing the medium for plant roots.²⁰
- When soil is fed by organic matter (such as fallen leaves, branches and rotting plants), it creates a food source for bacteria and fungi. Spiders, millipedes and worms eat the bacteria and fungi. Each of these consumers releases nutrients back into the soil that are utilized by plants. This complex system, known as the soil food web, is what creates healthy soil.
- Many soils in the U.S. and around the world have become degraded. Degradation most commonly occurs when erosion and decreased soil organic matter levels initiate a downward spiral resulting in poor crop production. Soils become compact, making it hard for water to infiltrate and roots to develop properly. Erosion continues, and nutrients decline to levels too low for good crop growth.²¹
- School food waste, such as fruit and vegetable scraps, can be used to make compost. Adding compost to degraded soil in and around the site introduces beneficial organisms and nutrients to help rebuild the soil.

ON-SITE COMPOST PROGRAM PLAN

There is a lot of preparation that must happen to ensure a successful campus compost program.

Procedure

1. Answer the questions below.
2. Create a plan.
3. Once complete, go to page 13 to get more information through interviews with key stakeholders that will help create the final plan.

Site

Where will the compost bin be set up? Using a map of the site look for:

- **Open space area**
 - At least 10' by 10' space for each bin
 - Semi- to full-sun exposure
 - At least 10 feet away from any window or door (for potential odors)
- **Source of water**
 - This is a spigot or other source that supplies water using buckets or close enough to use a hose



Materials

- Site Map
- Resource List (page 22)

NGSS in Action

This activity can be used to:

- Directly support the science and engineering practice “Planning and Carrying Out Investigations” for grades 6 through 12.



Materials

What materials do you have? What materials do you need to source? The following materials are needed to ensure a successful composting program:

- **Compost bin**
 - See the Resources section on page 22 for more information on the different types of bins that are available
 - The proposed location determines the type of bin needed
- **Carbon-rich materials**
 - Mulch (dead leaves, twigs, branches)
 - Sawdust (only from untreated wood)
 - Paper, such as newspaper, brown paper bags, etc.
- **Nitrogen-rich materials**
 - Fruit and vegetable scraps (orange peels, carrot tops, apple cores, etc.)
 - Moldy fruits and vegetables
 - Coffee grounds and loose tea leaves
 - Grass and garden clippings

Mulch

Some school districts have mulch available and can have it delivered to the site.

Tools and Supplies

What tools and supplies do you have? What tools and supplies do you need to source? The following tools and supplies are needed:

- Pitch fork or shovel
- Gloves
- Sifting screen
- Compost thermometer (optional)
- Hose
- Water buckets
- 5-gallon food scrap collection buckets
- Instructional signs

Facilities and Maintenance

Check to see if tools and supplies are available for use through the Facilities and Maintenance staff.

Usage

How will you use the completed compost? Some ideas include:

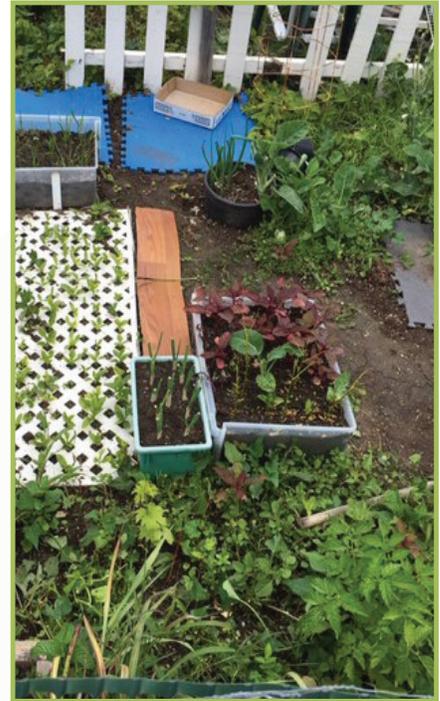
- **On-site**
 - Adding compost to vegetable and/or flower gardens.
 - Adding compost to other garden areas.
 - Breaking up and adding compost to hard, compacted soil or areas where soil is eroding.
- **Off-site**
 - Student distribution for home use

Daily/Weekly Plan

What is the plan for gathering materials and feeding the compost bin? Who will turn the compost when needed?

Consider the following:

- **Number of bins**
 - Will there be one compost bin or more? This will help determine the daily or weekly plan and how much material will be needed.
 - If there is only one bin, gathering materials once a week is enough.
 - If there are multiple bins, gathering materials every day is needed.
- **Gathering vegetable/fruit scraps**
 - Gather small amounts of food scraps directly from cafeteria staff.
 - Gather large amounts of food scraps during lunch from students.
 - How will this be done? Who will make it happen?
- **Tending the compost bin**
 - Who will be in charge of turning and tending to the compost bin?
 - Who will tend to the finished compost?



Club or Class

Consider collection and tending to the compost bin as part of class time or during a club meeting.

What is needed to take care of a compost bin?

Go to page 19 to review the guidelines on how to tend to a compost bin to get an understanding of what is involved.

Promotion Plan

How will you promote composting? The size of your program and how you get your materials will determine how you promote the program.

- **If you are collecting food scraps from students**
 - Make signs to inform students about composting and the campus system.
 - Include instruction for what can and cannot be put into the compost bucket.



Sustainability Plan

What is your plan to ensure the continuation of the program? Consider the following as part of the plan:

- **Teacher/class support**
 - One way to ensure a successful on-going program is to include it as part of a class.
- **Student club**
 - One way to ensure a successful on-going program is to make it part of a student club or gardening program.



GET MORE INFORMATION

It is important to find out more information by interviewing key site stakeholders. In this case, stakeholders are people who affect and provide the necessary materials for the composting program.

Procedure

1. Review questions as a team.
2. Set up interview opportunities with the appropriate contacts for answers to questions.
 - Principal
 - Cafeteria Manager/Food Service Manager
 - Facilities and Maintenance Manager
 - Teachers
3. Create an information sheet about the value of composting. See the Resource section on page 22 for a variety of resources.
4. Bring a copy of the draft plan, compost information sheet and a school map showing the proposed location to the interviews.
5. Have groups share what they learned.
6. Adjust the plan as needed.

Materials

- Draft Plan
- Interview questions for each group (pages 14 - 17)
- Pencil/pen

Be Prepared

Know your facts so you can answer questions.

For example:

Will the compost smell?

The compost pile will be turned regularly and a balanced mix of greens (nitrogen) and browns (carbons) will be maintained to avoid a smelly bin.

What about pests?

No meat, oil, sugars or dairy products will be added to eliminate potential odor and pests.

Campus Composting Interview

Name(s)

Date

Cafeteria Manager/Food Services Manager

1. Are there any wasted fruits and vegetables from breakfast and/or lunch?
2. Which meal generates the most fruit and vegetable food waste?
3. What happens to fruit and vegetables that are returned at breakfast or that don't get served at lunch?
4. Are there any leftover fruits and vegetable scraps or egg shells that get thrown away?
5. Would you be willing to place scraps into a bucket for our use?
6. What would be the best time/day for a food scrap pickup and who should pickups be arranged with?
7. Are there any additional comments or concerns we can address for you?

Campus Composting Interview

Name(s)

Date

Facilities and Maintenance Manager

1. Are there grass clippings, other plant material and used paper or newspaper available to use?
2. Is it possible to get a load of mulch from the school district?
3. Are there any regulations or safety concerns we need to be aware of?
4. Are there tools that we could have access to, such as gloves, hose, 5-gallon buckets, shovel or pitchfork?
5. Are there any concerns about the location we identified? Is there a better location?
6. Are there any concerns about the source or use of water periodically to rinse out buckets or moisten the compost?
7. Are there any additional comments or concerns we can address for you?

Campus Composting Interview

Name(s)

Date

Teacher

1. Would you be willing to help manage and sustain a compost program?
2. How can the compost program become part of the curriculum for specific classes?
3. Would you be willing to manage a compost collection bin in your classroom?
4. Would you allow students to be part of the compost program as part of the class or to provide extra credit?
5. Are there any additional comments or concerns we can address for you?

Getting Permission

Getting permission is the last step necessary before setting up the space and installing the compost bin.

Procedure

1. Using information from the stakeholder interviews, update the composting project plan.
2. Set up a meeting with the principal or other stakeholder responsible for the site.
3. Provide the composting information sheet, compost program plan and a school map showing the proposed location.
4. Once permission is given, begin planning the compost bin installation.



Support Needed?

A Generation Earth Coordinator is available to assist your group through this process and to help avoid any roadblocks.

NGSS in Action

This activity can be used to:

- Directly support the science and engineering practice “Constructing Explanations and Designing Solutions” and “Engaging Argument from Evidence” for grades 6 through 12.

COMPOST BIN INSTALLATION AND MAINTENANCE

Setting Up the Bin

- Go to the Resource section on page 22, for more information on sources and types of bins.
- Set up the compost bin in an outdoor area with semi- to full-sun exposure at least 10 feet away from any window or door (for potential odors).
- Place a 1" layer of mulch (or other carbon-rich material) at the bottom of the compost bin.
- Fill the compost bin lasagna style (see box).
- End with a top layer of brown, carbon-rich material to keep odors down and help maintain moisture.



Maintenance

- **Phase 1: Fill the compost bin**
 - Follow the instructions above to fill the compost bin.
 - The duration of this phase depends on how much material is added. Fill it up in 1 day or in 2 months, either works.
- **Phase 2: Active decomposition**
 - Once full, to prevent too much heat harming the microbes, give the material oxygen by removing the material, spreading it out and placing it back in the bin.
 - Do this at least once a week.
 - This phase lasts about 4 - 6 weeks.

Lasagna Style

- Start with a base layer of mulch or other carbon-rich material.
- Add one layer of green, nitrogen-rich material (up to 3" thick).
- Cover with an equal amount of brown, carbon-rich material.
- Repeat these layers until the bin fills up, ending with a brown layer.

brown (carbon-rich)

green (nitrogen-rich)

brown (carbon-rich)

green (nitrogen-rich)

Base layer of brown

- **Phase 3: Curing**

- Allow the compost to return to ambient soil temperature (80°F) before sifting.
- This phase lasts about 3-4 weeks.

- **Phase 4: Sifting and application**

- Sift the cured compost to remove chunky carbon.
- Apply compost to your soil!

- **Go back to phase 1!**

Trouble Shooting

- Use your thermometer to assess how well your compost is decomposing. A standard compost pile won't reach optimal temperatures (120°F or higher) until the bin is near/at capacity.
- Too much of the browns can cause the pile to dry out and the bin won't reach high temperatures. Too much of the greens can cause the pile to become sludgy and excessively hot.
- If your compost is too dry, add water or more greens. If your compost is too wet, add more carbon.



EVALUATION

Once your compost program is underway, answer the following questions to evaluate the project.

QUESTIONS

1. What was the most successful part of the project?
2. What was the least successful?
3. What would you do differently next time?

What's Next?

Another Project Guide

Are you interested in another project guide? Consider:

- E-Waste Collection Event
- Community Swap Event

Share!

Generation Earth would love photos and/or videos of the project!

- Send them to your Generation Earth Facilitator, at generationearth@treepeople.org

RESOURCES

COMPOST BINS

There are a variety of options for compost bins. The site, space and resources will determine what system you decide on.

Where to find compost bins:

- On-line
- Home improvement store
- New/used through an online marketplace
- Donations

Types:

Round Upright

- Open bottom so that organisms can easily make their way into the bin to help break down material
- Side vents allow air to get into the bin.
- Sliding panel at the bottom to access finished compost and keep fresh material at the top.



Square Upright

- Open bottom so that organisms can easily make their way into the bin to help break down material
- Side vents allow air to get into the bin.
- Locking self-watering lid offers air ventilation.
- Two sliding panels at the bottom to access finished compost and keep fresh material at the top.



Tumbling Composter with Two Chambers

- Two chambers – one chamber for fresh scraps and one chamber for making/cooking compost.
- Allows for storage of fresh scraps while making compost.
- Raised off the ground, to help prevent rodents and other pests.



Do-it-Yourself Bins

- Build from scratch using basic materials.
- Costs less.
- Adaptable to the site.
- For ideas go to:
diyncrafts.com/33618/home/gardening/35-cheap-easy-diy-compost-bins-can-build-weekend



FOOD WASTE AT SCHOOLS

The following are a variety of resource materials related to food waste at school, including some sample project plans.

Guide to Conducting Student Food Waste Audits - A Resource for Schools

- epa.gov/sites/production/files/2017-12/documents/guide_to_conducting_student_food_waste_audit_-_nov_20_2017.pdf

Reducing School Food Waste Infographic

- usda.gov/sites/default/files/documents/reducing-food-waste-infographic.pdf

Education and School Waste Reduction Programs

- calrecycle.ca.gov/education/

Food Recovery in Los Angeles County

- epa.gov/sustainable-management-food/links-and-resources-about-food-recovery-los-angeles

Reducing Food Waste at Schools: Inside Tips for School Staff, Students, and Parents

- fns-prod.azureedge.net/sites/default/files/tn/USDAHelppreventwastedfood.pdf

Food Waste Best Practices

- nrdc.org/sites/default/files/k-12-food-waste-best-practices-ib.pdf

Green Waste Management Resource Guide

- dpw.lacounty.gov/epd/sbr/pdfs/Green-Waste-Management-Resource-Guide.pdf

How to Comply with Organic Waste Policies in California

- calrecycle.ca.gov/recycle/commercial/organics/faq#Jurisdiction

Food Reduction Made Easy

- wastedfood.cetonline.org/wp-content/uploads/2019/08/FoodReductionMadeEasy.pdf

Food Separation Made Easy

- wastedfood.cetonline.org/wp-content/uploads/2019/08/FoodSeparationMadeEasy.pdf

Project Plan for Reducing Cafeteria Waste

- thegreenteam.org/wp-content/uploads/2016/01/Lunch-Against-Landfill-Us-vs.-Waste-Campaign.pdf

Food Waste Diversion Guide for Schools

- [thegreenteam.org/wp-content/uploads/2015/08/Food_Waste_Diversion_Guide_for_Schools_\(1\).pdf](http://thegreenteam.org/wp-content/uploads/2015/08/Food_Waste_Diversion_Guide_for_Schools_(1).pdf)

School Composting Resource Package

- thegreenteam.org/wp-content/uploads/2017/03/MassDEP-School-Composting-Resource-Package.pdf

HOW-TO / INFOGRAPHICS

How to Layer Compost

- thegreenteam.org/wp-content/uploads/2012/08/Composting-is-Easy.pdf

Compost Food Web

- thegreenteam.org/wp-content/uploads/2012/08/Compost-Food-Web-Poster.pdf

Composting Video Demonstrations

- portal.ct.gov/DEEP/Waste-Management-and-Disposal/Organics-Recycling/Compost-Video-Downloads

LAWS / POLICIES ON ORGANIC WASTE IN CALIFORNIA

Policies and laws to support teacher and student advocacy efforts.

SB-1383 Short-lived climate pollutants: methane emissions: dairy and livestock: organic waste landfills (2015-2016)

- leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB1383

AB-1826 Solid waste: organic waste

- leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201320140AB1826

AB-827 Solid waste: commercial and organic waste: recycling bins

- leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200AB827



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5. calrecycle.ca.gov/climate/slcp
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NOTES

