

# JOB CORPS

Sustainable Living  
Making a World of  
Difference with Simple Actions



United States Department of Agriculture • Forest Service

CURRICULUM AND ACTIVITY GUIDE—MODULE 2

“It really boils down to this: that all life is interrelated...  
Whatever affects one directly, affects all indirectly.”  
—Martin Luther King, Jr., Civil Rights Activist, 1967



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## PURPOSE OF THE MODULE

The lessons that follow are designed to introduce Job Corps students to the concept of sustainable living. But how do we ensure that our Nation is living sustainably? The answer is green jobs. As we move from a fossil fuel-based economy to a renewable resource economy, we need people to show us the way. We need people with green skills—such as the green skills students will be learning at Job Corps. Students will be trained to do many of these important jobs. We need construction workers to build green homes and offices. We need mechanics who can work on hybrid vehicles. We need landscapers who create designs with local, drought-tolerant plants. We need chefs who cook and bake with locally grown, organic food. And, we need teachers to share their knowledge of the environment. Jobs that support sustainable living are green jobs.

Our Nation's future relies on a well-educated public to be wise stewards of the very environment that sustains us, our families and communities, and future generations. Teaching young people about the environment will help them, as they prepare for the working world, to make the connections between economic prosperity, benefits to society, environmental health, and our own well-being. Ultimately, the collective wisdom of our citizens, gained through education, will be the most compelling and most successful strategy for environmental management.

At the same time, business leaders increasingly believe that an environmentally literate workforce is critical to their long-term success and profitability. With better environmental practices and improved efficiencies impacting the bottom line, businesses will prepare their companies for the future. Charles O. Holliday, Jr., Chairman and Chief Executive Officer of DuPont, speaks for a growing number of his peers in declaring that “an environmentally

sustainable business is just good business, given the growing concern for environmental problems across America. A key component of an environmentally sustainable business is a highly educated workforce, particularly involving environmental principles.”

## INTRODUCTION

Green jobs depend on green thinking. Green thinking depends on everyone taking a closer look at how they live, the resources they use, and how it affects others. Currently, 305 million people live in the United States. Not only is our population growing, but our society is using more and more natural resources every day.

Sustainability means meeting our basic human needs today without compromising the ability of future generations to meet their own needs. To survive and thrive, we all need food, shelter, space, water, and clean air. Some of these resources are renewable, such as forests and water. If we take care of them, they will be around for future generations. Other resources are nonrenewable, such as coal, oil, and gasoline. Once they are gone, we can't make more. Because there are limits on both our renewable and nonrenewable resources, we need to think about how we use them today so that they are around for the future.

At the heart of sustainable living is thinking about how we can meet our everyday needs while using our natural resources more responsibly. Can we do more with less? If we reduce our consumption and learn how to conserve our natural resources, will they be available to our children, grandchildren, and others around the world? Will future generations be able to achieve the same standard of living that we experience today? If the answer to those questions is yes, then we are thinking about sustainability.

“We are eternally linked not just to each other but our environment.”

- Herbie Hancock

## CONNECTING TO THE CONTENT

Why is it important to consider sustainable living?

- 1. It protects and enhances the environment.** When we use our natural resources in a sustainable manner, we ensure that they will be around for future generations. This means harvesting trees at a rate that they can be replaced or using engineered wood. It means recycling food and drink cans so that metals are reused instead of mined. It means driving our cars less or using low volatile organic compounds (VOC) paint so that we improve our air quality. Saving our resources also means saving money.
  - 2. It creates jobs.** We need people to show us the way. America is making a green shift towards new technologies, new products, and new ways of living. This green shift has already resulted in jobs. Solar panels and geothermal heat pumps need to be installed, and homes and offices need to become more energy efficient. Vehicles are becoming more energy efficient, and our food is being produced with less chemicals. These jobs can be filled with trained young people.
  - 3. It saves money.** Most actions we take to live more sustainably also help us save money. If we weatherize our homes and turn down the thermostat at night, we will be conserving energy and saving money. With today's high energy prices, the impact on our wallets can be significant.
  - 4. It improves health.** The smog we see in large urban areas is the result of fossil fuel emissions from vehicles, buildings, and manufacturing. Smog can affect our health and reduce the time we can safely be outside. It can create acid rain and impact the growth of trees and gardens. But if we reduced our fossil fuel emissions by carpooling, taking public transit, and making our buildings more energy efficient, we will also improve air quality and make it healthier for all living things.
  - 5. It ensures that all members of society can meet their basic needs.** Sustainable living means that everyone can access food, shelter, water, space, and clean air. This means changing our practices to ensure that human rights are respected, that barriers to employment are removed, and that everyone has safe living conditions. Living sustainably is about respect for our environment and for all people within society.
- Sustainable living attempts to find a balance between our environment, our economic needs, and the needs of our society. This is not always an easy balance to find. But we live in a Nation that wants change, that celebrates innovation, and that looks to all members of society to contribute to a healthy country. With our knowledge and skills, we will be better equipped to find a balance.

### CENTER SUCCESS!

Green thumbs abound at the Cassadaga Job Corps Academy in New York! Students and staff have created and are tending a variety of fruit, vegetable, and herb gardens throughout campus. Christopher Weaver, Culinary Arts student and avid kitchen gardener, noted "I love working in the garden. We can use the herbs we are growing in cooking so it fits well with my Culinary Arts trade. Gardening is teaching me patience. Everything takes time to grow. I think gardening on campus is a good activity to have for students' down time and a great way to keep students busy doing something positive. And, then, we have fresh produce for our dining room!"

Janet Forbes, with Cassadaga Job Corps Academy, said that Cornell Cooperative Extension staff provided training on making compost. Since then, Food Services staff and students have begun a compost pile near the vegetable garden and are adding kitchen food waste into the mix.

## ACTIVITY OVERVIEW

Activity Name	Activity Type	Duration	Number of Students Required	Page Number
Water Wonders	A warmup investigation that gets students thinking about the amount of water they consume.	Approximately 10 minutes	1	7
Water—Our Blue Planet	A small group activity demonstrating that, although water covers about 70 percent of our planet, potable drinking water is not a plentiful resource.	Approximately 30 minutes	1 - 15	8 - 9
What Are the Limits?	A small group or independent learning activity where students will play the role of grey squirrels living in a finite area, competing for food.	Approximately 40 minutes	3 - 15	10 - 14
A Sustainable Neighborhood	A small group or independent activity that asks students to review a scenario where neighbors had to make decisions about how to reduce their electric bill.	Approximately 30 minutes	1 and up	15 - 17
Tracing Our Roots	This independent learning activity connects the items we own with their natural resource origins.	Two to three 40-minute class periods	1	18 - 20
From Farm to Fork	An independent or small group activity where students learn about food miles and determine the origin of a few produce items.	Approximately 30 minutes	1 - 15	21 - 24
I Have Sustain-Ability! Footprint	An activity in which students complete an ecological assessment and then take on an environmental service project that involves making a personal change.	Depends on nature of community service project	1	25 - 26
Start a Center Garden	This service learning activity outlines the basic steps to starting a garden on center grounds.	Approximately 1 to 2 days	3 and up	27 - 30

You can select only one activity to complete with students or you can complete them all. They are nonsequential activities and can be completed in any order. Student worksheets and handouts accompany this module and can be photocopied as needed.

At the end of each activity, there are suggested questions for assessment with the students. These questions can be posed to students to facilitate a group discussion or they can be answered individually, using paper or a computer.



## WARMUP INVESTIGATION: WATER WONDERS

**TIME:** 10 minutes

**NUMBER OF  
STUDENTS REQUIRED:** 1

### TRY THIS ACTIVITY IN:

- Career Preparation Period (CPP)/New Student Phase
- Academic Training: Science, Math
- Residential Living
- Student Government Association

### BACKGROUND:

The U.S. Geological Survey states that each of us use about 80 to 100 gallons of water per day. We use water for drinking, cooking, showering, brushing our teeth, and cleaning. Water is also required to grow our food, produce our clothes, and make most of the products in our lives. Because water in the United States is always available at the turn of the tap, we can forget how precious this resource truly is.

### STUDENTS NEED TO:

1. Time the length of their next shower. They can use a stopwatch, timer on a wrist watch, or kitchen timer. If students remember, they can record the length of their most recent shower.
2. Ask students to estimate how much water they used while showering. Ask your student to record this number (in gallons) on a sheet of paper or on the computer. They can make a table that looks like this:

Activity	Estimated gallons used	Number of minutes	Gallons per minute	Actual gallons used	Difference between estimate and actual
Showering					

3. Calculate the actual water used. A conventional showerhead uses 3 to 8 gallons per minute, while a low-flow showerhead uses about 2.5 gallons per minute. Students can also determine the rate of waterflow by placing a pail under the flow of the showerhead. Students can time how long it takes to fill the pail to a predetermined volume.

### WRAP-UP:

1. What was the difference between the students' estimate and actual water use? The difference is usually quite high because we don't think about how much water we are using.
2. What can you do to conserve water in the shower? In the bathroom? At the center?



## SMALL GROUP ACTIVITY: WATER – OUR BLUE PLANET

### TIME:

About 30 minutes including debriefing

### NUMBER OF STUDENTS REQUIRED: 1 to 15

### TRY THIS ACTIVITY IN:

- Career Preparation Period (CPP)/New Student Phase
- Academic Training: Science, Math
- Student Government Association

### WORDS TO KNOW:

Conserve  
Consumption

### OBJECTIVES:

Students will:

- Develop an understanding of water as a limited resource.
- List ways that they can conserve water.

### MATERIALS:

- Gallon milk jug
- Glass measuring cup (with ounce marks)
- Eye dropper
- Water

### PROCEDURE:

1. Fill the gallon milk jug with water. Tell students that this represents all the water on the entire planet.
2. Ask students to estimate how much water in the milk jug represents drinking water for humans.
3. After a few estimates, pour 3 ounces into the glass measuring cup. Most of the water in our gallon jug represents ocean water. It is too salty to drink. This leaves 3 ounces, or 2.5 percent of water on Earth remaining for human consumption.
4. Ask students to estimate how much water, of the 3 ounces, is available for human drinking water?
5. After a few estimates, pour out all but 1.2 ounces. Most of our fresh water is frozen in the ice caps at the North and South Poles. We can't drink that frozen water.
6. Of the 1.2 ounces that remain, ask students how much of this water is available for human drinking water.
7. After a few guesses, use the eye dropper to remove approximately 4 drops. This represents all the fresh, potable water on Earth. The water that remains in the measuring cup represents water that is in the soil or too deep underground for our wells to reach. Therefore, we only have about 4 drops of water for all the people on the planet!



## ASSESSMENT:

Assessment can be done in a number of ways. These questions may be used to facilitate a classroom discussion or small group conversation. Alternatively, students may record answers to these questions as an assignment to complete the activity.

Those 4 water drops represent clean, safe drinking water for 6 billion people on planet Earth. Do you think everyone on Earth has access to clean drinking water? Do you think we have enough water to go around?

Nearly 87 percent of all of the country's fresh water supply originates from forests and agricultural lands. Knowing this, what are some things you can do to protect America's fresh water supply? Examples include:

- Plant trees
- Use sustainably harvested lumber
- Don't pour chemicals or oil down storm drains
- Find out the source of your water supply—at your center or at your home

What actions can you take to conserve water?

- Turn off the tap while brushing your teeth
- Take shorter showers
- Take showers instead of baths
- Wash cars with a bucket and sponge instead of with a hose
- Don't use the toilet as a garbage can

In which Job Corps vocations is knowledge of water conservation most important? Examples include:

- Landscaping
- Culinary Arts
- Plumbing
- Facilities Maintenance
- Urban Forestry

Brainstorm with students about how to reuse the gallon of water that you used for this experiment. Water plants? Fill an aquarium?



## DID YOU KNOW?

Forests in the United States provide drinking water to more than 180 million people.

USDA Forest Service



## GROUP ACTIVITY: WHAT ARE THE LIMITS?

### TIME:

About 40 minutes including debriefing

### NUMBER OF STUDENTS REQUIRED:

3 to 15

### TRY THIS ACTIVITY IN:

- Career Preparation Period (CPP)/New Student Phase
- Academic Training: Science
- Student Government Association

### DESCRIPTION:

Every living thing, plants or animals, needs food, water, space, shelter, and air to sustain its population. In this simulation game, students will play the role of grey squirrels living in a finite area, competing for food over a 5-year period. The teacher will record and visually chart the changes in the population.

### WORDS TO KNOW:

Air pollution  
Carrying capacity  
Habitat  
Limits  
Natural resources  
Population  
Predator

### OBJECTIVES:

Students will:

- Describe how the elements of a habitat can control population.
- Demonstrate how population and food are related.
- Understand that both animal and human populations can become limited because of limited resources.

### MATERIALS:

- 12 plastic poker chips or tokens per student
- One package of plastic sandwich bags
- One data board (such as flip-chart paper or an erasable white board)
- One marking pen for the data board
- A stopwatch or a watch with a second hand

### PROCEDURE:

1. Tell the students that they will be simulating a population of squirrels living in an urban park. They will play the simulation game five times, with each round of the game representing 1 year.
2. Ask students to stand in a circle with some space between each student. The area of the circle is the space in which the game will be played. It should be small enough so that the students can be easily brought together after each “year” is over and large enough so that the students won’t be running into each other while picking up the food tokens.

### DID YOU KNOW?

The United States sent 25 million tons of food waste to landfills in 2005. The greenhouse gas (GHG) impact of composting this mass would be the equivalent of removing 7.8 million passenger cars from the road.

U.S. Composting Council

## Year One

1. Give each student one plastic bag that will represent the squirrel's stomach.
2. Scatter all tokens inside the circle of students.
3. Tell the students that the tokens represent squirrel food and when the feeding period begins they must go into the feeding area and collect as many tokens as they can in 1 minute (i.e., 1 year). In order to survive the year, they must have at least five tokens.
4. Before giving the signal to begin, emphasize that they should not be physical with other participants by pushing or shoving in order to compete for food.
5. With the watch ready, yell "time to feed squirrels!" Let the students keep picking up tokens and putting them into their "stomachs" until either 1 minute is up and you tell them to stop or until all the tokens are gone.
6. Have the students count the number of tokens they have collected and report on whether or not they survived (meaning they put at least five tokens in their plastic bags).
7. Bring out the data board and record the numbers of squirrels that started the round. Then tell the students that over the year, the squirrel population doubled in size. The data board might look something like the table below.
8. Be sure and collect the tokens from each student before you begin year two.

Year	Number of squirrels to start round	Actual number of squirrels at end of round	Predicted number of squirrels at end of round
1	6	6	
2	12		
3			
4			
5			



Photo © iStockphoto.com

### INSTRUCTOR TIP:

Although students might believe that when they have five tokens they have enough to continue the game, point out that five tokens is only "enough" to merely survive or keep themselves just beyond starvation. Squirrels need more than "enough" food to survive, especially during the winter.

## Year Two:

1. The successful squirrels from year one were able to reproduce, and the population of squirrels has doubled.
2. Give each person who survived round one a second “stomach” (i.e., sandwich bag).
3. Scatter the same number of food tokens on the ground as was done in the first round. This assumes that there is about the same amount of food available as in the first round.
4. Before the second round begins, make sure that the students remember that they need to get five tokens for each stomach they have. If a student is feeding for 2 squirrels, they need at least 10 tokens to survive. Explain that if they get only eight tokens (five tokens in one bag and three tokens in the other), then one of their squirrels will not survive.
5. Also, before the feeding begins, ask the students to estimate how many of the squirrels will survive in year two. Make a note of the range of estimates in the last column of the data chart.
6. Start your timer and let the feeding begin.
7. Once time is up, have each student determine how many of his or her squirrels survived year two. Record the numbers on the data chart. The following is an example of what the chart might look like. Yours may have different numbers depending on your results.

Year	# of squirrels at start round	Actual # of squirrels at end of round	Predicted # of squirrels at end of round
1	6	6	
2	12	12	9-11
3			
4			
5			

### DID YOU KNOW?

Saving water and energy reduces the environmental impact of our society. The transportation of water throughout California, for example, accounts for 19 percent of the State’s electrical use. Saving water saves energy. Plumbers are the face-to-face solution providers for consumers, and efficient plumbing could have an enormous impact on our country’s footprint.

from the article, Power to the Green Plumbers, Utne Reader, Jan-Feb 2010

**INSTRUCTOR TIP:**

You should begin to see that, although the numbers of squirrels may continue to increase at the beginning of each round, the number surviving will start to level off. As in the chart below, by the end of the game you should see that the number of squirrels that survived by the end of year four is similar to year five. (You may play more rounds than five if you wish, but the number of survivors will stay fairly constant.)

**Years Three, Four, and Five**

1. Continue through the next 3 years (rounds) keeping track of the changes in the population sizes as the game progresses. Be sure to note how many squirrels survived at the end of each year, then double that number for the beginning of the next year. Also, keep a record of the student predictions.
2. Be sure that the students are accurate in determining how many squirrels survive each round. Also, they need the correct number of stomachs before they start feeding each year.
3. Ask the student why the number of survivors leveled off after a few years. At some point you may want to point out that the number that survived as the game ended is called the “carrying capacity” for that population of squirrels.

Year	Number of squirrels at start round	Actual number of squirrels at end of round	Predicted number of squirrels at end of round
1	6	6	
2	12	12	9-11
3	24	14	12-15
4	28	14	10-14
5	28	14	10-16

## ASSESSMENT:

Assessment can be done in a number of ways. These questions may be used to facilitate a classroom discussion or small group conversation. Alternatively, students may record answers to these questions as an assignment to complete the activity.

What seems to be the most stable population size based on the amount of food that was available? *About 14 squirrels.* What factor determined the size of the population in this game? *Food.* What other factors did we ignore in the playing of this game? *Predators, hunters, storms, illness, disease.* Be sure to let students have plenty of time to explain why and how these factors influence the size of the population.

What happened to the squirrel population? *The population continued to grow but the amount of food was stable. Over time, the squirrel population grew beyond what their habitat could provide.* What if there was a period of extremely bad weather, for instance too much hot weather and no rain? How would this effect the squirrel population? *The amount of food may decrease because the trees and shrubs would produce much less acorns, berries, apples, nuts, etc. The result would be less food, and fewer squirrels would survive.*

Do you think that squirrels eat more than they need to exist? *Usually not. They eat to a point of fullness. Squirrels do store food for periods when food is less accessible (in winter).*

If the temperature of the Earth increases, how could this impact our food production or supply? *An increase in the Earth's average temperature can result in more frequent and widespread droughts, floods, forest fires, insect infestation, and melting polar ice caps. All of these can reduce our ability to grow and produce healthy food. The food supply in some parts of the world could be at risk.*

What would happen if we ran out of food? Water? Clean air? Space? *This may already be true. In many parts of the world, food is in limited supply because of war, bad weather, and climate change. In some countries, people do not have access to clean water. They may become sick or die. Clean air is also essential to good health. In cities with high levels of air pollution, people become sick more often and suffer from chronic illnesses such as asthma. People who live in areas of high populations and crowding are more likely to become sick and have less access to food and clean water.* All living organisms need these things to survive. What actions can we take to be sure we don't run out of the resources we need?

What Job Corps vocations help ensure that we have safe, healthy food? Clean water? Clean air? What Job Corps vocations help us save our natural resources?

- *Painting with low volatile organic compounds (VOC) paint ensures good indoor air quality.*
- *Installing tri-pane, low-energy windows helps people save energy and money.*
- *Learning the mechanics of hybrid vehicles helps improve air quality.*
- *Learning the regulations about disposing of oil, paint, and chemicals helps protect our water supply.*

**For an alternative activity or for an activity if you only have one student:**

1. Go to <http://www.otherwise.com/population/exponent.html>.
2. Run the applet for Exponential Growth and see what happens to the fish population.
3. Run the applet again this time looking at the graph. What happens to the population?

Can the fish continue like this? Is this sustainable? Is there anything that can be done? Is there a sustainable fish population or what is the right population of fish for the lake in which they live? When we play this game what is missing?



## SMALL GROUP or INDEPENDENT ACTIVITY: A SUSTAINABLE NEIGHBORHOOD

**TIME:** About 30 minutes including debriefing

**NUMBER OF STUDENTS REQUIRED:** 1 or more

### TRY THIS ACTIVITY IN:

- Career Preparation Period (CPP)/New Student Phase
- Academic Training: Reading/ Language Arts
- Residential Living

### DESCRIPTION:

Sustainable living considers the environment, the economy, and our society. Students will review a scenario where neighbors had to make decisions about how to reduce their electric bill.

### WORDS TO KNOW:

Energy auditor  
Standard of living  
Sustainability  
Sustainable living

### OBJECTIVES:

Students will:

- Understand the concept of sustainable living.
- Consider the environment, the economy, and our society's needs when making a decision.
- Understand how green jobs play a role in a sustainable society.

### MATERIALS:

- Copy(ies) of A Sustainable Neighborhood Scenario (page 35)

### PROCEDURE:

1. Ask each student or pair of students to read "A Sustainable Neighborhood Scenario." Alternatively, instructors can read the scenario aloud.
2. After reading the scenario, answer the questions. This can be done as a group or independently on paper or on the computer.
3. Finally, have students develop their own scenario about sustainable living. It could be based on an actual experience or it can be a story.

### A SUSTAINABLE NEIGHBORHOOD SCENARIO:

A small neighborhood has seen a huge rise in its electric bills over the past few years, from \$400 to \$1,200 during the winter months. The residents are worried that their electric bills will continue to go up. They would like to pay less for electricity each month, but they would also like to help the environment. The following are solutions from three residents.

#### Maria

Maria wanted to find out if she could use the Sun to make electricity. She heard that solar panels can decrease or eliminate the amount of electricity she would have to buy. Since they would be using the Sun's energy, as long as the Earth exists, she should be able to have clean, consistent power for her home. She found out that it will cost her \$15,000 to have solar panels installed. She hired people

to help her, including a technician, a carpenter, an electrician, and a mason. She was excited because she knew that there were people in her community to do this work. Maria borrowed money from the bank to purchase the panels and have them installed. Although she made the initial investment, she is eligible for a rebate of \$2,500 from her State once her solar panels are installed. The solar panels will take about 8 years to pay for themselves.

After the solar panels are installed, there are few additional costs. An environmental benefit is that energy comes from a nonpolluting renewable resource, and the neighborhood air quality should improve. On days when she does not use all of the electricity she created, she can sell it back to the electric company and make some extra money.

The result? Maria has invested in clean energy and in jobs for her community. She has improved local air quality and has significantly reduced her monthly electric bill. Maria will eventually make money by selling electricity back to the power company.

### **The Smith Family**

The Smith family knew they had to do something because they could not afford to pay more for electricity. They also could not afford the solar panel solution.

Instead, they hired an energy auditor. He looked at their home and determined what they could do to reduce the amount of energy they were using. The auditor suggested that they upgrade their insulation and weatherize their windows and doors. The cost of the audit was \$600. Some of the suggested changes could be done by the Smiths, and some of the changes needed to be done by professionals found in the community.

The outcome of the audit and the energy efficiency upgrades was a 10-percent saving on their electric bill. If their electric bill was \$3,000 per year, then they saved \$300 the first year. It will take 2 years to pay for the investment in the energy audit.

The Smiths not only saved money, but their upgrades also translated into saving energy. Today, they require less energy to heat their home, thus conserving our natural resources and protecting the environment. They also helped their community by supporting local workers.

### **The Garcia Family**

The Garcia family also hired an energy auditor. He said that their house was very efficient, but their furnace was not. He suggested a heating and ventilation (HVAC) company to the Garcias to see what could be done to help to improve the efficiency of the furnace.

The HVAC company suggested two options that create both heat and air conditioning: a geothermal heat pump and an air-source heat pump. The cost of the geothermal system was \$7,500, plus the cost of drilling in the ground. This system would pay for itself in 8 to 10 years. Although the air-source heat pump costs less than the geothermal system, it is also less efficient. Local companies and people were available to install the air-source heat pump. The installation of the geothermal heat pump required specialists from the next community.

The Garcia family chose the air-source heat pump. They were able to heat their home more efficiently than with their previous furnace, and they decreased their monthly electric bill. The installation required hiring a cement mason for a heat pump pad, a carpenter for some of the installation, and



an electrician to work with the HVAC company. The Garcias reduced their electricity costs, improved the environment, and supported employment in their local community.

In each case above, the neighbors made a decision based on one or many components of a sustainable society. They considered economics, the environment, and the society in which they lived.

### QUESTIONS TO CONSIDER:

1. How was each neighbor's decision a sustainable decision?
2. Who do you think made the most environmentally friendly decision? Who made the most economical decision? Who made the decision that best considered the community in which they live?
3. Which neighbor's plan do you support? Why?
4. What advice would you have offered to Maria, the Smiths, or the Garcias? Is it different advice from what happened in the scenario?
5. List or use a highlighter and highlight all the green jobs that were discussed in the scenario? Which job would you be most interested in doing? In which jobs can you receive training at Job Corps? What skills do you need to do that job?

### ASSESSMENT:

Ask students to write their own scenario that considers the environment, economics, and society. It can be a simple scenario, such as buying bottled water versus using a reusable bottle. It can be a complex scenario, such as choosing an apartment close to public transportation versus living further away and needing to buy a car. Students should suggest solutions to the scenarios that they have created. Alternatively, ask students to research and find answers to the following questions:

- What choice is most sustainable: paper or plastic bags?
- What choice is most sustainable: cloth or disposable diapers?
- What choice is most sustainable: buying CDs or buying songs online?



### INSTRUCTOR TIP:

There is no “correct” answer to these questions. The objective is to have the students use their own personal experiences and the information provided in the scenario to support their answers.



## INDEPENDENT ACTIVITY: TRACING OUR ROOTS

### TIME:

About two or three 40-minute class periods

### NUMBER OF STUDENTS REQUIRED: 1

### TRY THIS ACTIVITY IN:

- Career Preparation Period (CPP)/New Student Phase
- Academic Training: Science, Language Arts/Writing, Computer Lab
- Residential Living

### DESCRIPTION:

We all like our “stuff”—cell phones, MP3s, tennis shoes, video games, hamburgers, CDs, jeans, soda, sunglasses, candy bars, hats, and more! We buy things that make us happy and to help us do things we enjoy, such as listening to music. Have you ever wondered where these things come from? And, what they are made out of? Is there a limited supply of materials to make my stuff? Where are they made? Why do they cost so much money? After we eat them, use them up, or wear them out, where do they go? This activity looks at items we all want and buy and connects these needs and wants to sustainability.

### WORDS TO KNOW:

Sustainability  
Natural resources

### OBJECTIVES:

One student will:

- Develop a better understanding of the life cycle of a product.
- Recognize that energy is required at almost every stage in the life cycle of a product.
- Describe how knowing about a product’s life cycle relates to sustainability.

### MATERIALS:

- One product (or photo of a product) to trace per student
- Chart paper
- Markers
- Computer with Internet access
- Chalk board or flip chart to summarize the various energy uses described by the students
- Chalk or markers

### PROCEDURE:

1. Ask each student (or small group of students) to select a product he or she would like to trace. It can be something that the student owns, such as a cell phone, or it can be a picture of something from a magazine or online.
2. Have the student do research on the Internet to find out more about how this product is produced and how energy is involved in each step of the process.

### INSTRUCTOR TIP:

- This Web site is a great starting point and includes plenty of products for students to trace: Good Stuff? - A Behind-the-Scenes Guide to the Things We Buy, from the World Watch Institute: <http://www.worldwatch.org/taxonomy/term/44>
- To use a search engine to find out more about a cell phone, type in the phrase, “life cycle of a cell phone.”

**INSTRUCTOR TIP:**

An example, “Tracing Our Roots: A Cell Phone,” can be found in the attachments section (page 37) and can be used as a handout.

3. Ask students to find the answers to three questions through their research:
  - What is your object made of? For example, what were its natural resource “beginnings”? If your object is made of plastic, find out what plastic is made of. We want students to trace the parts all the way back to the ground. If their object is a candy bar, they should research where most of the ingredients came from and the way they were processed.
  - How did it get here? What steps or processes must have been used to take it from its origin to being the product today? Be sure to have them focus on the uses of energy at each step of the way.
  - Where is it going? Will it be used and for how long? If it is discarded, what might happen to it? This will allow students to consider waste disposal costs or placing it in a landfill.
4. Ask students to showcase their results through one of the following creative expressions:
  - Poster or drawing
  - Comic book
  - Computer-generated presentation
  - Written summary
  - Verbal presentation
  - Poem, song, or rap
5. Encourage the students to list all of the information that they can find in about 30 to 40 minutes. Then, allow them another period to come up with their creative expression.
6. Have students present their findings. The teacher can keep a running list of the various energy uses and energy sources identified by the students.

**DID YOU KNOW?**

The average food item in the United States travels about 1,300 miles from farms to our forks.

[gardeningmatters.org](http://gardeningmatters.org)

## ASSESSMENT:

What was the most common energy source identified? *Oil*. Were students surprised at what they found? How many energy uses came from renewable energy resources and from nonrenewable energy resources? *Students will find that most of the energy comes from fossil fuels, which are a limited and non-renewable resource and need to be used carefully.*

According to the U.S. Department of Energy, fossil fuels supply 85 percent of the Nation's energy. Fossil fuels include coal, oil, and gas—those fuels that we extract from the ground. They are a nonrenewable resource. They took millions of years to create, and once they are gone, we can't make any more. Fossil fuels release many gases and toxins when they are burned. They release carbon dioxide—the main greenhouse gas associated with climate change, as well as gases such as carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), sulfur dioxide (SO<sub>2</sub>), volatile organic compounds (VOCs), and heavy metals. These emissions have been tied to human and environmental health concerns. Besides fueling our transportation system, oil, as you have discovered, is used to create plastics, artificial rubbers, Styrofoam, and synthetic fabrics. This means that there is a great demand on a limited resource.

In the United States, we are beginning to think about clean energy. Clean energy not only means solar panels and wind turbines, but fuel cells, geothermal heat pumps, and biofuels such as ethanol. It also means taking a new look at our fossil fuel supply and improving our technology. Researchers are looking at ways of capturing carbon dioxide at power plants and trapping it underground. Coal can be burned

today in many ways that reduces its environmental impact. Thinking sustainably and taking advantage of new technology is very important with our energy resources.

Are there ways that the cell phone could be made using less energy? *Cell phone companies and their engineering departments are always looking for ways to improve the performance of phones. This will help the companies economically and environmentally.* How much of the cost of the cell phone takes into account the energy costs? *Probably little is taken into account since oil and gas are still relatively cheap commodities.*

What green-collar jobs do you think of when you do this activity? *The answer will be largely based on what item the students choose for tracing. They may think of jobs in recycling electronics. When they trace a hamburger, they may think of the food service industry and looking at alternative ways of producing that burger, or alternatives to beef.*



**“In the end, we will conserve only what we love, we will love only what we understand. We will understand only what we are taught.”**

*Baba Dioum, a Senegalese conservationist, Speech 1968*



**TIME:** 30 minutes

**NUMBER OF STUDENTS  
REQUIRED:** 1 to 15

**TRY THIS ACTIVITY IN:**

- Career Preparation Period (CPP)/New Student Phase
- Academic Training: Science, Math, Language Arts
- Residential Living

**DESCRIPTION:**

The objective is to explore where our food comes from, map out the distance it travels to reach us, and gain a sense of the food miles associated with our purchases. Students will discover that a large portion of the produce in the grocery stores comes from countries far away.

**WORDS TO KNOW:**

Food mile  
Greenhouse gas  
Organic

**SMALL GROUP or INDEPENDENT ACTIVITY:**  
**FROM FARM TO FORK:**  
**AN ALTERNATIVE TO TRACING OUR ROOTS**

**OBJECTIVES:**

Student will:

- Understand that, in general, food travels a long way to reach our plates.
- Be able to explain some pros and cons of eating a diversity of foods.
- Think about ways to reduce their food miles.

**MATERIALS:**

- Shopping bag with global produce: 2 to 3 items per student.
- Large global wall maps (with scale bar such as 1 inch = 1,000 miles), plus tacks or tape to hang up if desired.
- Pencils/pens.
- Calculators.
- Ruler or pieces of yarn with the map scale marked on it. Instructors can hold up a piece of yarn to the scale bar and indicate distance by ticking the yarn with a marker. Continue the ticks until you have indicated about 5,000 miles.
- Chalk or markers.

**INSTRUCTOR TIP:**

- The most time-consuming part of this workshop is purchasing the produce/food items and then calculating their food miles ahead of time. For imported produce, use <http://www.indo.com/distance> to determine the “as the crow flies” distances. If only the State or country is known, use the largest city or the capital city of each country to determine your starting point.

## INTRODUCTORY DISCUSSION:

### *What is a food mile?*

Allow students to answer and come up with a definition that most closely resembles the one below. They are more apt to remember the meaning of the word if they created their own definition.

Food miles are the distance food travels from where it is grown to where it is ultimately purchased or consumed by the end user. The average food item (think one thing on your plate at dinner time) traveled about 1,300 miles to reach us.

Researchers at the Leopold Center in Iowa found that food items traveled, on average, 1,585 miles to get to Iowa destinations in 1998. The average distance was 33 times greater than food produced locally.

### *What is the importance of food miles and why are we talking about them today?*

It is important to consider this question from both sides. There are many positive and negative impacts to having our food travel from far away. This discussion allows students to discover “what’s in it for me?” They will consider their values and may start thinking of how their consumer choices align with the table below.

Pros	Cons
We have lots of choices when we eat. We don't have to eat the same food every day.	Food miles create air pollution and increase greenhouse gas emissions.
We can eat ethnically diverse food.	Food is often picked before it is ripe, thereby minimizing the nutritional content.
We enjoy a varied diet.	Increased use of chemicals is needed to transport produce long distances.
We can enjoy exotic fruits and vegetables in the middle of winter.	In many countries, producers receive a very small amount of the revenue from their crops.
Others?	Others?

### *Where does our food come from?*

Have students consider the food that was in their lunch today or the dinner they are going to eat tonight. What foods are included? Where did that food item originate? Have them read the labels on their granola bars, cans of soup, or bags of chips. It may be very surprising! There will be local, national, and international food in most of our meals.

If students are not very talkative, have them list their favorite foods. Then, have a discussion of where those favorites may have originated.

An increasing proportion of the food we eat is produced in other countries, including an estimated 39 percent of fruit, 12 percent of vegetables, and 78 percent of fish/shellfish. On the whole, imported items travel about 80 times further than local items.

**PROCEDURE:**

1. Give each student or group of students a bag of food, a ruler, a calculator, and pens and paper. Make sure you remove any labels from fruit or produce that may tell the student where the item was grown.
2. Be sure that the world maps are hanging on the wall or placed open on a table at either end of the room and are accessible to everyone.
3. Ask student(s) to discuss where they think different food items are grown/picked. They can give it their best guess.
4. Have the students calculate the distance from the country of origin to a large major city near their Job Corps center. They can use the location of capital cities to make the calculations easier.
5. Have the students use the scale on the wall map and a ruler or yarn to measure the distance between where they think the food comes from and where they are located. Have them write down the mileage on a piece of scrap paper.
6. Continue this process until each item in the bag has been “sourced.”
7. Have the students calculate their bag’s total estimated food miles by adding up all the food miles.
8. Have the students determine which item in their bag could be grown locally.
9. Have the students determine which item in their bag travelled the furthest.
10. Be sure to tell the class that the group that guesses closest to the actual distance will win a prize (win their fruits and vegetables) or another suitable prize.

Item	Location It Is Often Imported From
Pineapple	Hawaii, Costa Rica
Banana	Costa Rica
Kiwi	New Zealand, Chile
Orange	California or Florida
Apples	Everywhere
Garlic	China
Plum	Chile
Hot peppers	Thailand
Avocado	Mexico
Lime	Ecuador
Mango	Mexico
Chocolate	Ghana
Ginger	China
Cantaloupe	Honduras
Coffee beans	Columbia
Red, green, orange peppers	Mexico
Honeydew	Mexico

## ASSESSMENT:

Identify the answers to the challenges that were given to each group:

1. Calculate your bag's total estimated food miles.
2. Determine which item in your bag is local.
3. Determine which item in your bag travelled the furthest.

The winning group can win their bag of produce or some related prize. You can also share with the entire group the item(s) that travelled the furthest. Here are some other questions for discussion:

- Which foods that we looked at during this activity could have been bought locally?
- Which items could not have been bought locally?
- What would you be interested in doing to try to reduce your food mileage?

The idea behind this activity is not to convert everyone to buying local, but to encourage thought and discussion on the topic of food miles. As with any environmental issue, it is important to look at both sides of the issue and to consider our personal environmental, economic, and social needs.

Be sure to end on a positive note and encourage your group to discuss solutions to reducing our food miles. There are many solutions, including:

- Buy local
- Shop at farmers' markets
- Grow your own produce
- Can and preserve your extra fruits and vegetables.
- Encourage your favorite stores to carry local items
- Encourage your favorite restaurants to buy from local producers
- Try the 100-mile diet and only eat food produced within 100 miles of your residence
- Select certain items to buy locally as often as possible
- Select the local version of similar items (i.e., purchase canola oil instead of olive oil)
- Say no to "well-travelled" items such as chocolate or coffee





## SERVICE ACTIVITY: I HAVE SUSTAIN-ABILITY!

### TIME:

15 minutes to complete the ecological footprint and time for the student to select a sustainability action

### NUMBER OF STUDENTS REQUIRED: 1

### TRY THIS ACTIVITY IN:

- Career Preparation Period (CPP)/New Student Phase
- Academic Training: Science
- Residential Living
- Student Government Association

### DESCRIPTION:

If everyone does something small to save, conserve, or protect our resources, it can be multiplied many times! The small things we do and the purchases we make have a big impact on our Nation's sustainability. In this activity, students complete an ecological footprint assessment and then make a commitment to take one sustainable action for a certain period of time.

### WORDS TO KNOW:

Ecological footprint  
Sustainability

### OBJECTIVES:

Students will:

- Take actions that reduce their environmental footprint.
- Develop project-specific skills.
- Gain a sense of pride in completing an activity that benefits the environment.

### MATERIALS:

- Computers with Internet access OR
- Ecological Footprint activity sheet (page 38)

### PROCEDURE:

1. Have students calculate their ecological footprint at <http://earthday.net/footprint2/index.html>. They can complete the activity as a resident at Job Corps or as a resident in their own homes. Alternatively, have your students complete the Ecological Footprint activity sheet found in the attachments section on page 38.
2. After they complete the footprint, ask your students how they scored. What are they willing to give up to reduce their footprint?

### DID YOU KNOW?

In California, between 1995 and 2008, green businesses increased 45 percent and green jobs grew 36 percent while total jobs in the State grew only 13 percent.

Next 10's Annual California Green Innovation Index

“I can accept failure. Everyone fails at something. But I can’t accept not trying.”

Michael Jordan

3. Next, ask the students to make a commitment or a pledge to reduce their footprint. Begin with the list on the next page. Ask students which item they think they can commit to for 1 week, 1 month, 6 months, or other time period.

- I will recycle.
- I will carry a reusable water bottle.
- I will plant a tree.
- I will turn down the thermostat at night.
- I will examine how my diet affects the environment and adjust my eating habits.
- I will reduce stand-by power.
- I will take shorter showers.
- I will turn off the tap while brushing my teeth.
- I will check taps and toilets for leaks and find out how to repair them.
- I will turn off the lights in my classroom and room when I leave.
- I will run full loads of laundry.
- I will hang my clothes to dry.
- I will turn off the computer, TV, stereo, and video games when I am not using them.
- I will take clothes that no longer fit and donate them to a charity.

4. Ask students to write out their commitment on paper or on the computer. Remember to indicate their commitment period. An entire class can record their commitments together on a classroom poster, if desired.

## ASSESSMENT:

Ask the students if it was hard to commit to their action for the time period? If not, can they keep doing it? Why was it hard? Why was it easy? Was it a habit they had to break? *Research shows that it takes about 21 days to break or form a new habit.* Was it easier after about 3 weeks? Can their action become part of the culture at Job Corps?

## INSTRUCTOR TIPS:

- Have students compete against each other to go the longest with their commitment. Consider providing incentives for the winner or those that successfully achieve their commitment.
- Some students can make posters or create presentations to showcase the action they are taking.
- See if you can get the whole center on board for one action. Compete against other Job Corps centers to see who can be the most sustainable for 1 month.



## SERVICE ACTIVITY: START A CENTER GARDEN

### TIME:

Approximately 2 days – 1 day to prepare the gardening site and 1 day to complete the planting. This estimate does not include construction time that may be required to build garden boxes, raised beds, or composters.

### NUMBER OF STUDENTS REQUIRED: 3 or more

### TRY THIS ACTIVITY IN:

- Career Preparation Period (CPP)/New Student Phase
- Academic Training: Science
- Student Government Association
- Residential Living

### DESCRIPTION:

Gardens are a great opportunity to reconnect young people to the land. Gardens can teach students about science, nature, nutrition, health, and history. They also develop important life skills such as patience, teamwork, and planning. Your center garden can connect students with teachers, administrators, maintenance staff, cafeteria staff, and local farmers. This activity highlights some key points to get you started on your center garden.

### WORDS TO KNOW:

Organic

### THINGS TO CONSIDER BEFORE GETTING YOUR HANDS DIRTY:

1. Consider the type of garden you want to plant.
  - Vegetable garden
  - Herb garden
  - Flower garden
  - Native grasses and plant garden
  - Butterfly, bird, or pollinator garden
  - Berry or fruit garden
  - Three Sisters (corn, beans, squash) garden
  - Have students research another type of garden
2. Consider a location to plant your garden.
  - Select a site that gets 6-7 hours of sunlight each day.
  - Be sure the area is free of debris and large roots and has good drainage (no pools of water after a rain).
  - The site should be close to a water supply.
  - Consider the garden's proximity to classrooms, dormitories, maintenance sheds, and cafeterias. This may be important to ensure that the garden is used by multiple classes and is tended regularly.

### INSTRUCTOR TIPS:

- Some of the easiest vegetables to plant and grow include carrots, cucumbers, green beans, lettuce, and radishes.
- Talk to the cafeteria staff and find out what fresh herbs and vegetables they can use.
- Invite a local gardener or farmer to come and speak to your students before you start gardening. This will create excitement about their own garden project.

### 3. Consider your gardening needs.

- Do you want to use raised beds or garden boxes or pots or a garden in the ground?
- Do you need to cut the sod away to begin your garden?
- Do you need to do a soil test?
- What is your plant hardiness zone? Find out at the USDA Hardiness Zone Finder at <http://www.garden.org/zipzone/>. This will help you select plants that will thrive in your area.
- When is it safe to plant in the spring and when do you need to harvest in the fall to prevent frost damage?
- Do you need to consider wildlife? Deer, rabbits, and gophers can eat away your hard work. You may want to consider fencing your garden or using hardware cloth (placed about 1 foot deep).
- Start small—you can always expand. A large garden with few caretakers can become weedy and overgrown quite quickly.

### 4. Consider the costs. Do you have:

- Access to equipment such as spades, pitch forks, trowels, wheelbarrows, hoes, rakes, hoses, sprinklers or drip irrigation hoses, measuring tapes, hammers, mallets, stakes, plant labels to mark rows, compost bins, wood chips or mulch for walking areas, and a tool shed?
- Supplies like wood, nails, and paint for building garden boxes and composters or organic fertilizer and pest control to maintain plant health.

- Seeds or plants. Some gardening and charitable groups provide seeds at little to no cost. Visit America the Beautiful at <http://www.america-the-beautiful.org/> or Seeds of Change at <http://www.seedsofchange.com>. The National Gardening Association has Youth Garden Grants. Find out more at <http://assoc.garden.org/grants/>.

### 5. Consider the human power behind your garden. Some gardening jobs may include:

- Building planting boxes, raised beds, or composters.
- Preparing the garden area: removing sod, debris, and weeds.
- Preparing the soil: rototilling the soil and adding soil amendments such as compost or peat.
- Laying out the garden: measuring, staking, hoeing rows.
- Planting the garden.
- Maintaining the garden: watering, weeding, staking, fertilizing, thinning, and removing pests and bugs.
- Harvesting the garden: picking, digging, cleaning, delivering the product to the cafeteria, and composting unwanted plant parts.
- Developing a garden schedule.

Once you have considered the five points, you are ready to get started.

#### DID YOU KNOW?

On average a well-maintained food garden yields a \$500 return when considering a typical gardener's investment and the market price of produce.

National Gardening Association

**PROCEDURE:**

1. Prepare your site. If you are creating a garden in a grassed area, you can remove the sod in a number of ways.
  - Remove the sod by hand using a spade or sod stripper. Depending on the size of your garden, this can be fairly labor intensive. Very low cost.
  - Rototill the sod into the soil. This is more costly but is very fast.
  - Smother and kill the sod by covering it. You can cover an area of sod with dark colored plastic (staked down) or with newspaper covered by soil. This is best done in the late summer. The grass will die over the winter and the area should be ready for planting in the spring. This method is low cost but takes some time before you can plant.
2. If you are using garden boxes, be sure they are constructed and in place.
3. Prepare the soil, as required.
  - Be sure your soil is tested and can support the growth of healthy plants.
  - Add manure, peat moss, compost, or other amendment.
  - Add soil to garden boxes and pots.
  - Rototill or stir any amendment into the existing soil.



4. Lay out your garden.
  - Make a map of your garden layout. Use the map to make planting day easier.
  - Use stakes to mark rows.
  - Consider areas for people to walk — these areas can be mulched.
  - Figure out how much space each plant requires to grow. Cucumbers, for example, require quite a bit of space to spread. Carrots do not take up much space at all. Make sure that tall plants are not creating shade for low-growing plants that need sunlight.

**DID YOU KNOW?**

A well-maintained food garden can yield an estimated ½ pound of fresh produce per square foot of garden area. At in-season market prices that produce is worth \$2.00 per pound

National Gardening Association

## 5. Plant your garden.

- Be sure to follow directions on the seed packets and don't plant seeds too deep.
- If you have plants, dig a hole big enough to fit the entire root ball. Set the plant in and fill any gaps with soil. Lightly pack the soil around the plant.
- Give the garden a good watering. Use a Frisbee to help conserve water. Before you turn on the sprinkler, place a Frisbee upside down in the middle of your garden. When the Frisbee is full of water, you can turn off the tap.

- Remember that germination can take 1 to 2 weeks. Keep the soil moist during this time.
- Add woodchips or mulch around plants to maintain moisture and reduce weeds.

## 6. Make a garden maintenance schedule.

- Consider "gardening bees" where many students work on projects at the same time.
- Appoint a garden coordinator to ensure that jobs are being completed.
- Weed early and often.

### INSTRUCTOR TIPS:

- Start a garden club or Web site. Have students take weekly photos of the garden's growth.
- Have a garden harvest celebration. Eat the vegetables and fruit outdoors.
- Work with the cafeteria cook to create a "garden harvest" dish that features as many vegetables and herbs from your garden as possible.
- Start a garden bulletin board at your center. Make it the information center of your garden. It can contain photos, schedules, harvest dates, garden inventories, quotes, and student comments.

### GARDENING REFERENCES:

Environmental Education Council of Marin's Food System's Project: <http://www.eecom.net/mfsp/>.

National Gardening Association: <http://www.garden.org/>.

School Garden Web site by the Food and Agriculture Organization (FAO): <http://www.fao.org/schoolgarden/>.

## EXTENSION ACTIVITIES AND RESOURCES

The following links are provided for reader information and do not imply an endorsement by the Forest Service or any of its employees of any information or products.

More tips for going green can be found at the U.S. Environmental Protection Agency's "Your Environment. Your Choice." This site provides students with information about making environmentally sound choices about the products and natural resources they use, the waste they create, and the environment in which they live. Visit <http://www.epa.gov/waste/education/teens/think.htm>.

How has globalization affected our forests? "Living in a Global Forest," by the Forest History Society, has students compare the ecological footprint of a home constructed in 1950 with one constructed in 2000. Students will learn where our wood comes from now and will analyze global efforts to manage the world's forests. Visit <http://www.foresthistory.org/Education/Curriculum/activity/activ8/activity8.htm>.

Introduce your students to the concept of community gardens. Community gardens provide opportunities to grow food, to share traditions between cultures and generations, to create habitable environments, and, most importantly, to build community. Find out more at the Gardening Matters Web site, a Minneapolis-based organization that serves as a central clearinghouse for community gardening resources. Visit <http://www.gardeningmatters.org/>.

Ask students to research their favorite musical artist or band to find out what actions they are taking to reduce their ecological footprint. Bands like Radiohead, Beastie Boys, and John Legend have all taken on an environmental project or have greened their tours. Visit <http://www.hiphopcaucus.org> and artist Web sites to find out more.

I-Tree software was developed by the Forest Service and our partners to assess the benefits and costs associated with trees in urban forests and landscapes. It has been successfully used by urban foresters and many other professionals. Using a curriculum called i-Tree in the Classroom, the students will learn about the ecosystem services of trees, such as carbon sequestration, energy savings, and clean air and water benefits. They can apply their investigations in their schoolyard and other areas in the community. This curriculum connects teachers and students to a greater understanding of the benefits of trees and contribution to sustainable healthy living. The first of a series of lab exercises is currently undergoing classroom testing, and additional modules are planned. Visit <http://itreetools.org/education/>.

"Project Learning Tree's GreenSchools!" This program, funded by the Forest Service, provides a blueprint for educators, students, environmental and health advocates, school board members, parents, and interested community members to teach, learn, and engage together in creating a more green and healthy learning environment at their school. It combines environmental education, service learning, and leadership opportunities for students to help turn their school into a model GreenSchool. Join Us! Be part of the national movement to reduce the ecological footprint of our Nation's schools. Visit <http://www.pltgreenschools.org/>.

## WORDS TO KNOW

- Acid rain**—Any type of precipitation that is unusually acidic due to elevated levels of sulphuric acid or nitric acid. These acids are formed by sulphur oxides and nitrogen oxides that are released from the burning of fossil fuels. Acid rain can be harmful to plants, aquatic animals, and infrastructure.
- Air pollution**—Human-made or natural substances in the air that may interfere with human health and/or produce harmful environmental effects.
- Carpooling**—The act of sharing transportation to a destination to reduce fuel use, pollution, and travel costs.
- Carrying capacity**—The limits of land to support a population and, therefore, provide food, shelter, water, and space to keep that population alive.
- Conserve**—To save or protect from loss.
- Consumption**—The use of goods, services, and natural resources, such as water or energy, by human beings.
- Ecological footprint**—The impact of individual humans on the environment as a result of their use of land, water, and other natural resources. This is usually calculated in terms of area of planet needed to sustain current lifestyles.
- Energy auditor**—A person who has the job of looking at ways of saving money by reducing the amount of energy used in a building, such as a home.
- Energy efficient**—To use the least amount of energy to operate. An energy efficient fridge uses less energy to keep food cool when compared to a regular model.
- Energy sources**—Supplies of energy. These include resources that can be used to generate energy, including fossil fuels such as oil, coal, and gas; chemicals, such as batteries; nuclear; wind; hydroelectricity; geothermal; and solar power. Food is also considered an energy source for living things.
- Food mile**—The distance that food travels from where it is grown or raised to where it is purchased or consumed.
- Geothermal heat pump**—A device that takes advantage of the temperature difference between the air and the ground or a body of water to create heating or cooling in a building.
- Green job**—Positions in agriculture, manufacturing, construction, installation, and maintenance, as well as scientific and technical, administrative, and service-related activities that contribute substantially to preserving or restoring environmental quality (International Labor Organization).
- Green economy**—An economy that generates jobs, businesses, and investments while taking advantage of clean energy; improving energy efficiency; reducing greenhouse gas emissions, waste, and pollution; and conserving water and other natural resources.
- Greenhouse gas**—Natural and man-made gases in the atmosphere that trap heat near the surface of the Earth. Water vapor (H<sub>2</sub>O), carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), methane (CH<sub>4</sub>), and ozone (O<sub>3</sub>) are the primary greenhouse gases in the Earth's atmosphere.
- Habitat**—The place where a population, either human, plant, animal, or microorganism, lives and its surroundings, both living and nonliving and includes food, water, shelter, and space.



- HVAC**—Heating, ventilation, and air conditioning system used to provide comfort in a building.
- Insulation**—Material used to slow the transfer of heat through walls to reduce energy costs and help maintain a uniform temperature.
- Limits**—The maximum or minimum amount necessary for a population to exist. Often this is used with food, water, shelter, and space because all populations need a certain amount of each to exist.
- Natural resources**—Products or services from the Earth that are used by humans. Examples include water, oil, forests, animals, and soil.
- Non-renewable**—Materials and resources that are not capable of being naturally restored or replenished and are, therefore, in limited supply. It is commonly used to describe energy sources such as fossil fuels.
- Organic**—Products made of naturally occurring substances or food grown without the use of man-made chemicals.
- Population**—A group of interbreeding organisms that occupy a particular environment. For example, the number of humans or other living creatures in a designated area, such as the number of people in a town or city.
- Predator**—An animal that feeds upon another animal.
- Recycling**—Series of activities that include collecting recyclable materials that would otherwise be considered waste, sorting and processing recyclables into raw materials, and manufacturing these raw materials into new products.
- Renewable**—Materials and resources that are capable of being naturally restored or replenished. Example: wood or solar energy.
- Renewable resource**—A substance of economic value that can be replaced or replenished as it is used.
- Shelter**—A place where people and animals live.
- Smog**—A noxious mixture of gases and particles that often appears as a haze in the air. Smog has been linked to a number of adverse effects on health and the environment.
- Solar panel**—A device that is able to harness the power of the Sun and turn this energy into electricity for a building or home.
- Space**—The area needed for a person to live.
- Standard of living**—A way of measuring the kind of life a person has and can afford.
- Stand-by power**—Also known as “vampire power,” the energy that is consumed by an electronic device even after you turn it off.
- Sustainable living**—A lifestyle that tries to reduce or minimize one’s impact on the environment.
- Sustainability**—Meeting human needs today without compromising the ability of future generations to meet their own needs. (Based on the “Brundtland definition” of the 1987 Report of the World Commission on Environment and Development).
- Survivor**—An animal that is able to continue to live in spite of anything that might exist to harm it.
- Thermostat**—A device that indicates indoor temperature and allows you to adjust the temperature according to your comfort.
- Weatherize**—The process of upgrading a home or other building to improve its ability to maintain a constant temperature in both cold or warm weather.

## ATTACHMENTS & STUDENT HANDOUTS

## A SUSTAINABLE NEIGHBORHOOD SCENARIO

A small neighborhood has seen a huge rise in its electric bills over the past few years, from \$400 to \$1,200 during the winter months. The residents are worried that their electric bills will continue to go up. They would like to pay less for electricity each month but they would also like to help the environment. The following are solutions from three residents.

### MARIA

Maria wanted to find out if she could use the Sun to make electricity. She heard that solar panels can decrease or eliminate the amount of electricity she would have to buy. Since they would be using the Sun's energy, as long as the Earth exists she should be able to have clean, consistent power for her home. She found out that it will cost her \$15,000 to have solar panels installed. She hired people to help her, including a technician, a carpenter, an electrician, and a mason. She was excited because she knew that there were people in her community to do this work. Maria borrowed money from the bank to purchase the panels and have them installed. Although she made the initial investment, she is eligible for a rebate of \$2,500 from her State once her solar panels are installed. The solar panels will take about 8 years to pay for themselves.

After the solar panels are installed, there are few additional costs. An environmental benefit is that energy comes from a nonpolluting renewable resource, and the neighborhood air quality should improve. On days when she does not use all of the electricity she created, she can sell it back to the electric company and make some extra money.

The result? Maria has invested in clean energy and in jobs for her community. She has improved local air quality and has significantly reduced her monthly electric bill. Maria will eventually make money by selling electricity back to the power company.

### THE SMITH FAMILY

The Smith family knew they had to do something because they could not afford to pay more for electricity. They also could not afford the solar panel solution.

Instead, they hired an energy auditor. He looked at their home and determined what they could do to reduce the amount of energy they were using. The auditor suggested that they upgrade their insulation and weatherize their windows and doors. The cost of the audit was \$600. Some of the suggested changes could be done by the Smiths, and some of the changes needed to be done by professionals found in the community.

The outcome of the audit and the energy efficiency upgrades was a 10-percent saving on their electric bill. If their electric bill was \$3,000 per year, then they saved \$300 the first year. It will take 2 years to pay for the investment in the energy audit.

The Smiths not only saved money, but their upgrades also translated into saving energy. Today, they require less energy to heat their home, thus conserving our natural resources and protecting the environment. They also helped their community by supporting local workers.

## THE GARCIA FAMILY

The Garcia family also hired an energy auditor. He said that their house was very efficient, but their furnace was not. He suggested a heating and ventilation (HVAC) company to the Garcias to see what could be done to help to improve the efficiency of the furnace.

The HVAC company suggested two options that create both heat and air conditioning: a geothermal heat pump and an air-source heat pump. The cost of the geothermal system was \$7,500, plus the cost of drilling in the ground. This system would pay for itself in 8 to 10 years. Although the air-source heat pump costs less than the geothermal system, it is also less efficient. Local companies and people were available to install the air-source heat pump. The installation of the geothermal heat pump required specialists from the next community.

The Garcia family chose the air-source heat pump. They were able to heat their home more efficiently than with their previous furnace, and they decreased their monthly electric bill. The installation required hiring a cement mason for a heat pump pad, a carpenter for some of the installation, and an electrician to work with the HVAC company. The Garcia's reduced their electricity costs, improved the environment, and supported employment in their local community.

*In each case above, the neighbors made a decision based on one or many components of a sustainable society. They considered economics, the environment, and the society in which they lived.*

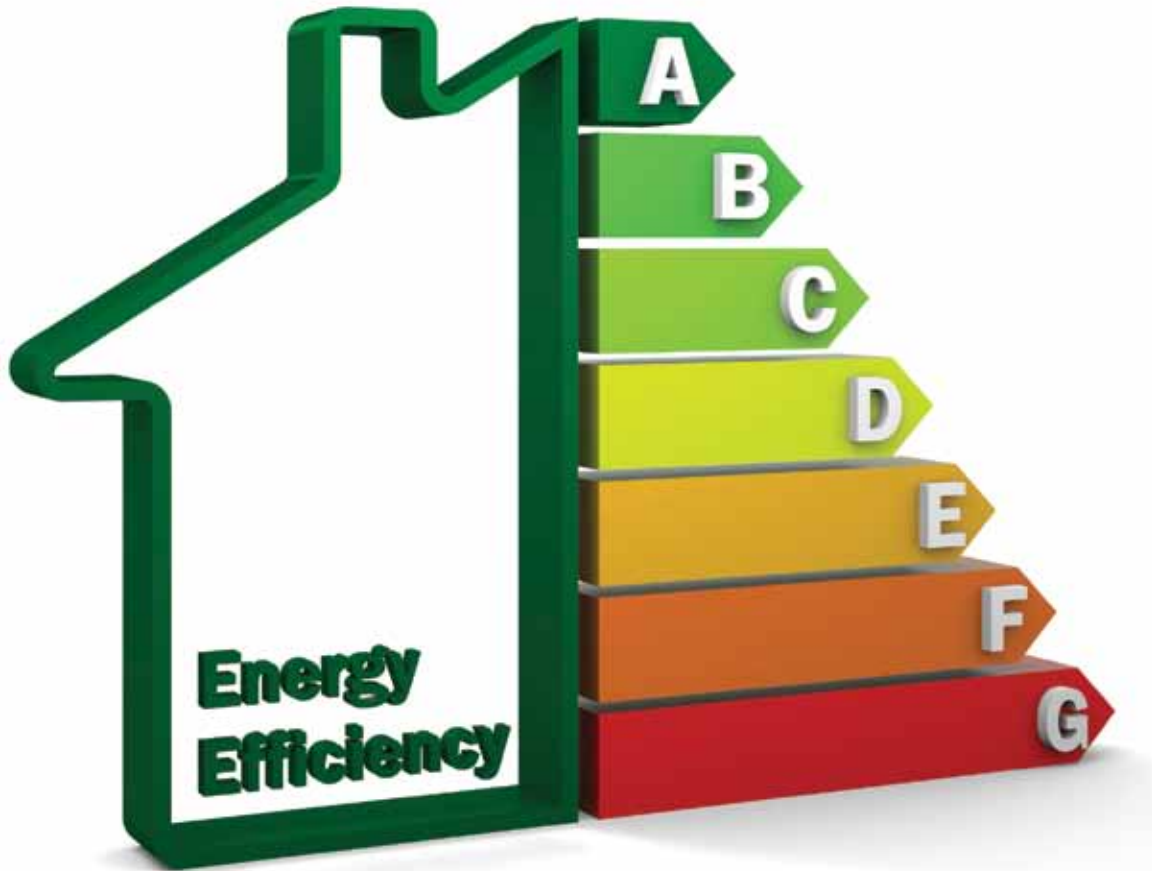


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## TRACING OUR ROOTS: A CELL PHONE

### 1. What is your object made of? For example, what were its natural resource “beginnings”?

The components of my cell phone include the phone’s circuit board, chip and subscriber identity module (SIM) card, liquid crystal display (LCD), batteries, plastic casing, and packaging.

- The plastic casing, packaging, and charger come from petroleum, a nonrenewable fossil fuel. Packaging includes paper from trees and aluminum mined from the ground. Many plastic components are sprayed with a chemical flame retardant.
- The phone’s circuit board is made up of raw materials including copper, mercury, gold, lead, nickel, zinc, beryllium, tantalum, coltan, and other metals. The manufacturing of these boards requires crude oil for plastic and sand and limestone for fiberglass.
- My phone’s battery is a lithium ion battery containing cobalt, copper, nickel, and iron. They are considered safe for landfills or incinerators (lithium ion batteries contain an ionic form of lithium but no lithium metal).
- Various liquid crystalline substances, either naturally occurring (such as mercury, a potentially dangerous substance) or human-made, are used to make LCDs. LCDs also require the use of glass or plastic.

### 2. How did it get here? What steps or processes must have been used to take it from its origin to the product it is today?

Cell phones are transported by plane, truck, and/or train. These transportation modes require the use of gasoline, diesel, and other fossil fuels. Fossil fuels come from the ground and are not renewable when they are gone.

### 3. Where is it going? Will it be used and for how long? If it is discarded what might happen to it?

Most cell phone companies and stores that sell cell phones will take them back for recycling. Some companies have a mail-in recycling program. Other organizations collect used cell phones for reuse, refurbishment, or recycling. Most cell phones still end up in landfills where they have the potential to cause environmental damage.

### INFORMATION FROM:

The Life Cycle of a Cell Phone. [http://www.wirefly.com/learn/wireless\\_news/the-life-cycle-of-a-cell-phone/](http://www.wirefly.com/learn/wireless_news/the-life-cycle-of-a-cell-phone/).

Robert L. Mitchell, “Lithium ion batteries: High-tech’s latest mountain of waste,” *Computer World*. August 22, 2006. <http://blogs.computerworld.com/node/3285>.

U.S. Environmental Protection Agency. eCycle Cell Phones. <http://www.epa.gov/waste/partnerships/plugin/cellphone/index.htm>.

## ECOLOGICAL FOOTPRINT

Adapted from the Climate Change in Wisconsin Activity Guide produced by the Wisconsin Environmental Education Board, 2007-2008.  
<http://www.dnr.wi.gov/ee/teacher/climatechangeeguide.htm>.

Complete this worksheet by answering all of the questions and awarding yourself points. “Yes” answers receive all of the points listed, “sometimes/maybe” answers receive half of the points, and “no” answers receive zero points.

1. Do you turn off the TV and computer when you are done with them? (4)  
 YES SOMETIMES/MAYBE NO

2. Do you turn lights off when leaving a room? (4)  
 YES SOMETIMES/MAYBE NO

3. Do you reheat leftovers in the microwave instead of the oven? (8)  
 YES SOMETIMES/MAYBE NO

4. Do you choose to open the windows on a nice day instead of turning on the air conditioner? (10)  
 YES SOMETIMES/MAYBE NO

**HOME SCORE** \_\_\_\_\_

5. Do you recycle all paper, glass, and plastic at the center? (20)  
 YES SOMETIMES/MAYBE NO

6. Do you recycle when at home? (10)  
 YES SOMETIMES/MAYBE NO

7. If there is no recycling bin available when you are away from home, do you hold onto your trash until there is a bin available (i.e., bring your soda bottles and paper home to recycle)? (20)  
 YES SOMETIMES/MAYBE NO

8. Do you use both sides of a piece of paper before tossing it into the recycling bin? (4)  
 YES SOMETIMES/MAYBE NO

**RECYCLING SCORE** \_\_\_\_\_

9. Do you carpool, walk, bike, or use public transportation like the bus to get around? (6)  
 YES SOMETIMES/MAYBE NO

10. Do you trip-chain? (e.g., combine trips by going to the store on your way home from work instead of going home and then back to the store and then home again.) (10)  
 YES SOMETIMES/MAYBE NO

11. Do you turn your ignition off when you are parked or stopped for more than 30 seconds? (10)  
 YES SOMETIMES/MAYBE NO

12. If you are going to a friend’s house just a mile or two away, do you leave the car at home and bike or walk there? (10)  
 YES SOMETIMES/MAYBE NO

13. Do you reduce driving on air quality alert days? (12)  
 YES SOMETIMES/MAYBE NO

**TRANSPORTATION SCORE** \_\_\_\_\_

continued on next page

14. Do you have compact fluorescent light bulbs installed in your room, classroom, or common area? (one point for each light bulb)

YES    SOMETIMES/MAYBE    NO

15. Do you use rechargeable batteries and/or recycle your batteries after use? (6)

YES    SOMETIMES/MAYBE    NO

16. Do you unplug your cell phone and MP3 chargers after they are done charging to reduce power vampires? (4)

YES    SOMETIMES/MAYBE    NO

17. Do you turn the thermostat down in the winter and wear a sweater, and up in the summer and wear shorts? (6)

YES    SOMETIMES/MAYBE    NO

**ENERGY SCORE** \_\_\_\_\_

18. Do you turn the water off while brushing your teeth? (10)

YES    SOMETIMES/MAYBE    NO

19. Are your showers less than 5 minutes? (10)

YES    SOMETIMES/MAYBE    NO

20. Do you wait to wash your favorite pair of jeans or other items until there is a full load of wash to be done? (8)

YES    SOMETIMES/MAYBE    NO

21. When able, do you choose organic foods? (24)

YES    SOMETIMES/MAYBE    NO

22. When possible, do you buy locally grown food instead of food shipped from elsewhere? (20)

YES    SOMETIMES/MAYBE    NO

**WATER SCORE** \_\_\_\_\_

23. Do you say “no thank you” to bags for items you buy at a store where you purchase only one or two things? (16)

YES    SOMETIMES/MAYBE    NO

24. Do you carry reusable bags into the grocery store with you instead of taking new paper or plastic bags? (10)

YES    SOMETIMES/MAYBE    NO

25. Do you use refillable water bottles instead of one-time use plastic bottles? (4)

YES    SOMETIMES/MAYBE    NO

26. Do you check out books from the library instead of purchasing new ones? (4)

YES    SOMETIMES/MAYBE    NO

**REDUCE & REUSE SCORE** \_\_\_\_\_

List up to four other environment-friendly steps you take (points indicated for each measure).

27. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ (4)

28. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ (6)

29. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ (8)

30. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ (10)

**ADDITIONAL STEPS SCORE** \_\_\_\_\_

continued on next page

**Count up your points in each category and then total them to find out which category you fit into.**

HOME	_____
RECYCLING	_____
TRANSPORTATION	_____
ENERGY	_____
WATER	_____
REDUCE & REUSE	_____
ADDITIONAL STEPS	_____
<b>GRAND TOTAL</b>	_____

**0–50: You are a Green Newbie**

*Jump on in and learn more about the environment and what you can do to reduce your ecological footprint! Try some of the tips on this worksheet to become greener.*

**51–125: Greenie-In-Training**

*You have really put an effort into becoming green, but there is SO much more to do! Keep going strong!*

**126–200: As a Green Machine,** you really know what you're doing when it comes to protecting the planet! Keep up the good work.

**200+: You are the Green Guru!**

*You are treading very lightly on Earth! Way to go! Try teaching others about protecting the environment without pressuring them.*







# ACKNOWLEDGEMENTS

The development of this module has been funded by the U.S. Department of Agriculture, Forest Service, National Job Corps Office and the Conservation Education Program.

This curriculum was developed following the North American Association for Environmental Education Guidelines for Excellence in Environmental Education.

## CURRICULUM DEVELOPMENT TEAM

Safiya Samman, Forest Service, Conservation Education Program (Team Leader)

Joseph Baust, Murray State University

Brian Day, North American Association for Environmental Education

Clarissa Mendez, Mendez & Associates

Aynsley Toews, North American Association for Environmental Education

Terry Wilson, Western Kentucky University

Special thanks to the Module Advisory Committee who reviewed drafts and provided invaluable feedback on the creation of this document:

Victoria Arthur, Forest Service, Conservation Education

Alicia Bennett, Forest Service Job Corps National Office

Sue Cummings, Forest Service, Conservation Education

Sharon DeHart, Forest Service Job Corps National Office

Elizabeth Destreza, U.S. Department of Labor National Office of Job Corps

Reginald Flip Hagood, The Student Conservation Association

Rosemary Howard, Frenchburg Job Corps Civilian Conservation Center

Jill Howdysshell, Timber Lake Job Corps Civilian Conservation Center

Joshua Loewen, Great Onyx Job Corps Civilian Conservation Center

Doris Melton, Lyndon B. Johnson Job Corps Civilian Conservation Center

Gerard O'Hare, Forest Service Job Corps National Office

Andrew Richards, Anaconda Job Corps Civilian Conservation Center

Cindy S. Swanson, Forest Service, Rocky Mountain Research Station

Ellen Truiett, Harpers Ferry Job Corps Civilian Conservation Center

John Voltz, Wolf Creek Job Corps Civilian Conservation Center

Terry West, Forest Service, Conservation Education

Thank you to Harpers Ferry Job Corps Civilian Conservation Center for pilot testing many of the activities found in this module.

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