MERIT BADGE SERIES

SUSTAINABILITY

NOVA SCIENCE • TECHNOLOGY ENGINEERING • MATHEMATICS BSA

Scouting America

STEM-Based

SCOUTING AMERICA
MERIT BADGE SERIES

SUSTAINABILITY

On our cover: **The shy giant panda, one of the world's rarest animals, eats a lot of bamboo. As people cleared more and more bamboo for building, industry, and farming, the panda lost more of its food source and its home. This great animal is also very slow to reproduce, which contributes to its vulnerability. We now know that the panda is endangered and needs to be protected.**

"Enhancing our youths' competitive edge through merit badges"

Scouting America

Requirements

Always check www.scouting.org for the latest requirements.

1. Describe the meaning of sustainability in your own words. Explain the importance of sustainability to society and how you can contribute to fulfilling the needs of current generations without compromising the needs of future generations.

2. **Water.** Do ONE of the following and discuss with your counselor:
   a. Evaluate your household water usage. If available, review water bills from the past year and evaluate the seasonal changes in water use. Identify three ways to help reduce water consumption.
   b. Explain why water is necessary in our lives. Create a diagram to show how your household gets its clean water from a natural source and what happens with the water after you use it. Tell two ways to preserve your community's access to clean water in the future.
   c. Different areas of the world are affected by either too much (flooding) or too little (drought) water. Explore whether either or both affect where you live. Identify three water conservation or flood mitigation practices (successful or unsuccessful) that have been tried where you live or in an area of the world that interests you.

3. **Food.** Do ONE of the following and discuss with your counselor:
   a. Explore the sustainability of different types of plant-based, animal-based and aquaculture food. Identify where four different foods (such as milk, eggs, tuna fish, avocados, or ketchup) come from and how they are processed and transported from the source to you.
   b. Identify four factors that limit the availability of food in different regions of the world. Discuss how each factor influences the sustainability of worldwide food supplies. Share three ways individuals, families, or your community can create their own food sources.
   c. Develop a plan to reduce your household food waste in a sustainable manner. Establish a baseline and then track and record your results for two weeks.

35711
ISBN 978-0-8395-0030-8

2024 Printing

4. **Community.** Do ONE of the following and discuss with your counselor:
   a. Create a sketch depicting how you would design a sustainable community and be prepared to explain how the housing, work locations, shops, schools, and transportation systems affect energy, pollution, natural resources, and the economy of the community.
   b. Identify one unsustainable practice in your community and develop a written plan to fix it.
   c. Identify five sustainability factors in housing and rate your own home's sustainability against these factors.

5. **Energy.** Do ONE of the following and discuss with your counselor:
   a. Learn about the sustainability of different energy sources, including coal, gas, geothermal, hydro power, nuclear, petroleum, solar, and wind. Identify three common energy sources in the United States and describe how the production and consumption of each of these energy sources affects sustainability.
   b. List eight ways your family consumes energy, such as gas appliances, electricity, heating systems or cooling systems, and transportation. For one home- and one transportation-related energy use, list three ways to help reduce consumption, reduce your carbon footprint, and be a better steward of this resource.
   c. List five ways you and your family could reduce energy consumption in your home, such as adjusting your thermostat, window shades, opening windows, reducing hot-water temperature, and minimizing water consumption. Identify the benefits and risks of each idea and implement if possible.

6. **Stuff.** Do ONE of the following and discuss with your counselor:
   a. Create a list of 15 items of your personal "stuff." Classify each item as an essential need (such as soap) or a desirable want (such as a video game). Identify any excess "stuff" you no longer need, working with your family, if possible. Donate, repurpose, or recycle those items you can.
   b. List five ways having too much "stuff" affects you, your family, your community, AND the world. For each of the five ways, consider the following aspects: the financial impact, time spent, maintenance, health, storage, and waste generation. Identify practices that can be used to avoid accumulating too much "stuff."

c. Research the impact waste has on the environment (land, water, air). Find out what the trash vortex is and how it was formed. Explain the number system for plastic recyclables and which plastics are more commonly recycled. Identify the average lifespan of one electronic device in your household, and whether it can be recycled in whole or part.

7. Do TWO of the following and discuss with your counselor:
   a. The United Nations lists 17 Sustainable Development Goals. These include Zero Hunger, Clean Water and Sanitation, Affordable and Clean Energy, Sustainable Cities and Community, Responsible Consumption and Production, Climate Action, Life Below Water, and Life on Land. Pick one of these eight and summarize the goal and its current and future impact on you, your family, community, and the world.
   b. Identify how the planetary life-support systems (soil, climate, freshwater, atmospheric, nutrient, oceanic, ecosystems, and species) support life on Earth and interact with one another. Share what happens to the planet's sustainability when these systems are disrupted by natural events or human activity.
   c. Identify how product life cycles (the cycle of design, sourcing, production, use, and disposal or reuse) influence current and future sustainability. Chose one common product to demonstrate how the full product life cycle would apply.
   d. Learn how the world's population affects the sustainability of Earth. Discuss three human activities that may contribute to putting Earth at risk, now and in the future.
   e. Explain the term species (plant or animal) decline. Share the human activities that contribute to species decline, what can be done to help reverse the decline, and its impact on a sustainable environment.
   f. Find a world map that shows the pattern of temperature change for a period of at least 100 years. Identify three factors that scientists believe affect the global weather and temperature. Discuss how climate change impacts sustainability of food, water, or other resources.

8. Do the following:
   a. On a campout or other outdoor Scouting activity that you attend, make notes on the sustainability practices you and your fellow Scouts practice. Observe transportation, forestry, soil conservation, water resources, habitat, buildings, campsites, and sanitation. Share what you observed and learned with your counselor.
   b. Discuss with your counselor how living by the Scout Oath, Scout Law, and Outdoor Code in your daily life helps promote sustainability.
   c. Identify five behavioral changes that you and your family can make to improve the sustainability of your household. Share and discuss each with your counselor.
9. Learn about career opportunities in the sustainability field. Pick one and find out the education, training, and experience required. Discuss what you have learned with your counselor and explain why this career might interest you.

For more information about sustainability and its connection to people, prosperity, and the planet, go to www.scouting.org/sustainability/.

Contents








Introduction

Sustainability. It's a big word with many aspects. But when you break it down, it goes hand in hand with being a good Scout. Sustainability means the ability to endure. Conserving the land, forests, air, water, wildlife, and limited resources we all share is everyone's responsibility. Reducing what we consume and recycling, repurposing, restoring, and repairing what we own all are parts of being thrifty, a key point of the Scout Law.

Sustainability requires living within our world's ability to regenerate the things we need to live. As good Scouts, we try to leave things better than we found them. We should try to do what we can to ensure generations to come will also have what they need.

The Big Picture

Healthy ecosystems (environments full of living things) provide goods and services to humans and are vital to all forms of life, from the tiniest organisms to the tallest trees, and from bugs to whales.

We human beings can lighten our imprint on planet Earth by managing the way we consume resources. Conserving the land where we walk, the forests that surround us, the air we breathe, the water all living things need to survive, and the other resources Earth provides is important to sustaining life itself—not just for your lifetime, but for future generations.

Sustainability begins with you. Can you bike or walk to school or work instead of drive? Or can you take public transportation?

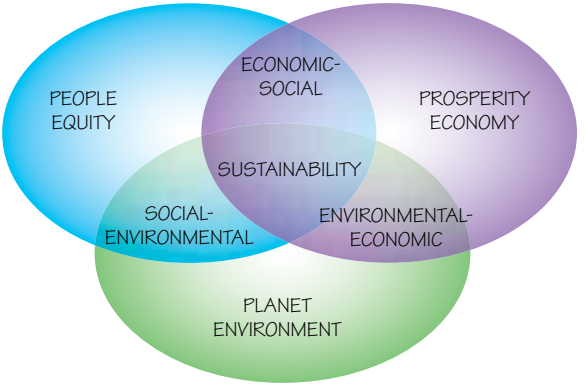
On a worldwide level, sustainability may involve urban planning that reorganizes living situations into eco-villages and eco-cities, where green building and green technologies, renewable energy sources, and sustainable agriculture become the new normal.

Sustainability begins with rethinking your individual lifestyle and becoming aware of how you can conserve natural resources. Moving toward a more sustainable lifestyle will challenge the attention, ingenuity, and know-how of your generation—the youth of America.

We all have a stake in preserving life. We all share in the responsibility to make our planet a desirable place, now and in the future. Human actions have lasting social, environmental, and economic effects on the place we all call home: Earth.

Sustainability is a journey, not a destination. It is a call to action. What can a single Scout do? A family? One community? It's time to find out! This is a journey that begins with you.

The Brundtland Commission (formerly the Commission on Environment and Development) was created to unite countries toward pursuing sustainable methods worldwide, reducing environmental impacts, and raising awareness about sustainability. Simply put by the commission, "Sustainable activity meets the needs of the present without compromising the ability of future generations to meet their own needs."



This diagram shows how sustainability intersects with the three P's (people, prosperity, planet) and the three E's (equity, economy, environment). It helps us understand our current situation and how we might find solutions. *Source: Safeway Inc.*

Sustainability: What Does It Mean?

To "sustain" a thing is to keep it up or continue it. *Sustainable,* then, relates to methods of harvesting or using resources in ways that do not squander or permanently damage them. A sustainable lifestyle or society meets today's needs without depleting (completely using up) natural resources for future generations.

The Summit: Leading the Way to a Sustainable Lifestyle

With the design and construction of the Summit Bechtel Family National Scout Reserve, Scouting America saw an opportunity to explore how communities can become more sustainable. The reserve turns into a busy city of 50,000 people during the national Scout jamboree. That is larger than many towns in America. A commitment to sustainability ensures that the Summit is strong and successful for Scouts today and for generations to come.

The Summit, Scouting America's newest national facility, located in West Virginia, is reaching for a goal of net zero through design of the site and its buildings and utilities. Learn all about the Summit and net-zero energy, water, and waste in this chapter.

A few key principles of Scouting guided the sustainable design of the Summit:

1. Be *thrifty and resourceful* in our use of energy and water.
2. Apply and expand *outdoor ethics* beyond the backcountry by considering how we use materials and reduce waste in all operations.
3. Be *good stewards* of our human and natural communities by creating healthy places today and for future generations.
4. Demonstrate leadership in sustainability by measuring our efforts and continually improving.

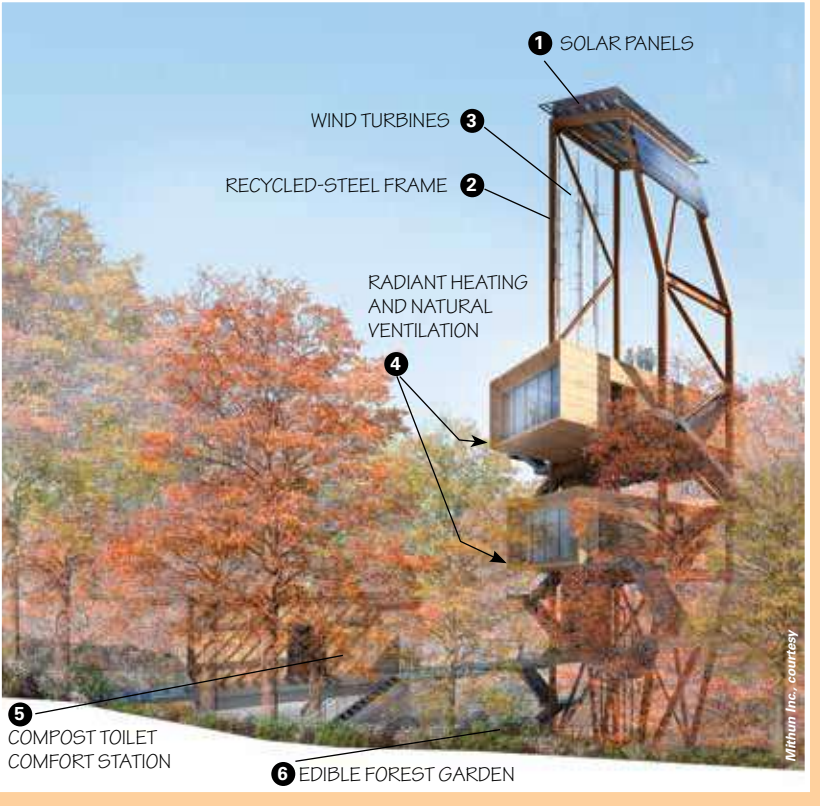
Scouting America has pledged to work toward a "net zero" property. Net zero is an ambitious goal that will take some time to reach. In order to achieve net zero, the Summit will need to:

1. Produce as much clean, renewable energy as it uses each year.
2. Collect water from the Summit's own watershed and treat it passively (making use of natural water treatment methods) before returning it to the soil.
3. Find creative ways to eliminate sending material to the landfill.

Buildings on-site are designed to conserve 30 percent more energy than typical buildings of the same size, staying cooler in summer and warmer in winter through their shape and location. Their doors, windows, and walls exchange very little heat or cold with the outside, requiring less energy to heat and cool the inside. Beneath the ground of the Summit Center are geothermal wells that keep the buildings warm in winter and cool in summer.

The Summit is designed for people, not cars and trucks. Within its compact footprint, Scouts live close to activities and amenities. A network of trails through the woods and around the lake connects base camps to central and adventure areas. Fewer vehicles mean cleaner air and a safer, healthier environment for Scouts and guests.

The Sustainability Treehouse, the first building on-site at the Summit, is a net-zero structure with solar panels and wind turbines. The panels collect sunlight and turn solar energy into electricity. Atop the treehouse, you can see a vertical wind turbine designed to work at lower elevations where wind speeds are slower. The Summit Treehouse combines a number of sustainability features with fun, education, and purpose. It is a "living playground" on three levels, ending at the top with a transparent enclosure.



In order to reach the goal of net zero water, the Summit concentrates first on finding ways to use less water and to apply passive treatments for processing any water used on-site.

- Graywater, the water that drains from sinks and showers, is cleaned and reused to flush toilets and urinals. This will save 11 gallons per day *per Scout*—a savings of 4.4 million gallons in the course of a single jamboree.
- Blackwater, the water that is flushed down toilets and urinals, is treated without chemicals at an on-site wastewater plant and then used to irrigate the surrounding forest. No wastewater leaves the site. Instead, it serves to put important nutrients such as phosphorus and nitrogen back into the soil.
- Stormwater, which runs off roofs, roadways, and paved areas, is also treated on-site over 70 acres of biofiltration. The dirty water is carried in a network of swales (depressions or low-lying land) and rain gardens that allow the water to soak back into the soil while the plants filter out oil and sediments.

The average American uses 80 gallons of water per day. At the Summit, conservation measures like low-flow fixtures and graywater systems have reduced that amount to 30 gallons.

On average, each American produces about 4.3 pounds of trash per day. At the jamboree, that would multiply to 2.15 million pounds of trash in just 10 days at a cost of nearly $50,000 to haul to a landfill.

But most of that trash is valuable material. Food, paper, and yard waste make up about 30 percent of what typically gets thrown away. At the Summit, Scouts will separate their food and paper for composting. This added to yard waste produces a rich material—compost—that provides nutrients to the soil. A jamboree produces 285 tons of compost worth about $43,000 to the Summit, not to mention the money saved on chemical fertilizers, landfill fees, and hauling fees.

Scouts attending jamborees also work toward net zero waste by separating plastics, metal, wood, and cardboard, which will then be baled and sold. Some things that are hard to recycle, such as glass and plastic foam, won't be found at the jamboree.

Careful construction with green (nonpolluting) building materials to create a healthy environment, and efforts to conserve and protect sparkling mountain streams and 1,600 acres of forest, ensure that Scouts today and in the future will be able to enjoy the Summit's Appalachian landscape.

Scouts admire this natural waterfall at the Summit, Scouting America's newest high-adventure base, in West Virginia.

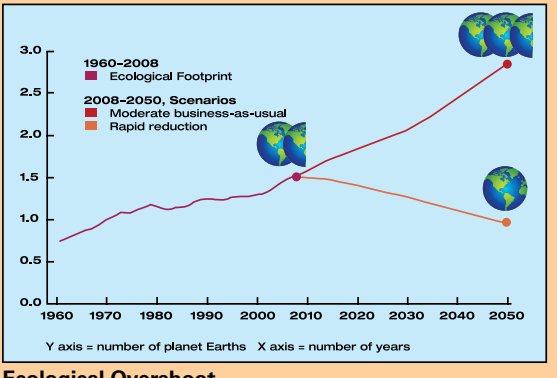
Ecological Overshoot

You might have heard the term "ecological overshoot" but did not know what it meant. Individuals in the United States consume more water, more food, more goods—just about more everything—than most people in other parts of the world. That rate of consumption has increased so much that we now are using more resources faster than those resources can be replenished by nature. This is called ecological overshoot.

Think about what would happen if you kept withdrawing money from your bank account but never replenished it. Eventually, the money would run out. The same thing is happening with our water supplies. We are "withdrawing" water faster than it can be replenished. In fact, in some aquifers, the water cannot be replenished and will eventually be depleted. The same thing can happen with other resources, such as minerals, food, fuel, and so on.

When we run out of something, we hardly give it a second thought to where we can easily get more. When something gets old, we throw it out and replace it. We continue to create vast amounts of waste and use up our resources with the notion that those resources are unlimited. Now that we are more aware of ecological overshoot, which scientists have known about since the 1970s, we can do something to change the way we think and behave.

The graphic here shows how in our current state, we are consuming or "spending" Earth's natural resources about 1.4 times faster than they can be replenished. This means it takes us 17 months to replenish what we consume in 12 months. By 2050, that rate will increase to nearly three Earths. If we were to work together to substantially reduce the rate of consumption, we could close that gap and Earth could sustain its current population.



Ecological Overshoot

Source: Global Footprint Network

Talk to Your Family About Sustainability

Now write in your own words the meaning of *sustainability.* Have a family meeting, and ask your family members to write down what they think sustainability means. Talk about how conservation and stewardship relate to sustainability. Be sure to take notes.

Reducing Water Use

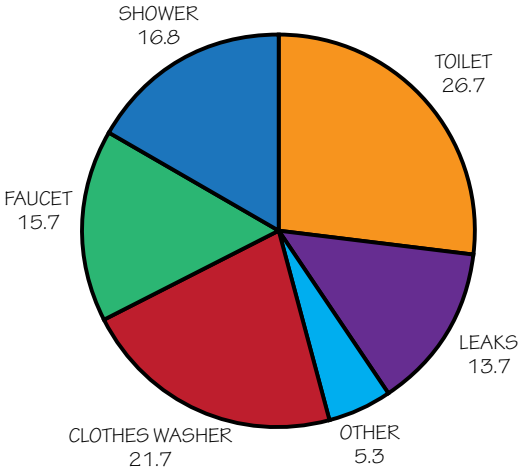
In the United States, people are fortunate to have easy access to some of the safest treated water in the world. For most of us, that means simply turning on the tap.

How much water do we use? According to the U.S. Environmental Protection Agency, the average American family of four uses 400 gallons of water per day at home. Indoor usage accounts for 70 percent of this whopping amount, with 30 percent used outdoors. That's 146,000 gallons per year—for one family!

Less than 1 percent of all the water on Earth can be used by humans. The rest is salt water from the ocean or water permanently frozen and not available for drinking, bathing, or watering plants. As the world's population grows, more people are using this limited resource. It's important that we *all* use water wisely.

Wisdom starts with understanding and becoming aware of how you use water and how much water you waste. Take note of places inside and outside your home where you use water. This might include the kitchen, bathrooms, laundry room, and outdoor faucets. Look carefully at all the ways you and your family use water every day.

A fully loaded dishwasher usually is always the most efficient way to wash dishes. This is particularly true if your dishwasher has an Energy Star rating and if you use the "light" cycle, which should work just fine for day-to-day loads that are not heavily soiled.



Source: American Water Works Association

Water-Saving Tips

It might surprise you where you use the most water each day. Flushing a toilet claims nearly 27 percent of family water use each day. The clothes washer uses nearly 22 percent, with the shower taking up almost 17 percent. The faucet is around 15 percent, and leaks take up almost 14 percent.

Do you wash your dishes in a dishwasher? Is your dishwasher energy efficient? If it is, you may use about four gallons of water to wash a load of dishes. If it is an older model that isn't rated for energy efficiency, you might be using about six gallons of water for every load.

If you wash your dishes by hand and run the water the entire time to rinse them, you can use up to 16 gallons of water for one load. Don't let the water run. Instead, fill one sink with soapy water and the other with rinse water.

Here are more water-saving tips for your home:

- Run your dishwasher and wash your laundry only when you have a full load. You can save up to 1,000 gallons of water a month just doing these two things.
- Use the garbage disposal sparingly, if at all. Compost your raw vegetable food waste instead, and save gallons every time.

- When brushing your teeth, simply turning off the tap while you brush can save up to eight gallons of water per day per person. That adds up to 200 gallons a month.
- Don't leave the water running when you wash your hands. Wet your hands, shut off the water, lather your hands, then turn the faucet back on to rinse.
- A bath uses about 70 gallons of water, and a shower takes about 25 gallons. To save water, take a shower and time yourself. Keep it under 5 minutes. For greater savings, wet down, then turn off the water. Wash your body and your hair, then turn on the water just to rinse.
- A small leak in a toilet can waste 200 gallons of water *per day.* That's like flushing your toilet 50 times for no reason.

Try this experiment with your parent's help: Test for leaks in your toilet by placing a drop of food coloring in the toilet tank. If the color shows up in the bowl without flushing, you could have a leak.

What about water use outdoors? Here are ways to conserve:

- Use a hose sparingly. To wash your bike or your car, use a bucket of sudsy water and a sponge. Spray with the hose only to rinse. Some commercial car washes recycle water instead of letting it run down the sewer drain. Ask your parents to check whether a car wash near you recycles water.
- If you use sprinklers, adjust them so they water only the lawn—not the house, sidewalk, or street.
- Check your outside faucets for leaks. Water your yard in the early morning and then only as much as needed.
- Place buckets under eaves or install rain barrels under downspouts to collect rainwater from the roof for watering your yard. You will be surprised how much water you can collect in a short rainstorm. Using water that would otherwise be lost or run off beats running a hose, which can discharge up to 10 gallons a minute.

Daily watering is not necessary, even in the hottest climates. Plants will grow longer and stronger roots if you don't overwater them. Once a week is plenty. Only water until the soil is wet 2 inches down.

- In the summer, especially if you live in a region that is hot and dry, adjust your lawnmower to a higher setting. Taller grass holds moisture and shades the roots from the sun better than close-clipped grass.
- Spread about 4 inches of mulch on top of the soil around the plants in your yard to protect the roots from heat and cold and to help keep moisture from evaporating. Your family will need to replace the mulch every few years to keep it 4 inches thick.

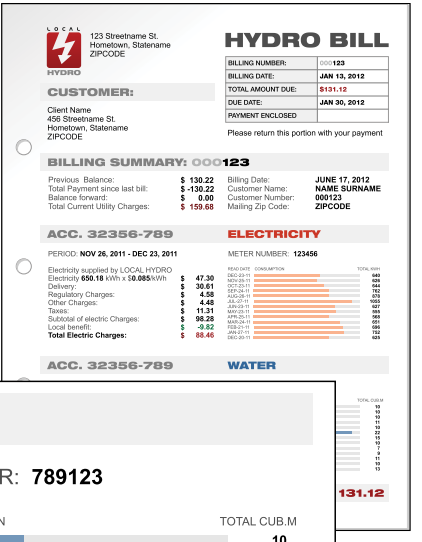
Many cities and towns offer free mulch to homeowners. City workers cut tree limbs to keep them out of power lines, and they may also take in Christmas trees and wood scraps that people put out for recycling. All of these natural items can be ground up into mulch. Check with your town or county to see if they have a free mulch program.

If your yard is xeriscaped (with plants such as succulents and cactus that don't take much water) or if you have shrubs, trees, and grass native to your region planted in your yard, once the plants are established, you should have to water them only once a month. If the soil is wet two to three inches down, that's enough.

Be water-smart with your pets, too. If you own a fish tank, when you clean the tank, recycle the nutrient-rich water to outdoor plants. When you refresh your pet's water bowl every day, recycle the water in the yard. When it's warm enough, bathe your pets outdoors so you are watering the yard at the same time.

Your Family's Water Bill

For requirement 2a(1), ask your parents for your family's water bills for the past three months. The bills will show how many thousands of gallons of water your family uses each month and the cost for that use. You should also examine wastewater service charges for treating the water that goes down the drains in your home.


LOCAL HYDRO

123 Streetname St.
Hometown, Statename
ZIPCODE

HYDRO BILL

BILLING NUMBER:	000123
BILLING DATE:	JAN 13, 2012
TOTAL AMOUNT DUE:	$131.12
DUE DATE:	JAN 30, 2012
PAYMENT ENCLOSED	

Please return this portion with your payment

CUSTOMER:

Client Name
456 Streetname St.
Hometown, Statename
ZIPCODE

BILLING SUMMARY: 000123

Previous Balance:	$ 130.22	Billing Date:	JUNE 17, 2012
Total Payment since last bill:	$ -130.22	Customer Name:	NAME SURNAME
Balance forward:	$ 0.00	Customer Number:	000123
Total Current Utility Charges:	$ 159.68	Mailing Zip Code:	ZIPCODE

ACC. 32356-789 ELECTRICITY

PERIOD: NOV 26, 2011 - DEC 23, 2011

METER NUMBER: 123456

Electricity supplied by LOCAL HYDRO	
Electricity 650.18 kWh x $0.085/kWh	$ 47.30
Delivery:	$ 30.61
Regulatory Charges:	$ 4.58
Other Charges:	$ 4.48
Taxes:	$ 11.31
Subtotal of electric Charges:	$ 98.28
Local benefit:	$ -9.82
Total Electric Charges:	$ 88.46

ACC. 32356-789 WATER

WATER

METER NUMBER: **789123**

READ DATE	CONSUMPTION	TOTAL CUB.M
DEC-23-11		10
NOV-25-11		10
OCT-23-11		10
SEP-24-11		11
AUG-26-11		10
JUL-27-11		22
JUN-23-11		15
MAY-23-11		10
APR-25-11		7
MAR-24-11		9
FEB-21-11		11
JAN-27-11		10
DEC-20-11		13

131.12

Talk with your family about how each person uses water. Do you leave the water on the entire time you brush your teeth? Do you take 20-minute showers? Do you run the water when you wash and rinse dishes? Do you wash full loads of laundry or do you often throw in your favorite pair of jeans by itself? How do you potentially waste water?

Be honest about your habits and how hard it may be to eliminate bad ones. Ask what each member of your family is willing to do to reduce water use. Choose three ways you can help reduce your use of water, and carry out those ideas.

Then check your family's water bill to see whether you and your family have become wiser and more thrifty about how you use a precious limited resource: fresh water.

"Off the Grid" Doesn't Mean "Free"

Fresh water is limited to the rain and snow that has fallen on Earth and the reserves where it has collected such as lakes, rivers, streams, and underground caverns.

If you have a private water well or a septic tank, your family may not receive a monthly water or wastewater bill. Unless you have a meter on your well, you won't have a way to measure how many gallons of water you use or how much wastewater drains into your septic system.

However, that doesn't mean your water and wastewater are "free." It costs a great deal of money to dig a well. The well must be dug deep enough to reach an underground water source such as an aquifer. An aquifer is an underground layer of water-saturated rock from which groundwater can be extracted through a well. Aquifers can run dry or be contaminated from pollutants such as fertilizers and chemical wastes.

In times of drought, groundwater levels often drop and wells must be dug deeper to continue to reach the water source. If you live close to the ocean and have a water well, it can also become contaminated with seawater. Water withdrawal can lower the water table enough to allow salty water to contaminate the groundwater.

Besides the cost of digging a water well, there's also the expense of a pump and a holding tank for the clean water. Well water is often full of minerals, which are hard on the pump, the pipes that run the water through the house, and the hot-water heater. All of these items cost money to maintain or replace.

If well water becomes undrinkable or the underground supply is completely exhausted, you would have to find an alternate water source. This can be expensive. Some towns in the United States in the past few years have had to truck in water when their water source dried up.

If you are on a septic system, wastewater from toilets, showers, sinks, and laundry goes into a septic tank. The more people in your household who are using water and creating wastewater, the more often your septic tank may need to be cleaned out. A company can be hired to pump out the tank and truck the waste to a treatment facility. This service can cost several hundred dollars each cleaning.

In the absence of water-use regulations or monthly bills, Scouts whose families have private water wells and septic tanks must make an even more conscious choice to use water wisely. It comes down to awareness of what you as an individual Scout and your family can do to conserve a precious resource.

Where Does Your Water Come From? Where Does It Go?

Your water may come from a nearby river, a lake, or an underground aquifer. Or the source could be a long way from where you live. If it is a surface water source (typically a lake or reservoir), find out where the water flows from, where it is treated, and how it gets from the treatment plant to your house.

Also investigate where water goes after it drains from the kitchen sink, bathroom basins, toilets, shower or tub, and washing machine. How far does your home's wastewater travel by pipe to a treatment plant? Where does that treated wastewater go? Where does the outside runoff go from watering the yard or washing the car?

You can usually find this information online at your official city, municipal utility district, or groundwater district website. If your source is an underground aquifer, find out more about the particular aquifer you draw your water from.

If you live in a region that has experienced drought, find out how dry conditions affect your source of water. If your water is threatened by industrial pollution, saltwater contamination, or commercial agricultural practices, make notes about what you discover and share them with your counselor.

Water treatment facility

Drought Across the World

From 2002 to 2012, Israel experienced a record heat wave and devastating drought. Its freshwater sources dropped by nearly 25 percent. The crisis caused Israel to take vigorous steps to conserve water.

Today, more than half of all water used for agriculture in Israel is recycled water. Urban consumption has dropped by 15 percent. The country is investing in the latest desalination (salt-removal) technology, turning Mediterranean seawater into more than half of the total clean drinking water available in the country. Israel's water authority has predicted that the efforts to conserve water could quickly return the country's water supply to sustainable levels.

From 2007 to 2012, Britain had endured its worst drought since 1929. In that same five-year period, Thailand was gripped by its worst drought in 20 years. The high temperatures also contributed to the thinnest sea-ice levels on record in the Arctic, and to an alarming melting of the polar ice cap. Because polar bears hunt prey from ice floes (sheets of floating sea ice), which are rapidly disappearing, the bears may become extinct in your lifetime.

Turning off the water while you brush your teeth is one of the easiest ways you can start saving water today—about 8 gallons per day, or 2,920 gallons per year. Encourage your family members to do the same, and see what a difference it makes in your water bill. This change of habit could save a family of four more than 11,000 gallons per year!

In the United States, particularly the Southwest and the Midwest, prolonged drought, depletion of underground water, and extensive wildfires have damaged vast areas of the nation's main "bread basket." These regions produce corn, wheat, and soybeans not only for our country but for much of the world.

Because of the long and widespread drought in the United States from 2009 through 2013, nearly 80 percent of the country's corn crops and more than 11 percent of its soybean crops were harmed. Food prices rose worldwide because of the low yields and record high prices for grains. America's drought led to food shortages and hunger in places around the globe.

Concern is growing that prolonged heat spells and droughts may become increasingly common. As the world population grows, water may become more precious and expensive, regardless of where you live.

Reducing Food Waste

As avid campers and backcountry stewards, Scouts are skilled at planning meals right down to the exact portion size each member of a troop will need for three squares a day while trekking into the great outdoors. Scouts come prepared but don't want to carry in or pack out anything more than what is needed.

Food and especially water weigh down backpacks. Troop trips are also less expensive when food costs are kept to a minimum and the expense is shared. These are just two of many reasons Scouts carefully plan their meals and the weight they'll be carrying before each campout.

Household food waste, however, can be another matter entirely. When you have a refrigerator and maybe a freezer and a pantry or cupboards to store food and drinks, items that do not get eaten often go to waste.

In the United States, more than 65 billion pounds of food is thrown away each year, according to the Environmental Protection Agency. That amounts to about $2,200 per year that the average American household simply throws away. Food waste is the single largest component of municipal solid waste that ends up in landfills and incinerators.

More than 60 percent of food waste could be avoided.

The more disposable income people in a country have to spend, the more food they waste. In industrialized countries, such as the United States and the United Kingdom, each individual throws away an average of 200 to 250 pounds of food per year. Compare those hefty figures with sub-Saharan Africa and South/Southeast Asia where individuals throw out only 13 to 24 pounds of food per year.

People are not only tossing away money but also contributing to the production of methane—a greenhouse gas that is a big concern for the future of the planet—as the food breaks down in landfills. Also wasted are the energy, water, labor, and other costs that go into growing, processing, and transporting food from farmers and factories to consumers.

While most folks want to make environmentally responsible choices, research shows that it is difficult for people to "go green" unless it saves them money. Changing consumer habits is a big challenge.

Making the best use of household food comes down to learning good management techniques to cut your food bills and food waste, much as Scouts do when camping out.

For food to compost properly, it needs light and air. In a landfill, it would get neither.

Composting: It's Everyone's Responsibility

Compost is organic matter that has been recycled into a natural fertilizer and a soil improver. It is a key ingredient in organic farming. Considering we throw away as much as a third of the food we buy each week, reusing it in compost is a valuable way to give back to the environment and save money.

Making composting easier for people to do is a step governments and companies are beginning to take to keep food waste out of landfills. At Portland International Airport in Oregon, the food court has been set up as one of the first public-area food collection stations in the country. Folks who buy food at the airport place their food scraps and leftover ice or beverages in separate bins for organic recycling.

Some green restaurants in the United States ensure that all the waste they produce can be either composted or recycled, and they provide compost and recycling bins instead of trash cans for their customers.

The King County, Washington, solid-waste department is part of an EPA program to reduce household food waste. The county works with families through a local elementary school to measure, reduce, and recycle their food waste. Families who follow the program's guidelines receive gift certificates to grocery stores.

A program in the United Kingdom helped 81 households cut their food bills and food waste in half. People who took part then served as volunteers to recruit and lead groups to do the same in their own communities. The groups trade tips about how to best use household food, right down to recipes for leftovers. They have produced a simple "how-to" guide for other communities to follow in their footsteps. In the process, they have learned to save money, recycle, and throw away far less food.

Organic waste collection systems are already available in cities such as San Francisco.

Tips to Reduce Food Waste

Here are some ways you can reduce food waste, help to protect the environment, and save money.

- Sit down with the member of your household who does the grocery shopping. Plan family meals for one week, including breakfast, lunch, dinner, snacks, and drinks. Pay attention to portion sizes. How much of each item on your list do you need? Check to see which ingredients you already have.

Make a shopping list that includes only what your household doesn't have.

Never go to a grocery store when you are hungry, or you will be tempted to buy things you don't need. Take your shopping list with you and stick to it.

- Check the refrigerator temperature. Food needs to be stored between 33.8 degrees and 41 degrees Fahrenheit (or 1 to 5 degrees Celsius) to keep it fresh for the longest time. Also check to see that the seals around your refrigerator and freezer doors are tight.
- When you buy new food from the supermarket, pull all of the older items in your pantry and refrigerator to the front. Put new food toward the back, and you'll have less chance of finding something moldy and green in the back of your food storage areas. By rotating your food in this way, you will also have a better idea of what you have on hand.

- Try not to throw away fresh food. Freeze overripe fruit to make into smoothies or fruit pies later on. Put wilting vegetables in soup. Pack leftovers for school lunches, or add other ingredients to make another family meal.
- Serve small portions of food. People may want second servings when they've cleaned their plates, but starting with small portions helps cut down on food getting scraped into a garbage can. Leftovers should be cooled, promptly stored in the fridge, and used another day of the week.
- If you buy loose fruits and vegetables instead of those that come prepackaged, you can buy precisely the amount you need. The same goes for buying meats and cheeses from the deli section of your grocery. Buy just what you can eat before it goes bad.

- If your family buys in bulk, meats and vegetables (and meals prepared ahead of time for those nights when there's too much going on to cook) can be frozen in portions that are sized right for a single meal for your household.

Some food waste will happen, no matter what you do. If you set up a compost bin, in a few months you'll have valuable compost for plants. A kitchen composter called a bokashi bin works for cooked food waste, even fish and meat. You feed it your scraps, sprinkle over a layer of special microbes, and leave it to ferment. Houseplants and gardens love this broken-down enriched substance.

One way to make a change and have a positive impact on ecological overshoot is to reduce waste. Does your family tend to throw out a lot of leftovers or uneaten food, such as fresh fruits and vegetables? If so, plan better and buy less. Purchase only what your family will consume.

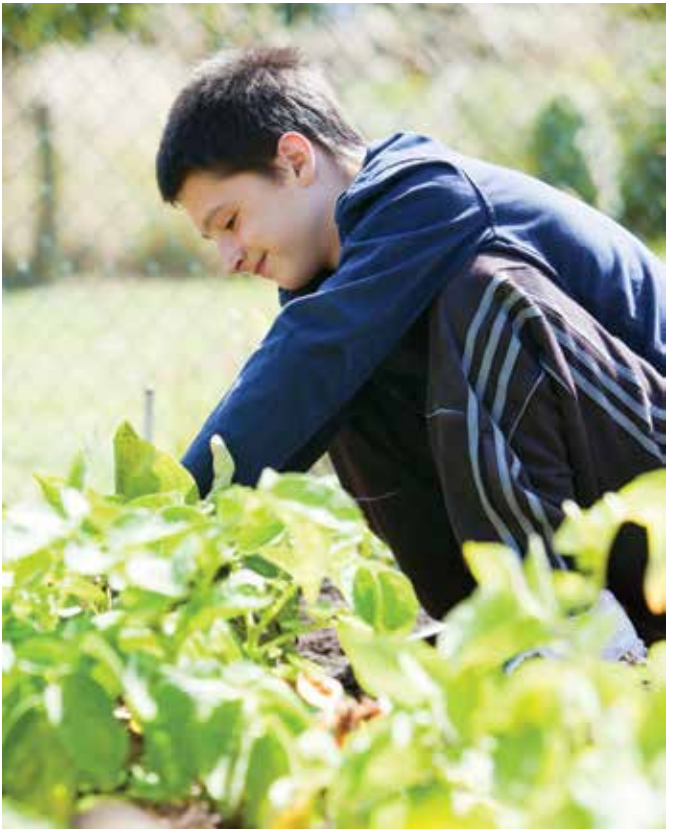
Creating Your Own Food Sources

Growing your food, or purchasing fresh fruits and vegetables from local sources when possible, has many benefits. You have better control over what is used on your food for fertilizer and pest control, and once a garden is in place your family can grow a variety of foods that do well in your particular region, depending on the season.

Sustainable Gardening

Gardening is a favorite leisure activity in America. In our country's 77 largest cities, there are close to 700 community gardens and 13,000 individual garden plots, according to a 2008 survey by the Trust for Public Land. Many community gardens are on urban parklands or land owned by churches or senior centers.

These gardens provide a place for people to come together to work side by side, grow food, educate young people, instill pride, raise property values, and reduce pesticide exposure. For example, the Central Bainbridge Street Community Garden in Brooklyn, New York, produces thousands of pounds of vegetables a year. It is also a center of activity for young and old in the large community it serves.



Fruits and vegetables fresh out of the garden are hard to beat for taste and nutrition.

A Seattle, Washington, urban garden program called P-Patch began in 1973. The program plans, oversees, and protects gardens citywide. As a model for community gardening, P-Patch has grown to 68 community gardens totaling 23 acres, with almost 2,000 plots that are cultivated by about 4,000 people. At any given time, about 1,900 people can be on a waiting list to get a garden plot.

City rooftops have been turned into garden spaces, too. Some of these urban gardens have small ponds with koi fish. Fish droppings enrich the fishpond water with nutrients, which provide natural fertilizer and water for the garden plants each time the pond is cleaned. Residents who live in buildings with rooftop gardens save their vegetable and fruit peelings for a community compost bin. The compost is spread around the plants to make the soil more nutrient rich.

Organic farmers who live in rural areas may raise cows, pigs, chickens, and other livestock on grazing land to provide consumers with natural meats, free-range chicken, and fresh eggs. The manure the animals make is used as natural fertilizer to grow organic gardens.

Many cities are turning unused land into urban garden spaces. Land used for gardens not only offers an excellent use for otherwise vacant spaces, but also beautifies areas that might otherwise be places of blight and trash dumping.

How might local gardens contribute to a more sustainable way of life if practiced globally?

Backyard Gardens

A backyard garden can provide much of the fresh produce your family needs in a small plot. Even a container garden grown in 12- to 15-inch-deep pots on a sunny apartment balcony can produce generous results. Check with your county extension agent to learn more about gardening in your area. Knowing when and what to plant for the season and your region is important for successful gardening.

Factors That Limit World Food Supplies

Producing and delivering enough food to feed the world's people is a serious challenge. Scientists estimate the world population could reach 8 billion by 2030.

In the 1960s, most countries were self-sufficient in food production. Today only a few grow what they need. During the '60s, high-yield crops and energy-hungry farming practices led to dramatic increases in crop production. Except for parts of Africa, grain yields exceeded population growth in those days. But now, grain production struggles to keep pace as the world's population increases.

For most people in the world, grain is a primary source of nutrition. Yet today, only two of 183 nations are major grain exporters: Canada and the United States. As many as 1 billion people in the world today are undernourished and live with hunger.

Although it was called the "Green Revolution," the energy-intensive farming that once fed the world depended on agricultural practices that many consider to be unsustainable. These practices include heavy use of fossil fuels for fertilizers, pesticides, and irrigation, along with designing plants that can tolerate high levels of fertilizers and pesticides to increase the harvest.

In nations that had good farmland, enough water for irrigation, and ready access to fossil fuels and fertilizers, the Green Revolution didn't turn out all that "green" in the current sense of the term. The energy-intensive farming led to soil erosion and water pollution, and sped up the depletion of groundwater and surface water resources.

Other unwanted environmental and public health consequences have arisen from the widespread use of chemical pesticides and herbicides. Worldwide, crop research centers are now studying how to make large-scale commercial agriculture more sustainable.

Limited land that is suitable for agriculture, soil contamination and erosion, dwindling water for irrigation, and pollution of water sources all play parts in the world's ability to grow enough food for the present and the future.

Discuss with your counselor some of these factors that limit the availability of food and food production in various regions of the world. How do these factors influence the sustainability of worldwide food supplies?

Designing Sustainable Communities

Before you sketch out how you would design a sustainable community, you may want to research some of the world's most sustainable cities to help you with your own plan.

For example, Reykjavik, Iceland, a city with about 115,000 residents, gets energy for hot water, electricity, and heat entirely from hydropower and geothermal sources. Both sources are free of greenhouse gas emissions and are renewable energy; that is, they are replaced by natural processes. (See "Achieving Sustainable Energy" in this pamphlet for more about hydropower, geothermal, and other energy sources.) Some buses and vehicles in Reykjavik run on hydrogen. Iceland plans to entirely end its dependence on fossil fuels by 2050 and become a hydrogen, solar, wind, and geothermal society.

Vancouver, Canada, has also embraced renewable energy. City leaders have developed a 100-year plan to become cleaner and greener. Vancouver is already No. 1 in the world in using hydroelectric energy, which provides 90 percent of its power. The city also plans to drastically reduce greenhouse gas emissions through investments in solar, wave, and wind energy systems.

Portland, Oregon, has been a sustainable-living model city for years. Urban planners have set aside 92,000 acres of green space with 74 miles of bike/hike trails, and created an urban-growth boundary to contain the city and protect outlying farms and 25 million acres of forestland. Portland is the first U.S. city to enact a plan to reduce its greenhouse gas emissions and get 100 percent of its energy from renewable sources. In this health-conscious city, one-quarter of commuters bike to work. More than 50 buildings in Portland exceed the U.S. Green Building Council's standards for sustainability.

Camp Emerald Bay: Scouts Tackle Sustainability

Located on the remote west end of Santa Catalina Island, California, Camp Emerald Bay is operated by Scouting America's Western Los Angeles Council. This is the home of the threatened Catalina Island fox and Catalina California ground squirrel, and many federally endangered plants. With less than 16 inches of rain falling per year on the island, water is scarce and there is a high risk of fire. Scouting leaders felt it was essential to protect the island's natural resources.

Water Conservation

In 2009, Camp Emerald Bay began shrinking its environmental footprint. First, it reduced water consumption by replacing high-use water fixtures with lower-flow models.

Water Consumption Area	Usage Before Reduction Measures	Usage After Reduction Measures	Total Result
Showerheads	2.5 gallons per minute	0.6 gallons per minute	75 percent reduction
Sinks	2.0 gallons per minute	0.5 gallons per minute	75 percent reduction
Toilets	1.6–3.0 gallons per flush	0–1.6 gallons per flush, depending on model; dual flush 1.1 (liquid waste) or 1.6 (solid waste) gallons per flush	
Washing Machines	35–40 gallons per load	14 gallons per load	60 percent reduction
Water Softeners	175 gallons of salty brine discharged weekly	0 gallons and 0 salt	100 percent reduction
Hose Bibs	Standard handles that could be turned on (and left on) by anyone	Keyed models that restrict unauthorized access	Estimated 25 percent reduction

Camp Emerald Bay garden

Other water-saving methods adopted by Camp Emerald Bay include:

Drip irrigation. Plants receive direct, precise amounts of water. Water is no longer lost to the air or to unnecessary plants as with traditional sprinkler systems.

Water meters. Water meters measure the amount of water going into a building. The camp's network of meters reveals where, when, and how much water is consumed. Some meters can be read in real time, immediately identifying problems such as running toilets or broken pipes. The real-time monitoring also sends an email alert any time water use is above a certain threshold.

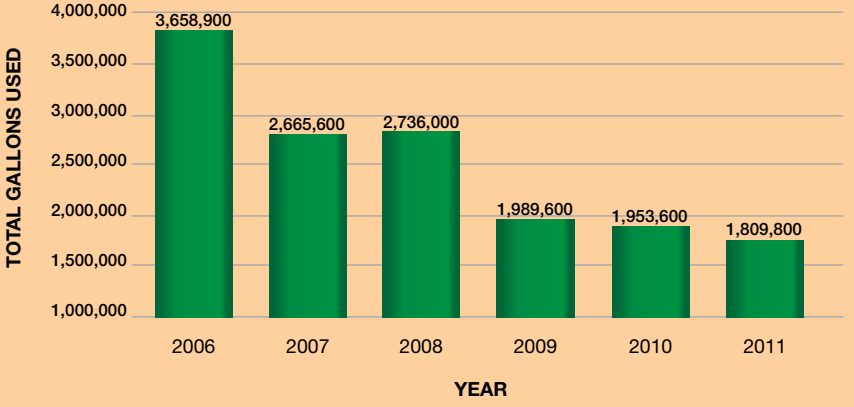
Pressure-assist toilets. These units need only 1.0 gallon per flush, using air pressure to push water through the bowl.

Waterless urinals. These use no water, helping to save thousands of gallons, and the novelty has made them popular with campers.

WATER CONSERVATION RESULTS

The water conservation efforts have helped Camp Emerald Bay save more than 1.5 million gallons per year, or use 50 percent less water than was used in 2006.

Annual Water Usage, 2006–2011



Besides saving water, the changes have brought other benefits, including:

Improved health of native plant species. With a drip irrigation system delivering precise amounts of water to each plant, native vegetation has flourished.

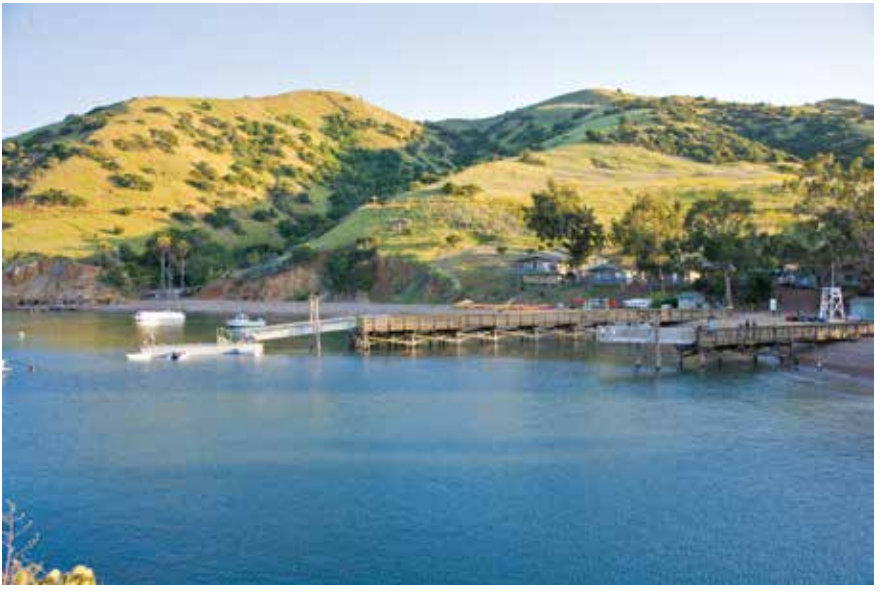
Improved leach fields. All drains in the camp lead to septic tanks, which treat the water and release it into vegetated areas known as leach fields. The elimination of salt-based water softeners has reduced the salty brine from the septic system and produced better soil in the leach fields.

Reduction in propane usage. Using less water for showering means less propane is required to heat the water. In addition, switching to on-demand water heaters that heat water only when it is needed has cut the consumption of propane and the release of 9.36 metric tons of carbon dioxide each year.

Think about how you would design the housing, work locations, shops, schools, and transportation systems to build a sustainable community for the future. How would you redesign your town or community for sustainability?

Protection of the natural aquifer. Fresh water on the island comes from an underground aquifer that currently flows out to sea. If too much water were to be used, that underground river could be diminished enough to reverse the direction of flow, allowing saltwater intrusion.

Increased awareness. Most importantly, Scouts at Camp Emerald Bay have become more conservation-minded. Conserving water and practicing environmental stewardship are now camp standards.



Sustainable Housing and Green Building

Along with water conservation, Camp Emerald Bay has explored sustainable housing options. The Scouts teamed up with an architectural firm to create its Eco-Cabin. The structure was built using reclaimed wood from a pier, two old 20-foot shipping containers, a rubber floor, and aluminum arches to suspend a silicone-coated roof. A small solar panel outside provides power to the eight LED lights inside the structure. Today, the Eco-Cabin serves as an education center to demonstrate sustainable design and principles of outdoor ethics, and it is used as a classroom for merit badge instruction.

Through the efficient use of resources, Camp Emerald Bay has constructed various spaces out of recycled material. The Scoutcraft area was built with materials from a pier, dock floats, and railroad ties. The obstacles for a Leadership Reaction Course were constructed from the roof of the dining hall. A bridge across an intermittent stream and parts of a garden were built from the pier.

The reclaimed "landship" at Camp Emerald Bay serves as a unique meeting place for Scoutcraft activities.

Energy Conservation

Energy conservation continues beyond the Eco-Cabin.

Lighting replacements. Incandescent bulbs have been replaced with compact fluorescent lamp (CFL) or LED lights, which use much less electricity. Motion-sensor timers have been installed in the bathroom facilities, dining hall, and maintenance yard.

Energy Smart meters. Monitoring energy consumption in real time helps identify where energy is being used and the peak times for energy consumption. The monitoring system sends an alert when energy use reaches a certain threshold.

"Upcycling" is converting waste materials or useless items into new materials or items of better value.

Every time a glass or plastic bottle is put in a recycling bin, natural resources are conserved and greenhouse gas emissions are reduced.

Waste, Recycling, and Compost

A waste audit found that only 27 percent of what was put in the trash bin actually belonged in the trash bin. The other 73 percent was either recyclable or compostable.

To reduce the amount of trash, recycling and composting programs are now part of daily life at Camp Emerald Bay.

Recycling. Glass bottles, aluminum cans, and plastic bottles make up 26 percent of the camp's trash. Instead of being thrown out, these items are collected in recycling bins located in every campsite, cabin, and building in camp.

Composting. Through the composting program, the camp also recycles fruits, vegetables, and grains. These items, along with leaves, wood chips, and discarded paper, are sent to compost bins to be processed daily.

During summer camp, nearly 150 gallons of compostable material is processed every day in the camp's garden. With proper aeration (supplied with air), food decomposes within a few days and transforms into a rich soil called humus that retains moisture and nutrients. This soil is added to the native clay soil to grow fruits, vegetables, and native plants in the garden and around camp.

Through the composting program, the food waste generated at Camp Emerald Bay turns into a usable product that enriches the soil and reduces the need for water, fertilizers, and pesticides.

These programs cut the number of times the camp's trash must be hauled across the Gulf of Santa Catalina, reducing pollution and extending municipal landfill life. Another benefit of waste reduction is that animals are less prone to scavenge through the trash to find food. This keeps trash from being scattered and also protects animals from accidental harm.

With initiatives such as these, Camp Emerald Bay sets a pattern for sustainability and strives to protect Catalina Island for future generations.

Sustainable Building Materials

At the heart of sustainable construction are the three R's of green living: reduce, reuse, recycle. Inside and out, energy efficiency is built in to environmentally sound buildings.

When ordering wood for a sustainable home, for example, you would look for wood products certified under the Sustainable Forestry Initiative (SFI) and purchase wood that is generated locally. This reduces shipping costs and saves the energy of shipping wood from a faraway location.

SFI is the largest forest certification program in North America and the largest single forest certification standard in the world. Philmont Scout Ranch is certified to the SFI Standard. *Scout Life* magazine is printed on paper certified by SFI's global Programme for the Endorsement of Forest Certification (PEFC), and the magazine displays the PEFC label in every issue. Merit badge pamphlets also are printed on SFI-certified paper.

Green Building Initiative's Green Globes program and the rating tools of the U.S. Green Building Council's LEED (Leadership in Environmental and Energy Design) certified sustainable home program have set high standards of sustainable design and development practices for land developers, architects, engineers, real estate professionals, and others who are interested in sustainable construction. The programs rate building projects based on construction site selection, water and energy efficiency, materials used, and indoor environmental quality.

Tax breaks and incentives are available for green building and vary from state to state and sometimes by city. The Database of State Incentives for Renewables and Efficiency (DSIRE) keeps a database online with up-to-date information by state.

Listed below are some of the materials and techniques that are recognized in sustainable construction:

- Plywood processed without formaldehyde
- Installation of large energy-efficient windows that provide fresh air and natural light
- Installation of energy- and water-efficient appliances
- Installation of low-emitting volatile organics carpeting
- Use of low-volatile-organic compounds (VOC) paint
- Use of reused or recycled construction materials when possible
- Building within walking distance of many basic services
- Selection of a building site that is not on prime farmland, in a floodplain, on threatened animal habitat, or too close to wetlands
- Prevention of pollution on the construction site
- Space provided for recyclable collection and storage
- Establishment of a minimum level of indoor air quality
- Building near alternative transportation

With your parent's permission and counselor's approval, interview a local architect, engineer, contractor, or building materials supplier. Before the interview, prepare a list of questions to ask the construction expert or building supplier. Find out the factors that are considered when using sustainable materials in renovating or building a home. Share what you learn with your counselor.

How Communities Assess Housing Needs

Cities and towns throughout the country conduct "housing needs assessments" to determine the need for affordable housing. With parental permission, go online or visit a public library to look at a current housing needs assessment for your town, city, county, or state.

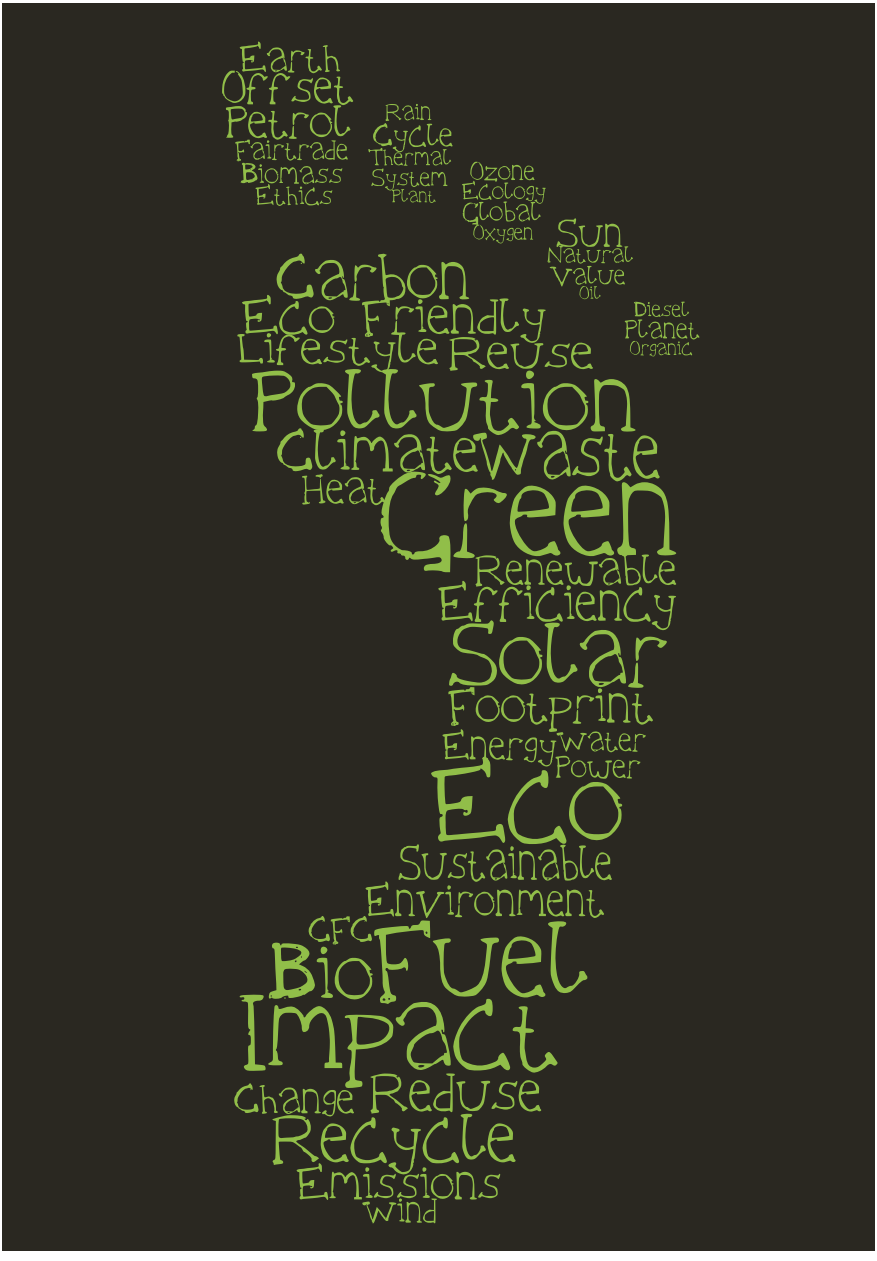
Looking at a housing needs assessment will give you a better understanding of the need for rental housing, affordable homes, senior housing, and special-needs housing in your community. A housing needs assessment also helps to identify issues that may need to be addressed such as urban blight or foreclosure.

In this way, cities determine whether proposed development projects meet the community's needs and should be high priority. A housing needs assessment is a first step in planning how, when, and where to address local housing issues so that priorities can be set, resources identified, and strategies chosen.

City planners and interested groups might ask the following questions:

- Who can afford to live in this community?
- Does our community provide quality housing to a wide range of residents?
- Can our children afford to remain in, or return to, the community as they start their own careers and households?
- Can those people who provide essential services to the community—such as firefighters, law enforcement officers, healthcare workers, and others—afford to live here?
- Do people with special needs have adequate housing options?
- Are there substandard, overcrowded, or other undesirable living conditions that should be addressed?
- Do our elderly residents have adequate housing for remaining in the community as they age?
- Do we provide the type of housing that promotes local job growth?
- Are there significant local housing trends such as an increase in absentee landlords, mortgage foreclosures, increasing housing prices, or decreasing home values?

"Needs" categories you may want to research include affordable rental housing, home ownership, senior housing, and special-needs housing.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Efficiency
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ECO
Sustainable
Environment
CFC
BioFuel
Impact
Change
Reduse
Recycle
Emissions
wind

Achieving Sustainable Energy

You are now set to learn about the sustainability of different energy sources and what the term *carbon footprint* means. Here is a list of the terms you will find in this section and a brief definition of each of these forms of energy.

Fossil fuels, such as petroleum, coal, and natural gas, come from the accumulated remains of ancient plants and animals. Burning fossil fuels releases carbon dioxide and other greenhouse gases, which are considered by many to be among the primary causes of global climate change.

Solar energy is the energy received by Earth from the sun in the form of solar radiation, which makes the production of solar electricity possible.

Nuclear power is produced by a fission reaction that splits the uranium nucleus, creating heat. The heat is used to turn water into steam; the steam drives a turbine, spinning a generator to produce electricity. Although nuclear energy is carbon-free, the toxic waste created by used or depleted uranium is difficult to dispose of safely.

Wind power is the conversion of wind energy into usable forms of energy through windmills for mechanical power, wind pumps for water pumping or drainage, and wind turbines to make electrical power. Wind energy is renewable and clean and produces no greenhouse gas emissions, but some people find wind turbines unsightly or noisy.

Hydropower, or water power, comes from the energy of falling and running water, which may be harnessed for useful purposes such as operating textile mills and other mechanical devices, and generating electricity. Hydropower is a renewable energy source.

Geothermal power comes from the heat of Earth's core. Hot spring water can be brought to Earth's surface and used to heat homes and buildings. Geothermal power generates clean, renewable electricity. Its sources are mainly concentrated in the "Ring of Fire," a volcanic region with large geothermal reservoirs located around the Pacific Ocean. Geothermal power is cost-effective and sustainable, although bringing the heat to Earth's surface does emit small quantities of greenhouse gases.

Bioenergy is generated from biomass: trees, crops, algae, animal dung, or plant material that is left over from agricultural and forestry operations.

Everyone Makes a Carbon Footprint

Your *carbon footprint* is the total amount of carbon dioxide (CO_2) that you create. The bigger your footprint, the less green your lifestyle is. When you burn fossil fuels like gasoline in your family car or heating oil to warm your house, carbon dioxide is released.

Many websites provide ways to figure out the size of your carbon footprint. Get parental permission before using one of these "carbon calculators," because you will need to answer questions about where you live, the type of home you live in, how much electricity you use, and how often your family uses a car.

Unless your family lives "off the power grid" (that is, you don't rely on a power company for electricity), the electricity used in your home creates the biggest part of your carbon footprint. Although electricity does not make greenhouse gases when you use it in your home, most of the power plants that generate electricity do, by burning fossil fuels.

Using fuels like oil, natural gas, or coal-generated electricity to heat or cool your home add to your carbon footprint. How you adjust the thermostat and what type of fuel you use make a difference in the amount of CO_2 produced.

Cars, buses, trains, and planes that run on fossil fuels also produce CO_2. Household garbage is a culprit, too, if it isn't composted. For every pound of trash you throw in the garbage, one pound of greenhouse gases is created because trash over time produces CO_2 and methane.

How to Shrink Your Carbon Footprint

By using less fuel and less electricity and reducing the amount of trash you create, you can reduce your carbon footprint dramatically. Start by turning off computers, televisions, and lights when you are not using them. Unplug small appliances and phone chargers, etc., when they are not in use. Lower the temperature in your home to 68 degrees or lower in winter, and raise it to 78 degrees or higher when running an air conditioner in summer. Turn off your heat or air conditioner entirely and open screened windows for natural ventilation when the weather is comfortable.

Here are more tips for reducing your carbon footprint:

Buy local and buy organic. When possible, buy organic or "fair trade." There's a better chance the food was grown in an eco-friendly way. Food grown locally doesn't have to be transported far, which saves fuel, reduces the carbon footprint, and supports the local economy. Eat at restaurants that serve locally produced or seasonal foods.

Keep packaging to a minimum. For example, choose loose vegetables instead of boxed or plastic-wrapped ones. Take reusable cloth tote bags to the grocery store.

Don't buy bottled water. Bottled water creates a huge carbon footprint. And it is often shipped long distances. Refill a reusable water bottle instead.

Take steps to make your home energy-efficient. The attic should be insulated, windows need to close properly, and heating and air-conditioning systems should be properly maintained. If possible, switch to reusable air filters instead of disposable filters. Switch from incandescent to compact fluorescent or LED light bulbs. These use less electricity and last longer. They are more expensive to purchase, but they will pay for themselves over time in reduced energy costs.

Switch to native plants. Wherever you live, there are plants that are native to your region. These will grow better and take less water in most cases than nonnative species and may get shipped shorter distances to reach your local nursery. Green plants are an excellent way to offset carbon. Planting anything helps the environment.

Close window drapes to keep heat out in summer, and open the drapes to let in the warm sun in wintertime.

Practice being thrifty. To help you buy only the things you truly need, avoid impulse buying. Every item you purchase has a footprint, so when you curb your urge to spend money on items, you are reducing your individual carbon footprint *and* our nation's overall footprint. Some people call this "precycling." If you don't buy stuff, no "recycling" is necessary.

Switch your water heater to vacation mode when you go away. In "vacation" or "away" mode, a water heater does not keep a tank full of hot water ready when you don't need it. Newer tankless models heat water only when it's needed, making them far more energy efficient than standard water heaters.

Pull the plug. If you don't use an appliance frequently, unplug it. The same goes for cellphone chargers, laptops, televisions, stereos, toasters, coffee pots, hair dryers, and other electronics. Many devices continue to use energy even when they appear to be turned off. If you use a power strip for a group of electronic devices, you can flip one switch and disconnect them from the power all at once.

Keep your car as long as it runs well. Rising gas prices do not mean you should rush to buy a hybrid or an electric vehicle. If your older car still runs well, keep it, and keep it well tuned-up. Even hybrids create a huge footprint when they are built, so consider driving a well-maintained older car for a while longer. Use more eco-friendly forms of transport—buses, light rail, bicycle—and walk or carpool whenever possible.

Choose fresh over frozen. Frozen dinners are energy-intensive to produce. It takes energy to freeze foods, ship them cold, display them frozen in the grocery store, and keep them frozen in the home freezer. Try to eat fresh food when you can, and ditch frozen foods that must be zapped in the microwave.

Use cold water to wash clothes. It takes lots of energy to heat water. Multiply that energy by the number of washer loads your family does weekly, and it adds up to a big footprint. Try washing mixed loads and dark clothes in cold water. Most detergents are designed to have the same cleaning power in cold water as in warm water.

Combine errands to save trips in the car. Driving to the same part of town on different days to run multiple errands uses more gas than if you had planned and done everything in the same area all at once. Reduce your need to travel back and forth on short trips by planning your errand trips in advance.

Remember the Three R's: Reduce, Reuse, Recycle! Buy less, reuse and fix things when you can instead of buying new, and recycle as much as you can at home and at school. **Upcycle, too: Repurpose things into useful and fun new items.**

Think about how you and your family can reduce your carbon footprint. Discuss with your counselor what you've learned about how each energy source affects the environment, what the term "carbon footprint" means, and what your family can do to reduce your impact on Earth.

Reduce your food waste by shopping and cooking wisely, and you'll also reduce the size of your carbon footprint.

Lowering Household Utility Bills

In addition to the other tips provided in this pamphlet, consider these ideas for lowering your family's utility bills.

- Seal cracks around doors and windows to cut energy costs by an estimated 15 to 30 percent. Caulk and weather-stripping are inexpensive to buy.
- Properly insulate attic spaces. In cold climates, install storm windows.
- Use heat-generating appliances like the oven, clothes dryer, and dishwasher at night when it is cooler outside. Running these appliances during the heat of the day in summer forces the air conditioner to work harder to keep a home comfortable.
- Use a slow cooker to cook some meals each week. Slow cookers use less energy than cooking in pans on the stovetop, and they do not heat up a house the way cooktops and ovens do.
- If you have ceiling fans in your rooms, turn them on. Fans make a room feel more comfortable, and using them could save hundreds of dollars a year.
- Air-dry laundry instead of using a dryer. If you live in a city or you can't hang clothes outside on a clothesline because of allergens in the air, try hanging them on hangers and letting them drip-dry in your laundry room or inside your home.

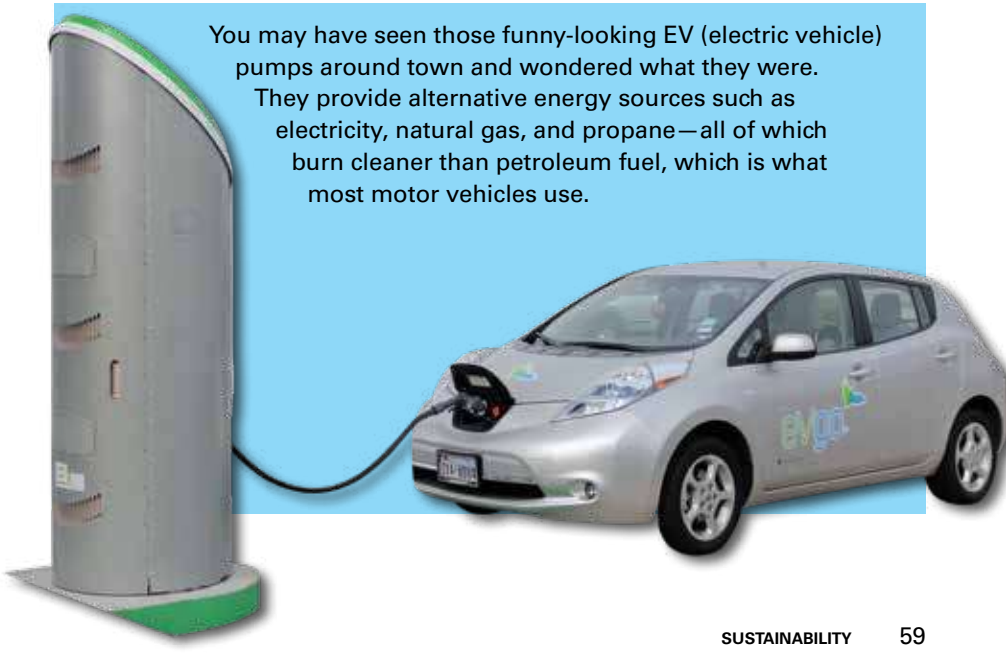
- When you leave a room, turn out the lights. That single act can save hundreds of dollars per year.
- Use a programmable thermostat. If you don't have one, make it a habit to set the thermostat higher in summer or lower in winter when no one will be home.
- Replace air filters or clean a reusable filter once a month. Dirty air filters cause air-conditioning or heating systems to run longer and harder as airflow gets restricted.

After you have made and carried out a family plan to reduce one or more of your household's utility bills, share with your counselor how your plan affected your family's usage.

Lowering Transportation Bills

To evaluate your family's fuel and transportation expenses, look at your family's transportation-related bills (gasoline, diesel, parking, public transportation, etc.). As a family, consider how you can help reduce these costs.

You may have seen those funny-looking EV (electric vehicle) pumps around town and wondered what they were. They provide alternative energy sources such as electricity, natural gas, and propane—all of which burn cleaner than petroleum fuel, which is what most motor vehicles use.



Here are some ways you can save on fuel and transportation costs.

- Use the right grade of gasoline. Most cars run fine on regular. Look at the vehicle owner's manual to find out what's right for your family's car. Regular-grade gas is usually significantly less expensive than premium grade.
- Make sure the fuel cap is on tight. Loose gas caps can reduce fuel efficiency and allow gasoline to vaporize into the air.
- Carpool, use public transit, or bike and walk when you safely can.
- Encourage family members to not drive aggressively and to drive at the speed limit. Vehicles lose economy at speeds above 55 mph.
- If it's cool outside, use the flow-through ventilation system in your car instead of rolling down windows or running the air conditioner. Air conditioning increases fuel use.
- On a trip, carry suitcases, tents, coolers, and camping gear inside the vehicle, not on a roof rack. Loaded roof racks increase wind resistance and fuel use. Also eliminate unnecessary weight from your car.
- Idling for a long time in a drive-through lane wastes gas. Instead, park and walk inside.

After you have followed your family plan to reduce fuel and transportation costs, discuss with your counselor how your plan affected your family's transportation habits.

What About All This Other Stuff?

We live in a consumer culture that bombards us daily with advertisements and enticements to buy the latest whatever-it-is, from cellphones and tablet computers to games, movies, and shoes. Many of us buy more "stuff" than we need.

One part of living greener is learning to tell the difference between essential needs and desirable wants. Eliminating unnecessary "stuff" from your life is easier when you consider every new purchase in terms of momentary "want" versus true "need."

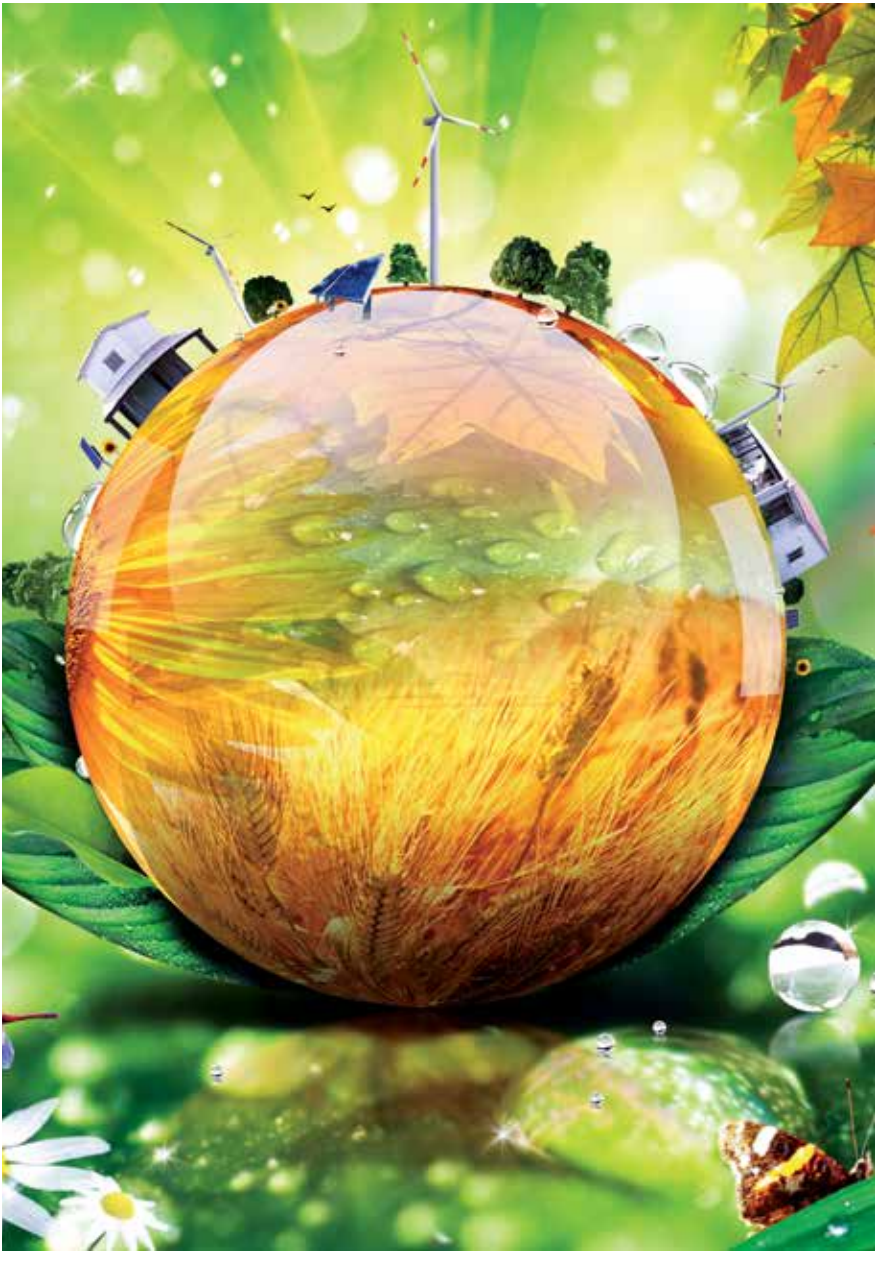
If too much "stuff" is cluttering your home, plan a family project to identify the possessions your family no longer needs. Individually, go through closets and drawers. Together, sift through the garage, basement, attic, or other common areas.

The key to paring down clothes is to look at each piece of clothing and ask yourself how long ago you last wore the item. Does it still fit? Is it comfortable? Are you ever likely to put it on again? Does it have sentimental value? Your answers will help you decide what to keep and what to put on the discard pile.

Make your life less complicated and cluttered by recycling or repurposing those things that are simply gathering dust. While you are at it, you might want to reorganize your closets and drawers so you know where everything is. Thinking thriftily and treading more lightly are important as you start to lead a more sustainable lifestyle.

Box up or bag your reusable items. Your donations will be welcome at Goodwill® stores, The Salvation Army, women's shelters, and various local nonprofit organizations. If you have items you want to sell, consider having a garage or yard sale. Recycle, repurpose, or donate items that don't sell.

As a Scout, you should make conscious choices about the stuff that you own, have to store, take care of, and use.



Earth's Life-Support Systems

One way to picture how planetary systems support life on Earth and interact with one another is to think of an intensive-care unit in a hospital, where many life-support systems are in place to help critically ill people survive and get better. Earth also has life-support systems. In a sense, our planet could be considered one big intensive-care unit, supporting all forms of life.

The *Encyclopedia of Life Support Systems* offers this definition:

> "A life support system … furthers the life of the biosphere in a sustainable fashion. The fundamental attribute of life support systems is that together they provide all of the sustainable needs required for continuance of life. These needs go far beyond biological requirements. Thus life support systems encompass natural environmental systems as well as … social systems required to foster societal harmony, safety, nutrition, medical care, economic standards, and the development of new technology. The one common thread in all of these systems is that they operate in partnership with the conservation of global natural resources."

By viewing the world in this way, people can begin to develop a new appreciation of how we can work together to sustain life on Earth. As we gain a deeper understanding of nature and society, that knowledge can be used to create a better quality of life and a healthy, sustainable environment for those of us who live here now and for all those who come after us.

This is a crucial challenge of our time. Many of our technologies and social institutions will need to be redesigned to lessen the environmental impact on our natural resources.

To make this happen requires a positive attitude toward sustainable development. Instead of consuming more of Earth's limited resources, people will need to learn how to consume far less.

Scouts are well prepared to lead this effort. Scouts are used to leaving no trace behind when camping in the backcountry. And community service is second nature for Scouts who see areas of need and pitch in to create a better quality of life for all.

Consider promoting sustainability and ecologically sound practices for your larger community—Earth itself—as the biggest Scouting project that you and 1.4 million like-minded Scouts can undertake in your lifetime.

A Tipping Point

The makeup of our atmosphere, marine ecosystems, coastal zones, freshwater systems, forests, land and soil, and biological diversity are all coming under increasing pressure as the global population grows and the global economy expands.

If public transportation is available in your area, consider yourself lucky and take advantage of it. Riding on a subway, train, or bus will give you some down time for listening to music or reading.

Since 1930 the world's population has tripled to more than 7 billion people. The global economy has increased more than 15-fold since 1950. All of this human activity has had far-reaching impacts on the planet and how it functions. Many scientists believe we may be reaching critical "threshold points" where the effects on land, oceans, air, and fresh water may be irreversible.

Carbon dioxide levels in the atmosphere are increasing at a rate 10 times faster than any natural increase since the last ice age. As more and more rainforests are cleared for housing, farming, and fuel, the environment has less ability to absorb greenhouse gases. More cars on the roads mean more pollution in the air and in the world's oceans and fresh water.

Earth's life-support systems interact in complex ways. For example, coral reefs in the world's oceans have been degraded by fishing and tourism, and by chemical and agricultural pollution. Now the reefs are also under threat from the changing chemistry of seawater, which is one result of the dramatic increase in atmospheric carbon dioxide.

Increasingly warm and dry conditions are contributing to soil erosion, dwindling wildlife diversity, diminishing freshwater supplies, and large intense wildfires worldwide.

Some scientists call this period of time the Anthropocene Era, where human beings are the dominating environmental force. Deforestation, biodiversity loss, freshwater depletion, and climate change are issues that call for major lifestyle changes and action on a large scale.

The need is great for cooperation among businesses, cities, states, regions, and countries because these life-support systems sustain all forms of life on the planet.

The melting of the Greenland ice sheet could lead to a rise in sea levels of from 6 to 20 feet. Imagine how that could change Earth's shorelines and disrupt societies around the world.

Use of Raw Materials

The energy and resources required to make *one* new aluminum soda can could be used to make *20* cans from recycled aluminum. *Source: Can Manufacturers Institute*

The extraction of raw materials from Earth has social and economic effects, both positive and negative. Extracting raw materials can create jobs and economic growth, but extraction activities also have the potential to affect people's health and disrupt or displace communities. Taking raw materials from Earth may cause environmental damage, such as water scarcity, air and water pollution, and problems of waste disposal.

Increasingly, ethics play a huge part in sustainable extraction of raw materials. Sustainable development of natural materials means preserving the environment, which can involve, for example, harvesting at the appropriate times, replanting for the future, and restoring the land to health. More companies are embracing forest certification standards like the Sustainable Forestry Initiative to ensure forest sustainability. Others are adopting fair-trade policies that try to pay fair wages and improve the quality of life for those who cultivate and harvest the products we need.

For example, a company in Australia uses sandalwood oil in its fragrance products. Company leaders knew that deforestation (destruction of forests) was threatening the sandalwood supply from India, so they partnered with a producer of Australian sandalwood oil to "ethically source" that raw material. The partnership creates a sustainable supply of oil from sandalwood that is harvested by indigenous (native) communities in western Australia.

The company also works with local communities and a local partner in Madagascar, which is the source for 80 percent of the world's vanilla. To ensure a sustainable, fair-trade supply of vanilla from the island, they have adopted environmentally sound harvest and production methods. The company works to educate the local people in how sustainable agricultural methods can enhance their quality of life and help protect their future.

Vanilla bean pods

These are just a few of the ways that businesses are turning toward sustainable methods to reduce their environmental impact on the planet while at the same time earning profits. Now you can meet with your counselor and talk about how the harvesting and production of raw materials, along with how they are distributed, consumed, and disposed of or recycled, is part of current and future thinking and planning for sustainability.

City governments, too, are looking for ways to help their cities become more sustainable. Some cities are working to significantly reduce greenhouse gas emissions. These steps include banning plastic bags; using wind power and other clean, renewable energy sources such as hydropower, biomass, and solar power for some of their electricity; switching high-wattage electric lights in parking garages and streetlights to low-wattage LED lamps; and recycling restaurant food waste by composting.

A Roundup of Sustainability Issues

You don't have to look far to see the blight that plastic waste makes in our environment. Drive down any road in America and you'll likely see plastic bags stuck in trees and plastered against fence lines, and plastic bottles, wrappers, and containers tossed in ditches or accumulating in piles along the banks of creeks, rivers, lakes, and marshes.

Plastic Waste and the Trash Vortex

Plastic bags are also among the top two items of trash found in our oceans, where they choke, strangle, and starve wildlife. The National Oceanic and Atmospheric Administration noted that plastic bags can also cover living corals in coral reefs, which can lead to the death of the reef.

Many large coastal cities use barges to transport their garbage offshore and dump it into the ocean. This has caused an island of plastic to form off California's west coast that is twice the size of Texas and made up of 7 billion pounds of plastic garbage. It is known as a trash *vortex* because the prevailing ocean currents keep it swirling around slowly in a circle. The dead zone is choked with dead fish, marine mammals, and birds that have gotten snagged in the mess.

Zooplankton are small floating animals that drift with the currents. Along with phytoplankton (tiny plants), zooplankton make up the food supply upon which almost all oceanic organisms depend to survive. Plastic pieces now outweigh surface zooplankton in the central North Pacific Ocean by a factor of 6 to 1, according to researchers.

Plastic pieces poison the ocean environment. They attract and hold deadly elements like PCBs, a pollutant used in coolants, transformers, capacitors, and electric motors; and DDT, a chemical

Reports of microscopic bits of plastic washing ashore to become part of a beach are starting to spring up where stunningly beautiful and abundant natural environments once stood.

compound widely used as an agricultural pesticide that Rachel Carson wrote about in 1962 in the famous book *Silent Spring*. Carson's book documented the ways pesticides harm the environment and wildlife, particularly birds. Although both DDT and PCBs were eventually banned, these toxic, cancer-causing chemicals do not break down in the environment.

When plastic enters water sources, it stays there. According to the Research Triangle Institute, "every little piece of plastic manufactured in the past 50 years that made it into the ocean is still out there somewhere." The plastics you use today will still be polluting our environment when your grandchildren are born.

Keep these things in mind every time you use a plastic bag, drink from a polystyrene cup, or buy anything wrapped or contained in plastic. Instead, substitute reusable shopping bags, bottles, and containers, and do your part by spreading the word to end wasteful consumption of plastics.

The Number System for Plastic Recyclables

A coding system exists for identifying the type of plastic used in products and packing materials. This recycling codes system consists of a number within the universal recycling symbol, which is a triangle formed by three arrows.

Each code provides useful information about the recyclability of an item and its possible effects on human health. Here are the seven types of plastics represented by the recycling codes system:

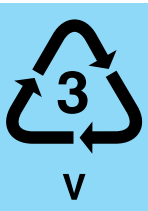
PETE

1. Polyethylene terephthalate (PETE) is a clear, hard plastic used in disposable food and drink containers. PETE is easy to recycle into furniture, carpet, polar fleece, and some types of containers. No known health risks are associated with this type of plastic. PETE is accepted at recycling programs in most U.S. cities.

HDPE

2. High-density polyethylene (HDPE) is a hard plastic but it is not transparent like PETE. HDPE is found in household cleaner bottles, shampoo bottles, and yogurt containers. Easy to recycle, it is accepted widely by recycling programs. It can be recycled into pens, recycling bins, laundry detergent bottles, drainage pipes, and fencing. No known health risks are associated with HDPE.

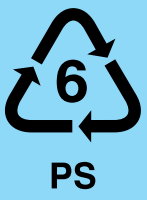
3. Polyvinyl chloride (PVC) is less stiff than HDPE but has many of the same uses. It is the main plastic in bottles for detergent, shampoo, and cooking oil. It is more difficult to recycle than the first two plastics and is not commonly collected in municipal recycling programs. PVC is known to contain phthalates, a suspected carcinogen, or cancer-causing agent.



4. Low-density polyethylene (LDPE) is a soft, flexible plastic found in plastic bags including bread bags, frozen-food bags, and plastic shopping bags. Although LDPE can be recrecycled, it is often not included in city recycling programs but can be recycled in collection bins set up at many retail stores. There are no known health concerns related to LDPE.

5. Polypropylene (PP) is a plastic commonly found in bottle caps, some yogurt containers, medicine bottles, and straws. Number 5 plastics are not accepted by all recycling programs. If PP plastics are recycled, they are used in items such as brooms, racks, battery casings, and battery cables. No health concerns have been linked to PP.

6. Polystyrene (PS), also known as Styrofoam®, is found in disposable coffee cups and takeout food containers. PS is not accepted by many recycling programs. If recycled, it can be used in insulation. PS contains styrene, a suspected carcinogen.



7. Number 7 includes miscellaneous plastics but is most often polycarbonate (PC). PC is used in water-cooler bottles, most other large plastic containers, and, until recently, in baby bottles. Number 7 plastics are not commonly accepted by recycling programs. PC contains bisphenol-A (BPA), which is a known hormone disruptor. The use of BPA has been banned from some items.

Check with your city or county to see which numbered items are accepted for curbside recycling.

Some recycling centers won't accept electronic waste but a growing number of businesses now offer e-waste recycling.

Electronic Waste (E-Waste)

Try counting the electronic gadgets your family has. Are you surprised by the number in your home?

When the newest gadget comes along and replaces the outdated computer, television, stereo, CD player, cellphone, or any number of other electronic devices, the old one often gets tossed in the trash. Americans now own an average of 24 electronic gadgets per household. It's a terrible idea to just throw them away.

All electronic scrap may contain contaminants such as lead, cadmium, and beryllium. These heavy metals can leak into our environment in landfills and spew into the atmosphere as ashes from incinerators. It has become increasingly important to manage e-waste more carefully and effectively.

A company headquartered in New Jersey has created national recycling systems for previously nonrecyclable or hard-to-recycle waste, including electronic waste. With more than 20 million people collecting waste in over 20 countries, the program has diverted billions of units of waste and used them to create more than 1,500 different products that are sold in well-known retail stores. In the process, the company has donated more than $20 million to schools and nonprofit organizations that serve as "brigades" to collect waste.

Many Cub Scout packs and Scouts BSA troops across the country have signed up to contribute to this program, collecting electronic waste from their communities and other "stuff" that is not commonly recycled, such as used juice boxes and pouches, candy wrappers, and office products.

In exchange for acting as a collection station and shipping the waste to the company, the Scouts earn points for their troop for the waste they collect. Points earned can be redeemed for charitable gifts, or for a payment of a penny a point to nonprofit organizations or schools.

New Life for Old Cellphones

The metals from cellphones—gold, silver, platinum, palladium, copper, tin, and zinc—are recovered in the recycling process, then used in such different industries as jewelry, plating, electronics, automotive, and art.

The plastics recovered from cellphones are recycled into components for new electronic devices and other plastic products such as garden furniture, license plate frames, nonfood containers, and replacement auto parts.

When the rechargeable battery can no longer be reused, it can be recycled into other rechargeable battery products.

Consumer electronics now make up 1 to 2 percent of all solid waste. A great deal of energy and diverse, often scarce resources go into manufacturing electronics. Instead of giving these devices the heave-ho when they have served their purpose, recycle electronic products even if you must go to some trouble to do so.

In 2009, 438 million new consumer electronics were sold, 5 million tons of electronics were gathering dust in storage, 2.37 million tons were ready for recycling, and yet only 25 percent of these tons were collected for recycling. Source: U.S. Environmental Protection Agency

Many councils collect old cellphones for recycling. Check with your local council to see if it participates.

For more composting tips, see the *Gardening* merit badge pamphlet.

Food Waste

What are the benefits of turning food waste into compost? To start with, it's a source of free fertilizer for your plants, it's good for the environment, and it's easy to make. Compost adds nutrient-rich humus to the soil, which fuels plant growth and restores depleted soils. It also introduces beneficial organisms into the soil that are a natural way to ward off plant diseases and aerate the soil. And compost offers a natural alternative to chemical fertilizers.

How to Compost

If you live in an apartment and have only houseplants, you might choose a kitchen-counter compost bin. If you live in the country and have a garden, lawn, shrubs, and trees, you can start a large compost pile that will enrich the soil on your family's land.

Here are suggestions for how to build a compost pile outdoors:

1. Build the pile on bare earth so that worms and other beneficial organisms can get into the compost to aerate it.
2. Spread twigs or loose straw on the ground a few inches deep to aid drainage and let air into the pile.
3. Add compostable materials in layers, alternating moist ingredients (food scraps, tea bags, etc.) with dry materials (leaves, sawdust, wood ashes). Sprinkle wood ashes thinly to keep them from clumping together.
4. Add manure, clover, buckwheat, wheatgrass, or any nitrogen source to help speed the composting process.
5. Keep the compost moist, not saturated. When rainfall is scarce, water the pile but do not soak it.

What You Can Compost

Compostable materials include table scraps, fruit and vegetable scraps, eggshells, leaves, grass clippings, garden plants, flowers, lawn and garden weeds, shrub prunings, straw, hay, pine needles, seaweed, wood ash, chicken manure, coffee grounds and filters, tea leaves, newspaper, shredded paper, shredded cardboard, corn cobs, dryer lint, sawdust pellets, and wood chips.

6. Cover the pile with plastic sheeting, wood, carpet scraps, or anything that will serve to hold in moisture and heat, two things that are essential for composting.
7. Every few weeks, remove the cover and turn the pile with a pitchfork or shovel to introduce more oxygen, which is needed for the composting process to work.

With your parent's permission, go online to find out more about composting, or get tips from local nurseries. Many cities and county extension services also offer free classes in composting.

Species Decline

The world's *biodiversity* (number of different species of plants and animals) is declining at a record rate, according to the International Union for Conservation of Nature (IUCN), an organization that produces an annual "red list" of the most vulnerable wildlife. Current extinction rates are at least 100 to 1,000 times higher than natural rates found in the fossil records, the group reported. Humans are the main reason for the decline of many of these species.

"Habitat destruction and degradation are the leading threats, but other significant pressures include over-exploitation (for food, pets, and medicine), introduced species, pollution, and disease," the IUCN has reported.

In 2012, the Red List of Threatened Species noted that of 63,837 species assessed, 19,817 are threatened with extinction, including 41 percent of amphibians, 33 percent of reef-building corals, 25 percent of mammals, and 13 percent of birds.

One strategy for preventing species decline is to protect and preserve wildlife habitats. Governments and private organizations purchase land to protect wildlife and provide nature preserves, state parks, national parks and reserves, and designated wilderness areas. Another strategy is to manage our natural resources to provide critical wildlife habitats, such as active forest management that takes into account the value of wildlife habitat and conservation as well as timber values.

Laws and regulations fostering biological diversity exist at state, national, and international levels. The U.S. Endangered Species Act of 1973 was enacted to protect plant and animal species.

"A sustainable future cannot be achieved without conserving biological diversity—animal and plant species, their habitats and their genes—not only for nature itself, but also for all 7 billion people who depend on it. The latest IUCN Red List is a clarion [loud, clear] call to world leaders … to secure the web of life on this planet."
—Julia Marton-Lefèvre, director general of the IUCN

Well-managed protected areas can benefit many species. Yet only about 3.2 percent of Earth's land surface is currently protected, which is not enough to preserve the world's biological diversity. Captive breeding—programs in which endangered species are bred in captivity to increase their numbers—has had some success in reintroducing species to wilderness areas. Ultimately however, if suitable habitat is not available and few released animals survive, those reintroductions may end in failure.

Many organizations work to increase suitable wildlife habitat and have been successful in helping species recover from extirpation (the disappearance of species in certain areas) and near extinction. Scientific research and public education play big parts in helping people understand the needs of certain species to help them recover. Many species have been reestablished and their populations stabilized in areas where they once thrived, including the American bison, eastern wild turkey, American bald eagle, whitetail deer, wolves, and grizzly bears.

Animals, fish, and birds cross national borders, and marine mammals traverse vast oceans, so there is a great need for international agreements to protect biodiversity. Cooperation among nations is crucial to protect wildlife, marine life, amphibians, birds, and pollinators such as bees and bats.

Two important international agreements to protect threatened or endangered mammals were crafted by the International Whaling Commission, which regulates commercial hunting of whales; and the Convention on the International Trade in Endangered Species of Wild Fauna and Flora, which regulates the buying and selling of endangered species and their parts, such as rhino horns, skins, and ivory.

Much more must be done to slow the destruction of wildlife habitats and protect our environment and ecosystems, which is one more reason why leading a sustainable lifestyle is how every Scout can take a big step for humankind.

If you have a yard, one way you can help wildlife is to turn your lawn into a suitable habitat for birds, butterflies, and bees. By providing food in the form of plants that attract and sustain birds, butterflies, and bees, and by providing water, cover, and places for wildlife to raise their young, your garden can qualify as a Certified Wildlife Habitat by the National Wildlife Federation. You can also work with your Scout troop and local schools to transform school property into an educational wildlife garden.

Discuss with your counselor how human activities can endanger animals and plants and contribute to species extinction. What do you think can be done to stop the decline in wildlife and its impact on a sustainable environment?

As Earth's climate warms, sea levels rise and snow and ice melt sooner in the spring, causing animals, and ecosystems to come under greater environmental stress.

World Population

The diverse life on Earth is interconnected in a "web of life." Maintaining biodiversity is crucial to the welfare and future of human life. Biodiversity also contributes mightily to the quality of life on Earth, providing climate regulation, fiber, food, clean water, and clean air.

Many of our medicines come from plants. We rely on wild populations of fish, shellfish, trees, and many other species for food, rubber, wood, and other products. When a species becomes extinct, it diminishes our lives and those of future generations.

Consider how the world's growing population can reduce biodiversity. You may want to do research on your own before you speak with your counselor about how the needs of the world's people affect the sustainability of life on Earth.

Climate Change

On any given day, you might see the weather change from sunny and warm to cold with thunderstorms. As you go through each year, you see the seasons change from spring to summer to fall to winter.

Earth's climate may be changing, too, but in ways that are more significant and far-reaching than daily or seasonal shifts in the weather. While Earth's climate has gone through many periods of change in its long history, the actions of people may now be adding significantly to the changes.

Conserving water now is our best way to "Be Prepared" for the future.

When people around the world started burning large quantities of coal, oil, and natural gas to power their homes, vehicles, factories, and businesses more than 100 years ago, the burning of these fossil fuels began releasing large amounts of carbon dioxide. Most scientists agree that fossil fuels are a significant factor in our changing climate.

Greenhouse gases exist naturally in the atmosphere. As the world's population has grown, however, the added gases from human activities seem to be causing Earth to grow warmer at a faster rate, and have set off many other changes on land, in the atmosphere, and in the oceans. These changes affect animals, plants, and people in many ways.

Scientists predict that higher temperatures can lead to more droughts, wilder and more extreme weather due to changing rain and snow patterns, less snowpack, and rapidly melting glaciers, shrinking sea ice, and thawing permafrost.

Less rain can mean water sources dry up in some locations, while too much rain can cause devastation from terrible flooding in other places. More hot days can make crop harvests smaller and sicken animals and people.

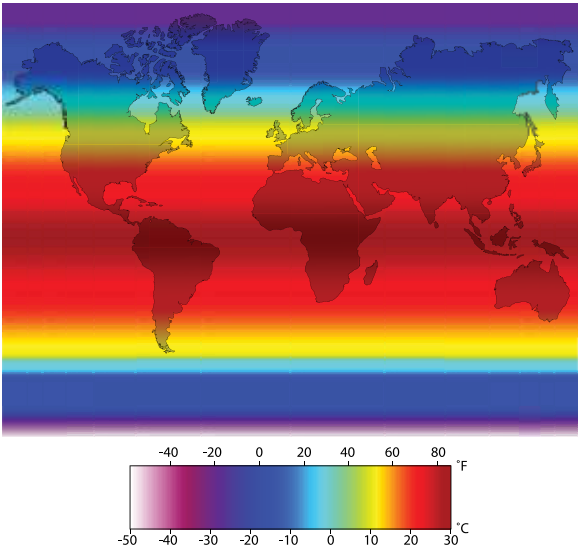
Oceans play an important role in keeping Earth's carbon cycle in balance. Warmer water and increased ocean acidity from absorbing excess carbon dioxide can make it hard for corals to build skeletons, and for shellfish to build the shells needed for protection. As the acidity in the ocean rises, more and more marine species may be unable to reproduce and may die out.

According to the U.S. Environmental Protection Agency, more deaths are caused by heat waves each year than by hurricanes, tornadoes, floods, and earthquakes combined.

Severe heat waves and stronger hurricanes are other possible effects from climate change. These changes may make it too hot to grow certain crops, and could reduce the amount of water available for irrigation.

Rising temperatures and an increase in the intensity and number of droughts worldwide will likely cause freshwater supplies to diminish. People will have to make lifestyle changes, using less water in their homes and businesses.

Annual Average Temperature Map



Heat waves, severe storms, air pollution, and diseases linked to climate may leave many people at risk for illness, especially infants, the elderly and disabled, and those who live in big cities and along coastlines. Heat waves can be lethal for people who are already ill.

Ozone found high in the atmosphere is called "good ozone" because it protects life from the sun's harmful ultraviolet rays. But ozone close to Earth's surface is considered "bad ozone" because it is a main ingredient of smog. The pollutants in smog make it hard for people to breathe. As the temperature rises, more ozone is created.

Most plants and animals live in areas with specific climate conditions that allow them to thrive. Any change in the climate of an area can affect the plants and animals living there, and the entire ecosystem they depend on to survive.

Some species are already moving to cooler locations. On a warming Earth, plants and animals that live in cold places, such as the Arctic, may not have suitable places to live any longer. Some scientists predict that up to one-fourth of all plants and animals on Earth could become extinct within the next 100 years.

In every ecosystem, all plants and animals play roles in the web of life. For example, some plants and animals are sources of food; others are predators, pollinators, or sources of shelter. Losing one element of an ecosystem can harm many others.

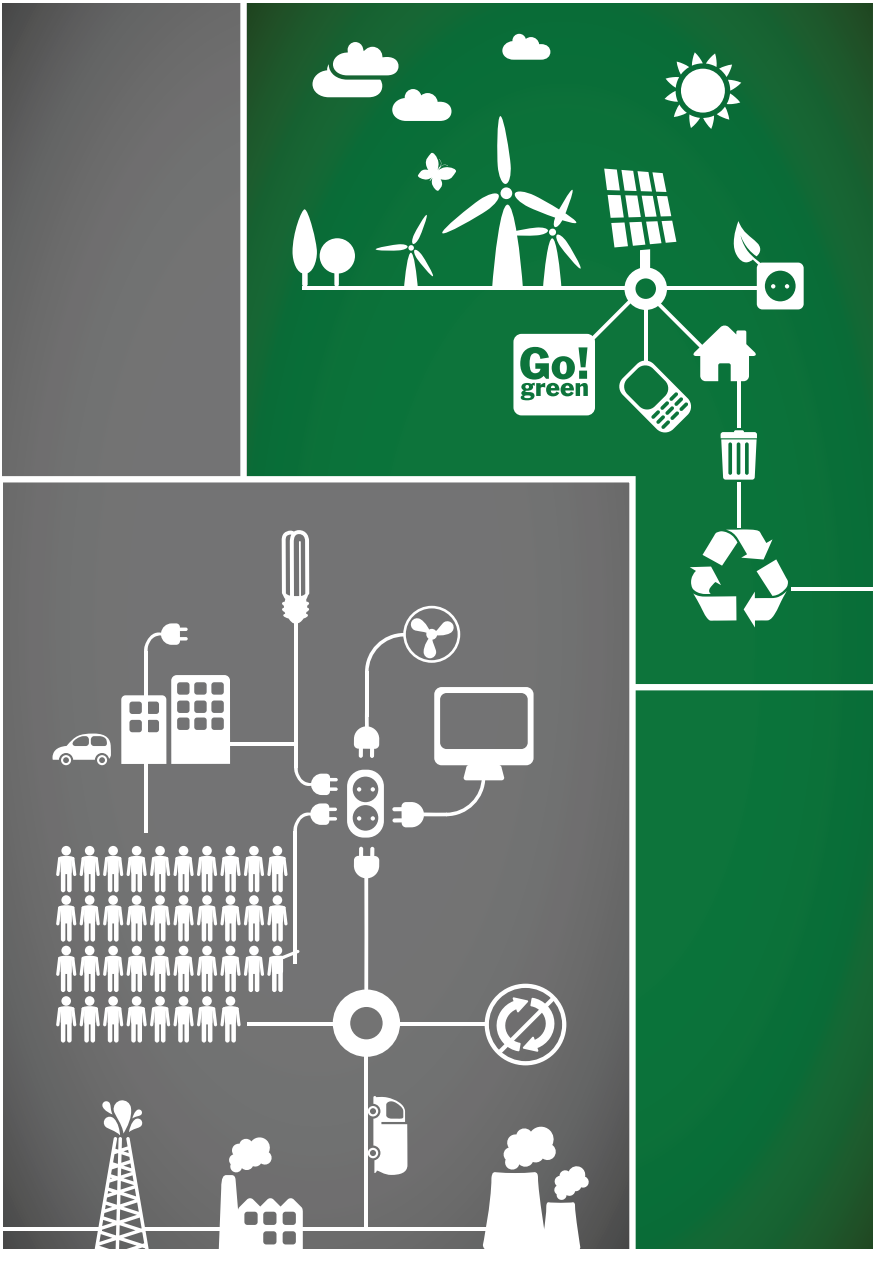
Reducing the use of fossil fuels and reducing garbage waste gives the coral reefs a better chance of surviving the effects of climate change.

Forests are particularly sensitive to climate change, because they can't get up and move when it gets too warm. Forests provide homes, shelter, and food for many kinds of plants and animals. Trees protect water quality in rivers, lakes, and streams. They also filter many pollutants out of the air we breathe. They can lower heating and cooling costs when near homes.

Severe droughts and the extreme fire conditions that result when long-term drought conditions take hold are expected to occur more often. On a warming Earth, wildfires may occur more often, spread faster, and burn more forestland than they do now.

To do some climate-change research of your own, find a map that shows the pattern of global temperature change for a period of at least 100 years. Discuss with your counselor the major factors that scientists believe affect the world's climate and temperature. You might also share your ideas about the seriousness of climate change and how to find solutions for the problems it is predicted to create.

Proper forest management based on scientific principles can help forests be healthier and resist their vulnerability to drought, disease, and insect attack, while providing renewable wood for products we all need.


Go!
green

How People Can Support Sustainability

Throughout this pamphlet are tips for sustainable living. Here are more actions you can take.

Choose green power. Talk with your family about switching to renewable energy.

Generate your own power. Can your home generate its own renewable energy? Talk with your family about the possibility of installing solar panels, a solar water heater, or a wind turbine.

Use less energy. Power down appliances and electronic devices when not in use.

Get an energy audit. An audit can help your family figure out how much energy your home uses and identify ways to reduce your energy use.

Look for the label. Energy-efficient appliances and electronics typically use about 10 to 50 percent less energy than regular models. Look for products that display the Energy Star label. Also look for products that display the Sustainable Forestry Initiative label. Wood and paper products from certified forests ensure forest sustainability.

Be energy wise at school. Schools can partner with the EPA's Energy Star program to reduce their energy use.

Travel greenly. Walk, bike, and hike when you can be safe doing so.

Watch your water use. Don't squander this precious resource.

Reduce waste. Reduce, reuse, recycle. Make compost. Upcycle useless items into things of value.

Plant a tree. Trees absorb carbon dioxide and provide shade.

Buy locally grown food. The farther your food travels, the more greenhouse gases are produced in getting it from the farm to your plate.

Spread the word. Teach others what you have learned.

Join with others. Find environmental or other public-interest groups that focus on sustainability issues in your community or region, and lend your time and support to their efforts.

Lead a Family Meeting About Sustainability

After completing requirements 1 through 4, have a family meeting to talk about what you and your family have learned about becoming sustainable citizens. Discuss the behavioral changes and life choices that your family can make to live more sustainably.

Scouting has taught you values that you use in your everyday life. How can living by the Scout Oath and Scout Law in your daily life help promote sustainability and good stewardship? Talk to your counselor about what you have learned.

Doing Your Part: Minimizing Your Global Footprint

You might ask yourself what role you play in sustainability, what you can do to help sustain Earth. Earning the Sustainability merit badge is the first big step in educating yourself and increasing your awareness about the topic. Continue the trend by making your family, friends, and classmates more aware.

There are lots of steps you can take toward net zero waste, from how you wash dishes or brush your teeth, to how you can be a smart shopper. Turn that water off. Buy only what you need or will consume. Help reduce what goes in our landfills and make purchases based on minimal packaging. Practice the three R's of green living—recycle, reuse, reduce.

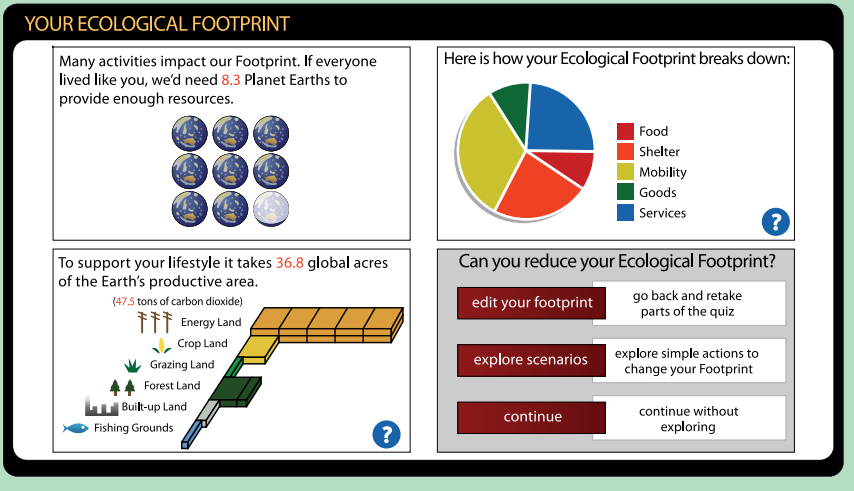
Take a genuine interest in practicing what you have learned and changing your lifestyle and habits at home, school, work, your place of worship, and in your community. You—and your family—can make a pledge to be sustainability citizens. Who knows, you might take it a step further and pursue a career in the growing field of sustainability.

Take the Footprint Calculator Challenge

To find out your ecological footprint, take the "Footprint Calculator" quiz found at the Global Footprint Network website www.footprintnetwork.org/en/index.php/GFN/page/calculators. You will learn how much land it takes to support your lifestyle, how much carbon dioxide you generate, and how many planet Earths it would take if everyone lived just like you.

The calculation is based on a number of factors, such as the foods you consume, where you live, the goods and services you depend upon, and how you get around. Once you have your ecological footprint, start thinking about the ways you can change your lifestyle and adopt new habits. Walk, bike, or take the bus, for example. Then go back and retake the quiz to see how those changes can help you reduce your ecological footprint. The results might surprise you.

The global footprint shown here is typical of a U.S. businessperson. The calculation shows how it takes 8.3 Earths and 36.8 global acres of Earth's productive area to maintain this individual's lifestyle, which generates 47.5 tons of carbon dioxide each year.



Source: Global Footprint Network

The Scout Law and Sustainability

A Scout is:

Trustworthy. Sustainability starts with you, and helps you to stand out as a young leader. You can help by recycling, and advocating green solutions to everyday issues.

Loyal. Demonstrate sustainability by being the voice of reason and reminding others we all share limited resources.

Helpful. You can make a difference in your family and in your community—and help our world—by using only what you need. Take time to share with others what you are doing.

Friendly. Volunteer in your community at a community garden, recycling center, or other sustainable activity and encourage others to do the same. This can be a fun and exciting way to see firsthand how, when we all are working together, we can make a difference in this world.

Courteous. Always thank people for their help and understanding, because we all benefit from sustainability and thinking about how our actions, no matter how small, affect others.

Kind. Treat this world with respect, save valuable resources and set an example for others to follow. Take time to smile; it does make a difference.

Obedient. To protect the world's resources you need to be true to yourself and believe in sustainability.

Cheerful. Tell your stories of sustainability activities and projects with a smile, knowing you are making a difference, and others just might take action based on how you tell your story.

Thrifty. Track your savings at home or in your troop on solid sustainability actions.

Brave. You can be a leader at home or in your community when taking the appropriate actions. Stand up for what is right; start with your actions so you and your family can lead others to engage in sustainable living.

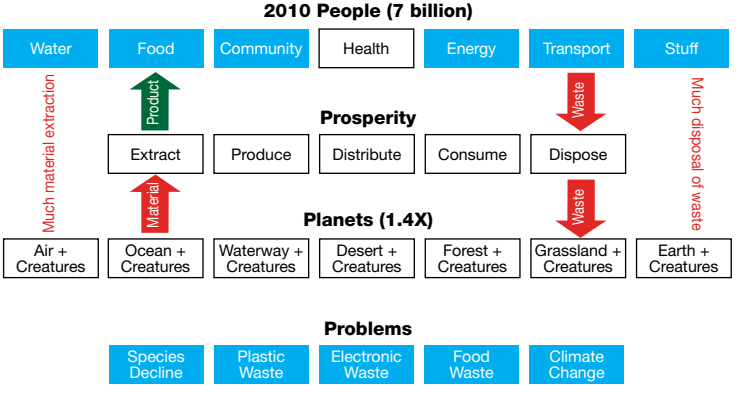
Clean. Respect our world and the valuable resources we are consuming every day. You can always help by understanding what is really needed and talking with others to protect the air we breathe, and the water we drink.

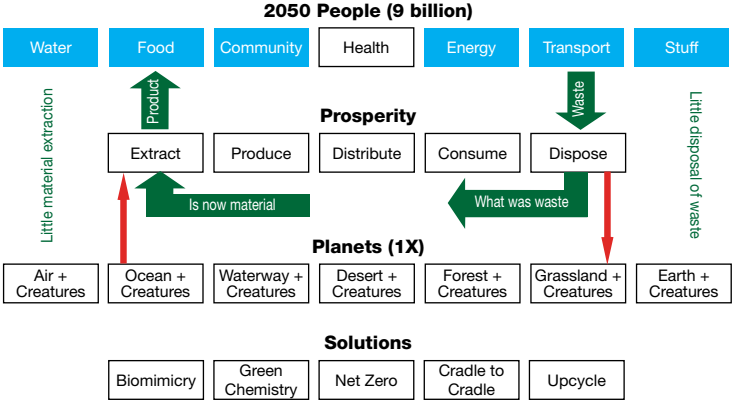
Reverent. Always consider other points of view and be true to Earth, as we all live here together.

Remember that sustainability starts with you.

Camp Emerald Bay

These charts*, which show the relationship between people, prosperity, and the planet, are examples of additional materials and resources available for those who want to learn more about sustainability than can be presented in a merit badge pamphlet. The blue boxes represent topics covered in detail in this pamphlet; the white boxes represent deeper topics that can be researched online. (Be sure to get your parent or guardian's permission before going online.)





Source: Scott Harmon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Careers in Sustainability

Scouts can use their science skills in many ways to help create a sustainable future, from developing sources of renewable energy to securing habitats for endangered wildlife or creating nonpolluting plastics.

Scientists in all fields working together and with the community will be needed to help solve the increasingly complex problems our world is facing. Here are some career paths in sustainability that may be of interest to you.

Environmental consultants study the ecological impacts of conservation, development, and industry projects and recommend solutions to environmental problems. Natural resource managers care for ecological resources for private and public organizations. Park naturalists provide education programs to people of all ages.

Restoration ecologists carry out programs to reestablish natural ecosystems. In the field of geography, geographic information system specialists evaluate alternative locations for landfills, roads, and other facilities using computer-based map information.

Area specialists study specific countries or regions of the world and provide information to help government officials set policy or address important issues. Coastal zone managers oversee ecologically sensitive areas, such as river mouths, bays, and marshes, so the areas can better survive the growth of cities, ports, industries, and roads as well as an increase in tourism.

In public health careers, statisticians help interpret data. Mathematicians analyze the data to develop models, for example, to predict epidemics and to compare various strategies to combat epidemics. Mathematicians and statisticians also create models that can help find oil reserves, understand complex biosystems, forecast weather, and predict storm surges.

Many large companies employ sustainability officers to ensure their business is functioning with sustainability in mind.

Sociologists can use their understanding of human interaction to help create sustainable pathways for the future. Careers for sociologists include environmental policy, environmental outreach, environmental law, urban planning, communications, environmental affairs, resource management, conflict mediation, government or university sustainability coordination, sustainable development, and human dimensions science.

Chemists and chemical engineers design products and processes that can eliminate or reduce hazardous substances. Careers in green chemistry and engineering can lead to new household products, green building materials, and energy-efficient devices.

The complex issues surrounding global climate change will provide jobs for chemists and engineers in the government and private sectors as challenges to sustainability arise and solutions must be developed.

Park rangers protect state and national parks and educate the public in preservation of natural resources.

Biologists also work to solve environmental problems and preserve natural habitats. Zoo biologists undertake endangered species recovery programs. Wildlife biologists manage, protect, rehabilitate, and enhance wildlife habitat.

Management and conservation biologists work with community members and special-interest groups to develop and implement land-management programs. Science advisors work with organizations to study and address the economic impacts of biological issues.

Psychologists, who are trained to study human behavior, may research such topics as understanding environmental beliefs, attitudes, and values and determining the emotional benefits humans receive from green, open spaces. Psychologists may also study the local ecological concepts of a native society.

Foresters manage forest resources to sustainably provide products that people need as well as habitats for wildlife, watersheds for clean water, recreational opportunities, and jobs that support communities.

Landscape architects plan and design outdoor spaces for homeowners, businesses, and others. They understand how to make the best use of large land areas, protect or restore natural resources, and also help preserve historic areas. Landscape architects are leaders in the area of sustainable, "green" designs.

Geologists, geophysicists, hydrologists, oceanographers, marine scientists, meteorologists, environmental scientists, and soil scientists gather and interpret data about Earth and other planets, using their knowledge to increase our understanding of natural processes. Atmospheric scientists study weather, solar radiation, climate and its effects, ozone depletion, climate change, and pollution.

Economic geologists study metallic and nonmetallic resources and mineral deposits, and find safe ways to dispose of waste materials from mining. Environmental geologists study the ways in which land, water, air, and humans interact. They also work to find solutions to pollution, waste management, flooding, and erosion.

Civil engineers help to meet human needs for industrial products, natural resources, food, transportation, shelter, waste management, and energy while protecting environmental quality and the natural resources essential for future development.

Mechanical engineers design and manufacture more efficient vehicles and power systems that use renewable energy sources, along with many other products needed for creating a sustainable world.

Electrical and computer engineers design information systems to connect people working on projects in remote areas, create networks that allow communities to quickly report data such as disease outbreaks or receive warning of natural disasters, and give people in developing countries access to the internet. They also design computer chips and circuit boards to be more environmentally friendly.

Congratulations! In fulfilling the requirements for the Sustainability merit badge, you have become a better citizen of planet Earth. As you go forward in your life and in Scouting, remember all the things you have learned about living a sustainable lifestyle.

Go forth and be green!

See the resources section to find more about sustainability and careers in the field.

Glossary

biological diversity. The full range of variety and variability within and among living organisms and the ecological complexity in which they occur, encompassing ecosystem, species, and genetic diversity.

biomass. The total mass of living matter within a given unit of environmental area. Also refer to all plant material, vegetation, or agricultural waste used as a fuel or energy source.

biosphere. The entire Earth including the atmosphere and all the living organisms that inhabit it.

carbon footprint. The sum of all emissions of CO_2 (carbon dioxide) that are induced by your activities in a given time frame. Usually a carbon footprint is calculated on a yearly basis.

climate change. A change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

consumption. The use of a resource.

eco-city. A human settlement that uses the least possible resources, keeps waste and pollution to a minimum, and builds dwellings to make good use of sun, wind, and rain. Food and goods are sourced locally. Transportation is limited to walking and cycling, with public transport for longer journeys.

eco-village. A small-scale intentional community with the goal of being more socially, economically, and ecologically sustainable while having less of an ecological impact.

extinction. When all members of a species cease to exist.

global economy. The world's nations, their respective economies, and the institutions that unite them in a global marketplace. Developments since World War II and especially since the early 1990s have enabled rapid movement of goods and services around the world, causing greater interdependence in trade and creating a system where the economic status of one nation affects many.

graywater. The relatively clean wastewater from bathtubs, sinks, washing machines, and dishwashers.

green chemistry. A philosophy of chemical research and engineering that encourages the design of products and processes that minimize the use and generation of hazardous substances; also called sustainable chemistry.

habitat destruction. The process through which a natural habitat is rendered unable to support the species present.

industrial pollution. Pollution resulting from an industrial plant releasing harmful emissions into the environment.

natural resources. Materials or substances such as minerals, forests, water, and fertile land that occur in nature and can be used for economic gain.

oil reserves. An estimate of the amount of crude oil located in a particular economic region. Oil reserves must have the potential of being extracted under current technological constraints. For example, if oil pools are located at unattainable depths, they would not be considered part of a nation's reserves.

organic farming. A form of agriculture that relies on techniques such as crop rotation, green manure, compost, and biological pest control. Organic farming uses fertilizers and pesticides but excludes or strictly limits the use of manufactured (synthetic) fertilizers, pesticides (which include herbicides, insecticides, and fungicides), plant growth regulators such as hormones, livestock antibiotics, food additives, and genetically modified organisms.

pollution. The presence in or introduction into the environment of a contaminating substance that has harmful or poisonous effects, thereby causing imbalance.

renewable energy. Energy that comes from resources that are continually replenished such as sunlight, wind, rain, tides, waves, and geothermal heat.

resource depletion. The use of resources, especially a natural resource, faster than it is replenished.

runoff. The draining away of water (or substances carried in it) from the surface of an area of land or a structure.

species decline. Reduction in the actual numbers of a species. Usually this decline is a result of a reduction in the area occupied by the species.

sustainable agriculture. A form of agriculture that uses nonrenewable agricultural resources and on-farm resources in the most efficient manner to sustain the economic viability of farm operations.

trash vortex. The Pacific trash vortex is composed of high concentrations of plastics, chemical sludge, and other debris trapped by the currents of the North Pacific Gyre. It is located in North Pacific Ocean roughly between 135°W to 155°W and 35°N and 42°N.

urban planning. The branch of architecture dealing with the design and organization of urban space and activities.

xeriscape. A style of landscape design requiring little or no irrigation or other maintenance that is used in arid regions.

wastewater. Water mixed with waste matter.

wildlife habitat. An ecological or environmental area that is inhabited by one or more species of wildlife.

Sustainability Resources

Scouting Literature

Scouts BSA Handbook for Boys; Scouts BSA Handbook for Girls; Fieldbook; Energy, Environmental Science, Fish and Wildlife Management, Forestry, Nature, Oceanography, Plant Science, Public Health, Soil and Water Conservation, and *Weather* merit badge pamphlets

With your parent's permission, visit Scouting America's official retail website, www.scoutshop.org, for a complete listing of all merit badge pamphlets and other helpful Scouting materials and supplies.

Books

Kaye, Cathryn Berger, and Philippe Cousteau. *Going Blue: A Teen Guide to Saving Our Oceans, Lakes, Rivers, & Wetlands.* Free Spirit Publishing, 2010.

Petronis, Lexi. *47 Things You Can Do for the Environment.* Zest Books, 2012.

Roa, Michael L. *Environmental Science Activities Kit: Ready-to-Use Lessons, Labs, and Worksheets for Grades 7–12,* 2nd ed. Jossey-Bass, 2008.

Savedge, Jenn. *The Green Teen: The Eco-Friendly Teen's Guide to Saving the Planet.* New Society Publishers, 2009.

Sivertsen, Linda, and Tosh Sivertsen. *Generation Green: The Ultimate Teen Guide to Living an Eco-Friendly Life.* Simon Pulse, 2008.

Organizations and Websites

American Association for the Advancement of Science
www.aaas.org

American Chemical Society Green Chemistry Institute
www.acs.org/greenchemistry.html

American Forest & Paper Association
www.afandpa.org

American Institute of Biological Sciences
www.aibs.org

Association of Fish and Wildlife Agencies
Telephone: 202-624-7890
www.fishwildlife.org

Center for Biological Diversity
www.biologicaldiversity.org

Eartheasy
eartheasy.com/grow_compost.html

Ecological Society of America
www.esa.org

EnviroLink Network
www.envirolink.org

Environmental Protection Agency
Telephone: 202-272-0167
epa.gov

Global Footprint Network
www.footprintnetwork.org

Leave No Trace Center for Outdoor Ethics
Toll-free telephone: 800-332-4100
www.lnt.org

NASA Climate Kids
climatekids.nasa.gov

The Nature Conservancy
www.nature.org

Natural Resources Conservation Service
Telephone: 202-720-3210
www.nrcs.usda.gov

Society of American Foresters
www.eforester.org

Sustainable Forestry Initiative
www.sfiprogram.org

U.S. Fish and Wildlife Service
Toll-free telephone: 800-344-9453
www.fws.gov

USDA Forest Service
www.fs.usda.gov

Acknowledgments

Scouting America greatly appreciates the tireless efforts of volunteers of Scouting America for their work in creating this merit badge. Without their vision, insight, expertise, and time, this merit badge and pamphlet would not have been possible. We would especially like to acknowledge Jonathan Harmon. He not only encouraged his family to live a more sustainable way of life, but it was his inspiration that brought this merit badge to life. We are thankful to the Crescent Bay Area Council's Camp Emerald Bay, Catalina Island, California, whose staff was instrumental in assisting with photography needs. We also thank the Orange County Council's Irvine Ranch Outdoor Education Center in California. We are grateful to Walmart Stores Inc.; Troop 64, Portola Valley, California; and George Denise for their support of this merit badge and pamphlet.

Many other individuals and organizations contributed to the development of the Sustainability merit badge and pamphlet. We thank them all here for their assistance and their role in educating our Scouts and encouraging them to adopt a more sustainable lifestyle than they had before earning the merit badge.

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Natural Resources Conservation Service/ Tim McCabe, courtesy—page 28

Sustainable Forestry Initiative, courtesy—page 49 *(logo)*

Wikipedia.org/evgonetwork, courtesy—cover *(car and pump)*; cover and page 59

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