MERIT BADGE SERIES

SUSTAINABILITY

BOY SCOUTS OF AMERICA®

How to Use This Pamphlet

The secret to successfully earning a merit badge is for you to use both the pamphlet and the suggestions of your counselor.

Your counselor can be as important to you as a coach is to an athlete. Use all of the resources your counselor can make available to you. This may be the best chance you will have to learn about this particular subject. Make it count.

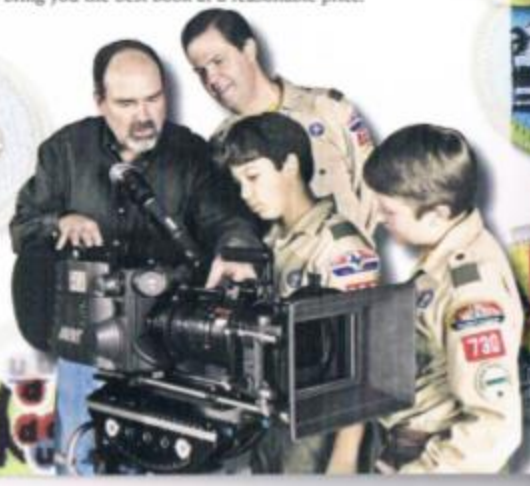
If you or your counselor feels that any information in this pamphlet is incorrect, please let us know. Please state your source of information.

Merit badge pamphlets are reprinted annually and requirements updated regularly. Your suggestions for improvement are welcome.

Send comments along with a brief statement about yourself to National Advancement Committee, S209 • Boy Scouts of America • 1325 West Walnut Hill Lane • P.O. Box 152079 • Irving, TX 75015-2079 • merit.badge@Scouting.org.

Who Pays for This Pamphlet?

This merit badge pamphlet is one in a series of more than 100 covering all kinds of hobby and career subjects. It is made available for you to buy as a service of the national and local councils, Boy Scouts of America. The costs of the development, writing, and editing of the merit badge pamphlets are paid for by the Boy Scouts of America in order to bring you the best book at a reasonable price.



BOY SCOUTS OF 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"

BOY SCOUTS OF AMERICA®

Requirements

1. Before starting work on any other requirements for this merit badge, write in your own words the meaning of *sustainability*. Explain how you think conservation and stewardship of our natural resources relate to sustainability. Have a family meeting, and ask family members to write down what they think sustainability means. Be sure to take notes. You will need this information again for requirement 5.
2. Do the following:

Water. Do A AND either B *OR* C.

A. Develop and implement a plan that attempts to reduce your family's water usage. Examine your family's water bills reflecting usage for three months (past or current). As a family, choose three ways to help reduce consumption. Implement those ideas for one month. Share what you learn with your counselor, and tell how your plan affected your family's water usage.

B. Using a diagram you have created, explain to your counselor how your household gets its clean water from a natural source and what happens with the water after you use it. Include water that goes down the kitchen, bathroom, and laundry drains, and any runoff from watering the yard or washing the car. Tell two ways to preserve your family's access to clean water in the future.

C. Discuss with your counselor two areas in the world that have been affected by drought over the last three years. For each area, identify a water conservation practice (successful or unsuccessful) that has been used. Tell whether the practice was effective and why. Discuss what water conservation practice you would have tried and why.

Food. Do A AND either B *OR* C.

A. Develop and implement a plan that attempts to reduce your household food waste. Establish a baseline and then track and record your results for two weeks. Report your results to your family and counselor.

B. Discuss with your counselor the ways individuals, families, and communities can create their own food sources (potted plants, family garden, rooftop garden, neighborhood or community garden). Tell how this plan might contribute to a more sustainable way of life if practiced globally.

C. Discuss with your counselor factors that limit the availability of food and food production in different regions of the world. Tell three ways these factors influence the sustainability of worldwide food supplies.

Community. Do A AND either B *OR* C.

A. Draw a rough sketch depicting how you would design a sustainable community. Share your sketch with your counselor, and explain how the housing, work locations, shops, schools, and transportation systems affect energy, pollution, natural resources, and the economy of the community.

B. With your parent's permission and your counselor's approval, interview a local architect, engineer, contractor, or building materials 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.

C. Review a current housing needs assessment for your town, city, county, or state. Discuss with your counselor how birth and death rates affect sufficient housing, and how a lack of housing—or too much housing—can influence the sustainability of a local or global area.

Energy. Do A AND either B *OR* C.

A. Learn about the sustainability of different energy sources, including fossil fuels, solar, wind, nuclear, hydropower, and geothermal. Find out how the production and consumption of each of these energy sources affects the environment and what the term "carbon footprint" means. Discuss what you learn with your counselor, and explain how you think your family can reduce its carbon footprint.

B. Develop and implement a plan that attempts to reduce consumption for one of your family's household utilities. Examine your family's bills for that utility reflecting usage for three months (past or current). As a family, choose three ways to help reduce consumption and be a better steward of this resource. Implement those ideas for one month. Share what you learn with your counselor, and tell how your plan affected your family's usage.

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C. Evaluate your family's fuel and transportation usage. Review your family's transportation-related bills (gasoline, diesel, electric, public transportation, etc.) reflecting usage for three months (past or current). As a family, choose three ways to help reduce consumption and be a better steward of this resource. Implement those ideas for one month. Share what you learn with your counselor, and tell how your plan affected your family's transportation habits.

Stuff. Do A AND either B *OR* C.

A. Keep a log of the "stuff" your family purchases (excluding food items) for two weeks. In your log, categorize each purchase as an essential *need* (such as soap) or a desirable *want* (such as a DVD). Share what you learn with your counselor.

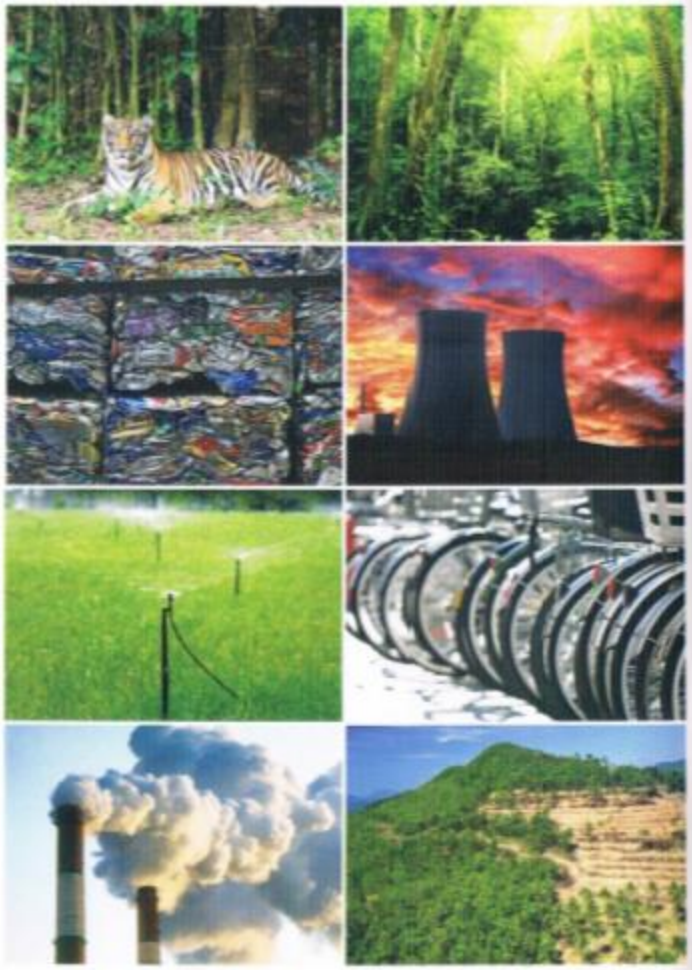
B. Plan a project that involves the participation of your family to identify the "stuff" your family no longer needs. Complete your project by donating, repurposing, or recycling these items.

C. Discuss with your counselor how having too much "stuff" affects you, your family, and your community. Include the following: the financial impact, time spent, maintenance, health, storage, and waste. Include in your discussion the practices that can be used to avoid accumulating too much "stuff."

3. Do the following:
   a. Explain to your counselor how the planetary life-support systems (soil, climate, freshwater, atmospheric, nutrient, oceanic, ecosystems, and species) support life on Earth and interact with one another.
   b. Tell how the harvesting or production of raw materials (by extraction or recycling), along with distribution of the resulting products, consumption, and disposal/repurposing, influences current and future sustainability thinking and planning.
4. Explore TWO of the following categories. Have a discussion with your family about the two you select. In your discussion, include your observations, and best and worst practices. Share what you learn with your counselor.
   a. **Plastic waste.** Discuss the impact plastic waste has on the environment (land, water, air). Learn about the number system for plastic recyclables, and determine which plastics are more commonly recycled. Find out what the trash vortex is and how it was formed.
   b. **Electronic waste.** Choose three electronic devices in your household. Find out the average lifespan of each, what happens to these devices once they pass their useful life, and whether they can be recycled in whole or part. Discuss the impact of electronic waste on the environment.
   c. **Food waste.** Learn about the value of composting and how to start a compost pile. Start a compost pile appropriate for your living situation. Tell what can be done with the compost when it is ready for use.
   d. **Species decline.** Explain the term *species* (plant or animal) *decline*. Discuss the human activities that contribute to species decline, what can be done to help reverse the decline, and its impact on a sustainable environment.
   e. **World population.** 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.
   f. **Climate change.** Find a world map that shows the pattern of temperature change for a period of at least 100 years. Share this map with your counselor, and discuss three factors that scientists believe affect the global weather and temperature.
5. Do the following:
   a. After completing requirements 1 through 4, have a family meeting. Discuss what your family has learned about what it means to be a sustainable citizen. Talk about the behavioral changes and life choices your family can make to live more sustainably. Share what you learn with your counselor.
   b. Discuss with your counselor how living by the Scout Oath and Scout Law in your daily life helps promote sustainability and good stewardship.
6. 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.

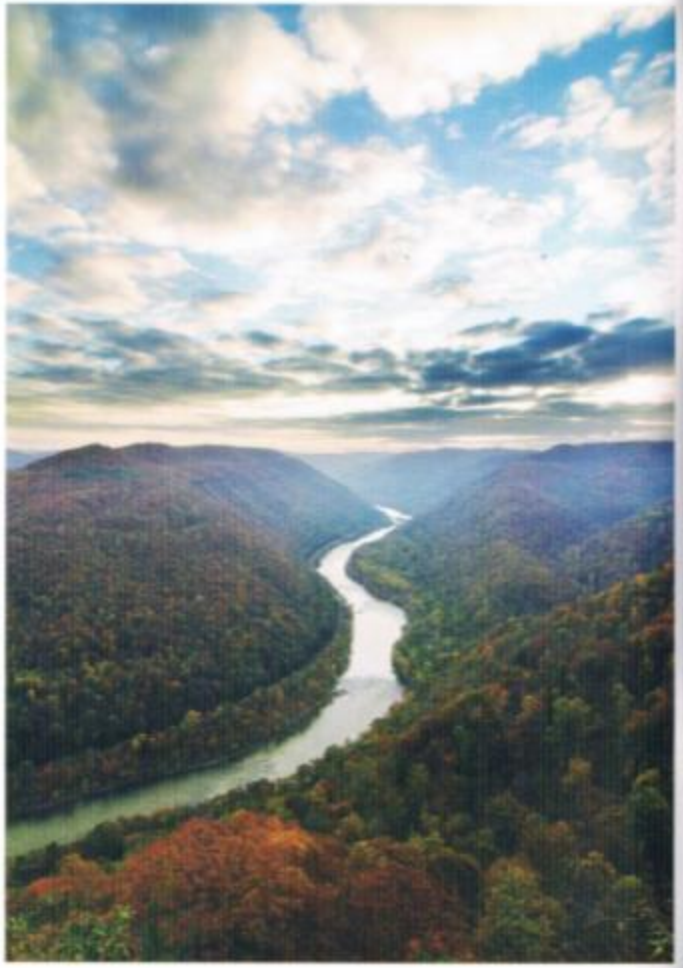
Sustainability begins with rethinking your individual lifestyle and becoming aware of how you can conserve natural resources. Moving toward a more sustainable lifestyle will challenge the attention, ingenuity, and know-how of your generation—the youth of America.

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, the Boy Scouts of 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, the BSA'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.

The BSA 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, the BSA's newest high-adventure base, in West Virginia

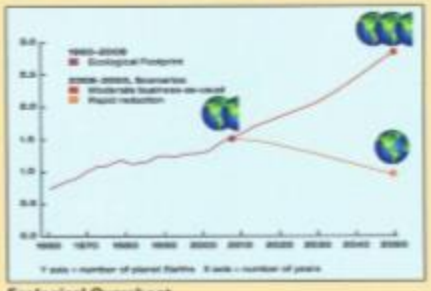
Ecological Overshoot

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.

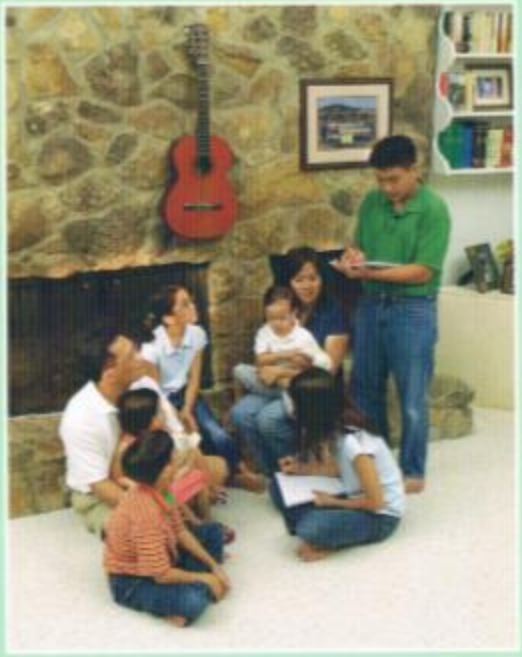


Ecological Overshoot

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

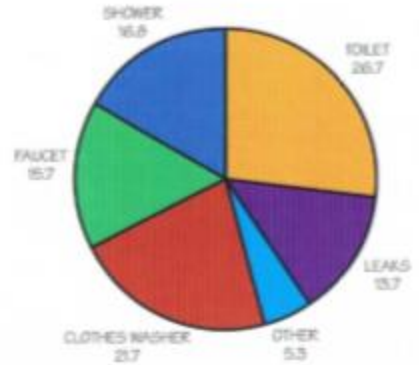
In the United States, people are fortunate to have easy access to some of the safest treated water in the world. For most of us, that means simply turning on the tap.

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 over-water 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.

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.

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.

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

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.

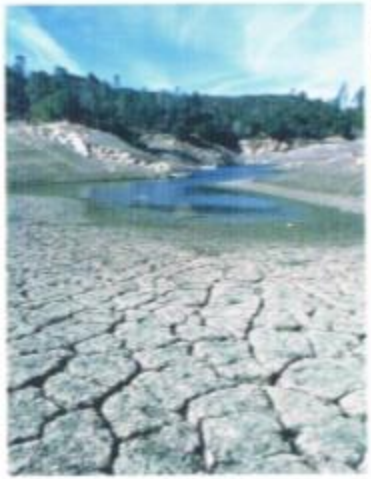
Water treatment facility

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 over-ripe 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 lots 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.

EMERALD◆BAY

Camp Emerald Bay: Scouts Tackle Sustainability

Located on the remote west end of Santa Catalina Island, California, Camp Emerald Bay is operated by the BSA'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.

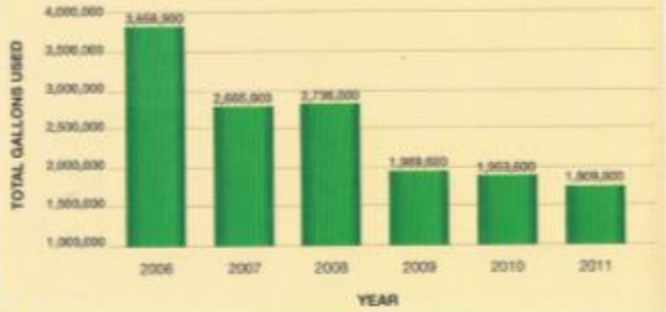
Pressure-assist toilets. These units need only 1.0 gallon per flush, using air pressure to push water through the bowl.

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.

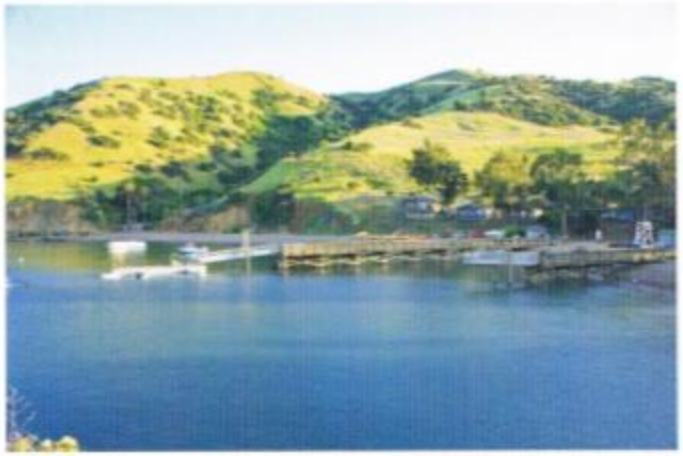
Improved leach fields. All drains in the camp lead to septic tanks, which treat the water and release it into vegetated areas known as leach fields. The elimination of salt-based water softeners has reduced the salty brine from the septic system and produced better soil in the leach fields.

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.