Girl Scouts of Central Texas - Sustainability Patch

**Statement of purpose:** When Girl Scouts have completed their sustainability patch, they’ll know more about the connections between humans and their natural environment. They will recognize how some of their everyday actions affect the world around them.

**About:** This patch can be earned at the troop or individual level. The curriculum is customizable and can be suited to both younger and older Girl Scouts. A field trip to the LBJ Wildflower Center, a park, or a nature center couples nicely with the topics covered by this curriculum but is not a requirement for the patch.

**Definition of “sustainability” from EPA:** “Sustainability is based on a simple principle: Everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment. To pursue sustainability is to create and maintain the conditions under which humans and nature can exist in productive harmony to support present and future generations.” (https://www.epa.gov/sustainability/learn-about-sustainability#what)

**Patches:** Patches will be available at the Girl Scouts of Central Texas retail store at 12012 Park Thirty-Five Circle, Austin, Texas 78753. For more information, email: austinshop@gsctx.org or call (512) 490-2316.

**Special thanks:** LBJ Wildflower Garden & National Fund for the United States Botanic Garden

To earn the sustainability patch, pick three of the four topics (water, plants & soil, energy, and/or habitat) to explore.

I. Water

   **a. Make a rain map:** Have the girls pretend that it is raining (perhaps it is!) where they are.

      i. **Do:** Go outside.

      ii. **Ask:** Where are some of the places that rain goes when it falls in this area?

      iii. **Do:** Have each girl create a map of their location that shows all the places they notice or imagine that rainwater would flow.

      iv. **Share:** Share out loud all the places that everybody noticed or imagined that rainwater would flow.

      v. **Discuss** the words “impervious” and “pervious”.

         1. Pervious definition – allowing water to pass through

         2. Impervious definition – not allowing water to pass through

   vi. **Share:** Share examples of things that are pervious (coffee filters) and impervious (concrete).

   vii. **Ask:** Which places on your maps were pervious and which were impervious?

      1. **Ask:** When water goes through a pervious surface, like soil, where does it go?

      2. **Ask:** When water falls on an impervious surface, where does it go?

      3. **Discuss:** Think about where you live (house, apt) – what areas are pervious and what areas are impervious?

   **b. Rain in your area:** Look at pictures of urban, suburban, and rural areas.

      i. **Ask:** Which picture most looks like where you live?

      ii. **Do:** Compare pervious vs. impervious land space in each of the pictures. Put the pictures in order from most pervious to least pervious.

      iii. **Do:** Look at the pictures, what happens when it rains a little, some, and a lot in each of these areas?
iv. **Brainstorm:** How can cities increase pervious space? What benefits might that have?

c. **Water in your state:** Look at a water map of Texas (*printing one might be useful*)
   i. **Ask:** Where are the different places that you see water on the map in Texas? (rivers, aquifers, streams, reservoirs)
      1. **River definition:** A natural stream of water of considerable volume.
      2. **Stream definition:** A general term for a body of flowing water. The term is generally applied to the water flowing in a natural channel (versus a canal)
      3. **Tributary definition:** A stream or other body of water, surface or underground, which contributes its water, even though intermittently and in small quantities, to another and larger stream or body of water.
      4. **Aquifer definition:** A water-bearing stratum (layer) of permeable rock, sand, or gravel.
      5. **Ground water definition:** The supply of fresh water found beneath the Earth's surface (usually in aquifers) which is often used for supplying wells and springs.
      6. **Lake definition:** An inland body of water, usually fresh water, formed by glaciers, river drainage etc., larger than a pool or pond. Bodies of water filling depressions in the earth's surface.
      7. **Reservoir definition:** A pond, lake, tank, or basin (natural or human made) where water is collected and used for storage
      8. **Ocean definition:** The great bodies of salt water which cover more than two-thirds of the earth's surface. *(Source: https://water.usgs.gov/edu/dictionary.html)*
   ii. **Ask:** Are there places that aren’t on the map where you might find water (water towers, stored in plants, in our bodies, in pipes, in water bottles)?
   iii. **Do:** Have the girls find where they live on the map.
      1. **Ask:** Do you recognize the water features on the map? Have you seen those before in real life?

d. **Human impact on water quality:**
   i. **Discuss:** What is pollution? What are some sources of pollution (pesticides, fertilizers, pet & animal waste, factories, refineries, water treatment plants)?
   ii. **Do:** Add a few stickers (or some other marker) to represent areas of pollution on your map of Texas.
      1. **Ask:** How might those areas of pollution affect our water in Texas?
      2. **Do:** Trace all the ways that pollution might leach into underground bodies of water or travel in above-ground water and to our oceans.
         a. **Leaching definition:** The process by which soluble materials in the soil, such as nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water.
   iii. **Ask:** What are things you can do to reduce water pollution?

II. **Plants & Soil –**

a. **The dirt on dirt:**
   i. **Ask:** What is soil? Have the girls share their thoughts.
   ii. **Say:** Soil is made up of living and non-living things. Soil is a mixture of minerals from rocks, organisms in the soil, and organic matter.
iii. **Do:** Have the girls sort dirt’s components into living and non-living categories.
   1. Minerals from rocks (non-living)
   2. Organic matter – decomposing plant and animal residues (non-living)
   3. Organisms in the soil (worms, bacteria, bugs; living)
iv. **Ask:** Why is soil important? (it provides nutrients for plants, filters water, decomposes living things)
   1. Ask: Would we be able to eat without soil? Why? Why not?
v. **Ask:** What is the soil like where you live?
vi. **Do:** Dig up a sample of soil and put it in a shallow container. Make observations about your soil.
   1. How much soil do you have? Can you weigh it?
   2. Is it wet or dry?
   3. Is it light or dark?
   4. Is it sandy or like clay?
   5. Was the soil loose or packed when you dug it up?
   6. What do you see in your soil?
   7. Did you find any critters in your soil? If so, what are they doing? Are the critters adapted to living above or below the soil? How can you tell?
   8. Did you find any plant material in your sample?
vii. **Do:** Look at the Texas soil map.
   1. **Discuss:** What is something new that you have learned from looking at this map?
b. **Keeping soil healthy** – One way that we can help put nutrients back into the soil is by composting. Composting speeds up the natural decomposition process of our green waste. As the green waste decomposes, nutrients are released back into the soil so that plants can use them to grow.
   i. **Do:** Look at pictures of waste items, what are things that can be composted and what are things that can’t be composted? **OR** look or imagine what’s in a trash can nearby, what are things that can be composted and what are things that can’t be composted?
   ii. **Ask:** Why might it be important to make sure that we compost and return nutrients to the soil? What is the benefit of doing that?
c. **Extra credit:** Build a compost pile & learn about the advantages of composting.
d. **Extra credit:** Bury an apple (or bury one apple with skin and one that has been peeled). Dig it up every now and then and look at it and then re-bury it. How does it change? How long does it take to disappear? Draw pictures of it every time you look at it. If you buried two apples, is there a difference in the decomposition rate?
e. **Fun activity:** use chocolate pudding, gummy worms, crushed up cookies, candy rocks to create an edible potted plant

### III. Energy

a. **Plug it in:** This activity is focused on recognizing the ways that we receive energy for home and personal use.
   i. **Ask:** What are things in your daily life that use energy? (appliances, car, phones, lights, etc).
   ii. **Ask:** Where does the energy to power those objects come from? (electricity, gas, solar panels, etc.)
iii. **Say:**

The majority of our electricity is made in power stations. A power station has large machines called turbines. Coal is burned to heat up the turbines to make them spin. As they spin, they turn magnets within coils (generators) which causes charged particles to move down the electric wire – electricity! (source: solarschools.net). Burning coal is one of our main sources of creating electricity. However, coal has to be mined and it creates some pollution when it’s used to make electricity. **“Renewable energy” is a term that we use to talk about sources of electricity that won’t ever run out.** (Source: https://www.nationalgeographic.org/media/where-does-electricity-come/)

iv. **Say:** “Renewable energy” is a term that we use to talk about sources of energy that won’t ever run out.

1. **Ask:** What are some sources of energy that don’t ever run out (wind, sun, dams)?

v. **Do:** Look at a map of the United States. Think about its geography.

1. **Ask:** Where would be a good place for us to build: wind turbines farms, solar farms, dams to capture hydroelectric power, tidal energy?
2. **Ask:** What is a good source of renewable energy that could be created where you live?

vi. **Extra credit:** Research your local energy company. What percentage of their energy comes from renewable versus non-renewable sources?

b. **It’s so hot you could fry an egg!** The sun provides us with energy. We often recognize that energy in the form of heat. Heat radiates down from the sun, but it also is reflected up from the surface. In this exercise, girls will compare air and surface temperatures in both human and natural landscapes.

i. **Discuss:** Talk to the girls about energy coming down from the sun. Where does it go?

**Answer:** Some gets absorbed into the surface and some gets reflected up into the air. Different surfaces reflect & absorb different amounts of light and heat. For example, a mirror reflects a lot of light/energy.

ii. **Do:** Using thermometers (infrared if you have them – they can be purchased at Amazon or at a home building supply store) or just the girls’ sense of touch, explore the surface temperature of different surfaces. Measure the surface temperature of asphalt in the sun, asphalt in the shade, soil in the sun, soil in the shade, a lightly colored surface, and a darkly colored surface. Also measure the temperature of the air above these surfaces. Keep record of your findings.

iii. **Discuss:** Compare temperatures of places. What was the hottest? What was the coolest? Why?

1. **Discuss:** What cooled down the surface temperature? What warmed up the surface temperature?
2. **Prompt, if needed:** Where are you cooler: under a shady tree or in the parking lot? Why?
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iv. **Discuss:** Imagine a city that was 100% asphalt, what would the temperature of that city be like? What would the temperature of a city that was 100% vegetation be like? Why does this matter?

v. **Discuss:** Scientists have noted that the temperature of cities is often several degrees warmer (“urban heat island effect”) than the surrounding rural areas. Why might that be? What changes in the city could be made to cool it down?

c. **Extra credit** – Build a solar oven! Use the power of the sun to cook or warm your food. Basic designs use foil or mirrors and cardboard.

d. **Extra credit** – Is it hot enough to actually fry an egg?

IV. **Habitat**

a. **What is a habitat?**
   i. **Do:** Look at pictures of different animals.
      1. **Ask:** What is their habitat like?
      2. **Ask:** How do you suppose their habitat provides them with food, shelter, and protection?
      3. **Imagine:** Pick an animal from one of the pictures. Pretend you put that animal into one of the other animal’s habitats, what would happen? (example: put the penguin in the desert)
         a. Animals do best in their own habitat – they have the food, shelter, and protection that they’re best suited for.
   ii. **Ask:** What is your habitat like? Where do you get food, shelter, and protection?
      1. **Ask:** How is your habitat like the animals in the picture? How is it different?

b. **Habitat make-believe:** Design a pretend habitat. When you’re drawing think about how the habitat will provide an animal with food, shelter, and protection.
   i. **Say:** Penguins have smooth, waterproof feathers and short wings that allow them to thrive in their watery habitat. Their waterproof feathers are an adaptation that they have to their wet environment. Another adaptation they have is a layer of fat to keep them warm in their very cold habitat.
   ii. **Say:** Think about your habitat, what adaptations would an animal in your habitat need to survive?
   iii. **Do:** Draw a pretend animal for your pretend habitat.

c. **Think like a scientist:** Monarch butterflies migrate 3000 miles south to Mexico during the colder months of the year. However, the amount of butterflies migrating each year has declined over the past decades. Part of a butterfly’s habitat is its food source. Butterflies will only lay their eggs on milkweed because when the eggs hatch into caterpillars, the caterpillars love to eat milkweed. Scientists think that our use of pesticides has reduced the amount of naturally occurring milkweed plants. This has decreased the numbers of monarch butterflies.
   i. **Ask:** What would you do to solve this problem?
   ii. **Do:** Learn about how citizen scientists track the monarch migration each year on this website. You can see a current map of monarch migration on this website: https://www.learner.org/jnorth/monarchs

d. **Extra credit - take action:** Support monarch migration by planting milkweed at your home, scout house, or school.
Tie it all together with a field trip to a local nature center, wildflower center, or park!