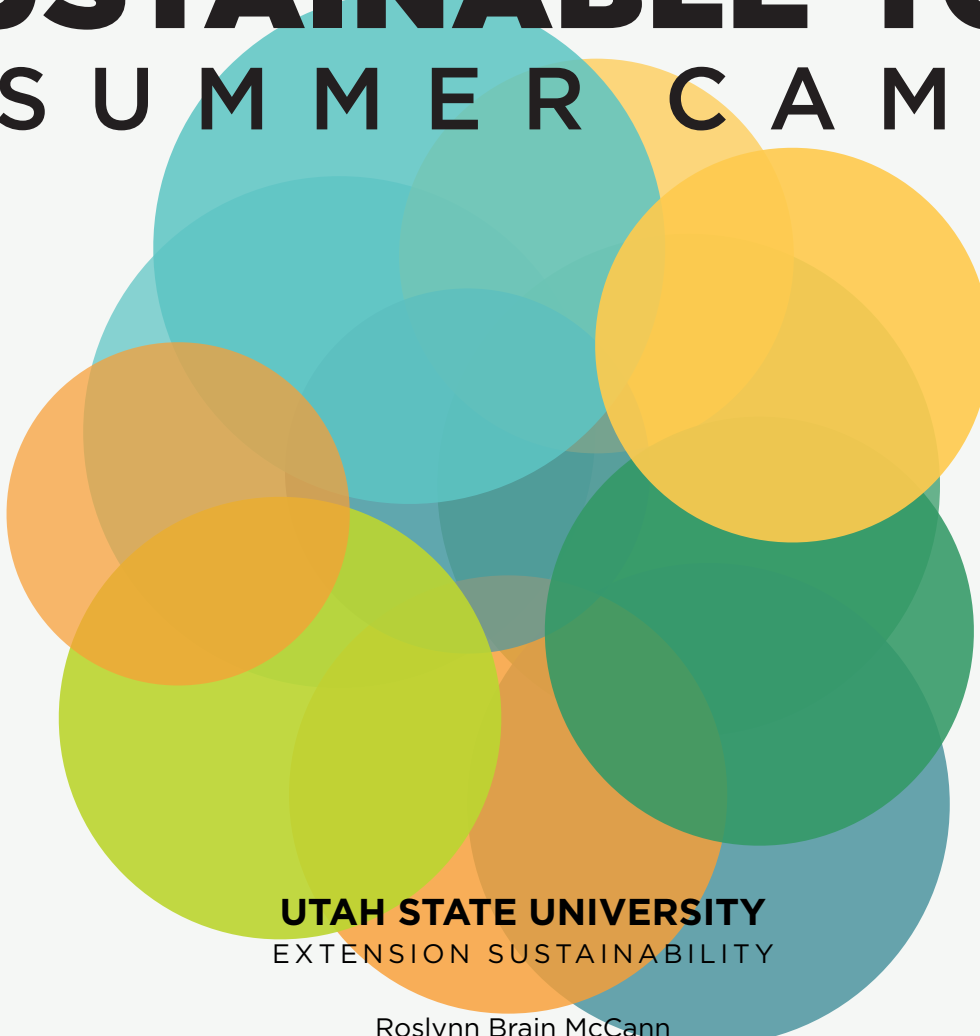




# SUSTAINABLE YOU!

## S U M M E R C A M P



**UTAH STATE UNIVERSITY**  
EXTENSION SUSTAINABILITY

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Sustainable You! Summer Camp is designed as a 5-day, 3 hours per-day camp for youth. Many options are provided for extending or shortening the camp to fit your needs. Each day has a different environmental sustainability theme: land, air, food, energy, and water.

Acknowledgements: This Sustainable You! Camp curriculum was created in direct response to a need voiced by David (Dave) Francis for a sustainability-themed curriculum in 4-H. Without Dave's insight, the curriculum would very likely not exist. We would also like to thank Barbara Williams for her editing and design, Rose Hayden-Smith for her enthusiasm and for bringing the camp to California youth through the University of California Extension system, and all of the educators nation-wide who motivated us with their excitement for this curriculum.

Contact Roslynn Brain, Utah State University Sustainable Communities Extension Specialist for any content-related questions or for assistance with the follow-up impact evaluation.

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# Sustainable You! Summer Camp

4-H Aggie Adventures for Kids

## **CAMP DESCRIPTION:**

Sustainable You! Summer Camp was designed to help youth understand what it means to be sustainable through fun, interactive activities based around the five major areas of sustainability: land, air, food, energy, and water. The camp is broken down into five days, each based around one of the 5 themes. This camp is written for grades 4-6 (ages 9-12) but could be adapted for all ages.

## **GOALS:**

1. Help youth develop an understanding of sustainability concepts.
2. Help youth develop a respect for our natural environment.
3. Teach youth about actions they can implement each and every day to lessen their impact on our environment and conserve resources.
4. Encourage attitude and behavior change in youth and their families that leads to their lessened impact on the environment.

These goals will be achieved by addressing specific objectives each day focused on the five major areas of sustainability: land, air, food, energy, and water.

## **BACKGROUND:**

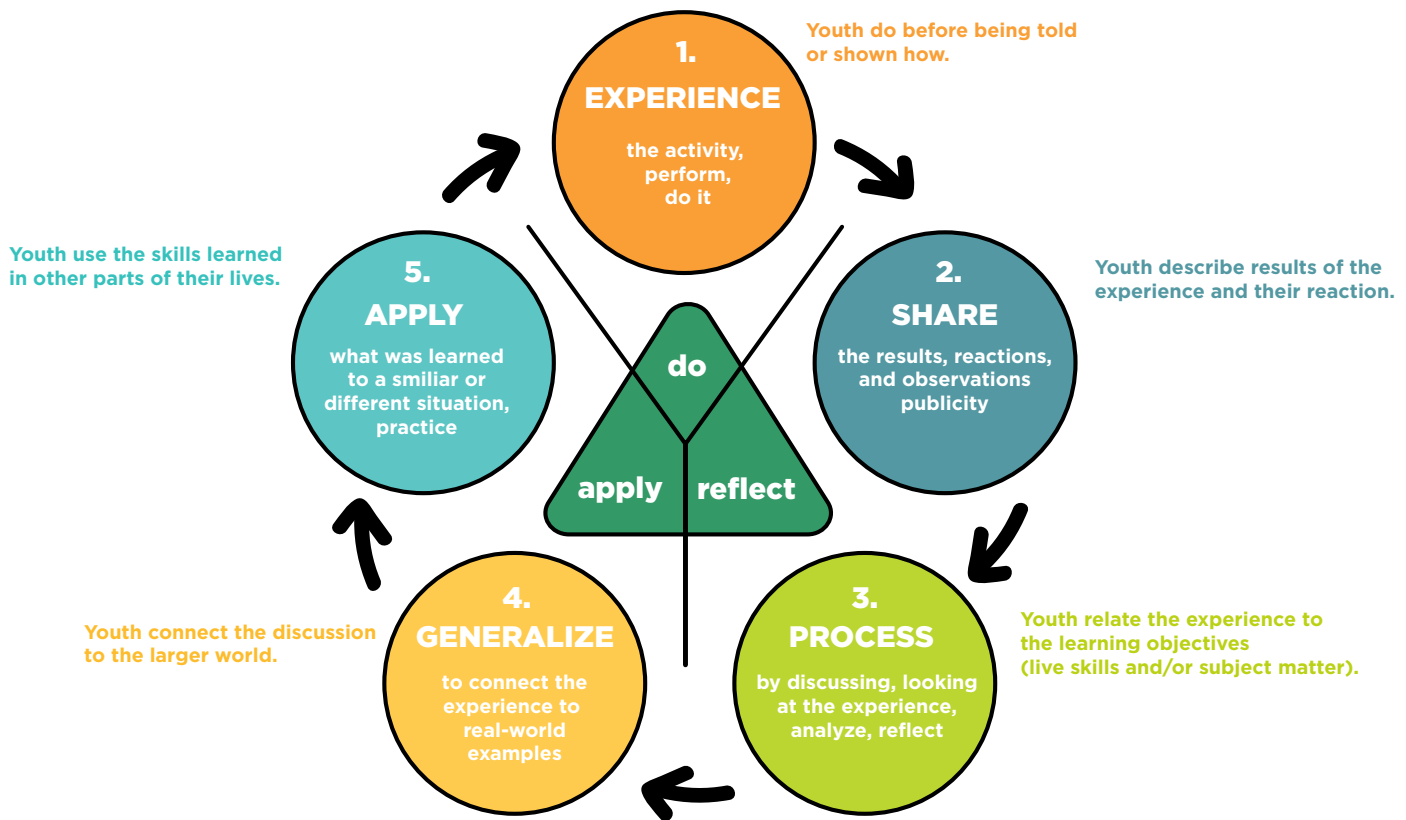
Living sustainably is defined as using natural resources in a way that does not permanently damage or diminish those resources. Although we do not know exactly what resources future generations will need, we do know they will need the essentials of land, air, food, some form of energy, and water. This sustainability camp, therefore, has been designed around each of those five topics. As population throughout the world continues to grow, the demand for these five basic resources increases. In order to ensure that these resources are available for future generations to use, current generations must learn why it is important to conserve resources and what actions to take and choices to make to ensure resource conservation. This camp teaches youth the basic concepts of sustainability and resource conservation as well as actions they can take in their everyday lives to live sustainably.

# Sustainable You! Summer Camp

4-H Aggie Adventures for Kids

## 4-H “LEARNING BY DOING” -- DO, REFLECT, APPLY LEARNING MODULE

The “Do, Reflect, Apply” approach allows youth to experience the learning process with minimal guidance from adults. Instead of being told the answers from activities, youth are exposed to experiential learning by using the following module:



Experiential learning is based on the theory of “learning from experiences.” This camp and its activities are based on the “Do, Reflect, Apply” module, which will allow youth to: experience the activity, reflect on new knowledge, and apply the new knowledge and skills in many aspects of life.

# Sustainable You! Summer Camp

## 4-H Aggie Adventures for Kids

### **CAMP RULES:**

1. Have a good attitude.
2. Respect all campers, instructors, and counselors.
3. Keep your hands to yourself.
4. Do not wander off without a camp counselor.
5. Listen to all instructions.
6. Have fun and be safe!

### **SET UP:**

As campers register for the camp, confirm their registration with their guardian (verbally, by mail, or by email). One month to one week before the first day of camp you may choose to send out an informational packet about the camp. This packet should be mailed or emailed to the camper's guardian. The packet should include a:

- Cover letter informing the guardian about the camp and important information (see Example Camp Letter below)
- A copy of the 4-H Liability Waiver/Code of Conduct form. This form should be filled out by the guardian and brought with the camper on the first day of camp.
- Directions to the camp location and/or the drop-off/pick-up location
- A checklist of items to bring to camp each day (items may include: sunscreen, water bottle, snack, lunch, hat, backpack, and any other items campers will need to participate in the camp activities you have planned)
- Optional: Some guardians enjoy receiving a basic camp agenda in advance. This does not need to be detailed. They just need enough information to understand the kinds of activities their children will be participating in throughout camp.

You may also want to send out a reminder email, letter, text, or phone call to guardians one week before the start of camp. This can serve to remind campers to bring their signed 4-H Liability Waiver/Code of Conduct form with them on the first day.

# Sustainable You! Summer Camp

## 4-H Aggie Adventures for Kids

To prepare yourself for the registration process, make an Excel spreadsheet or list of all of the campers, whether or not they have paid in full, whether or not they have turned in their liability form, and any allergies or medical concerns the camper may have. When campers register, this will help you make sure you have all necessary forms and payment and it will allow you to discuss camper concerns/issues with the guardian. In addition, you might want to create name tags for each camper and a sign-in/sign-out sheet. This sheet is a list of all the campers with a space for their guardian to sign them in and out each day. This helps you keep track of what campers you have at camp each day and helps you ensure that each camper has been picked up by the appropriate guardian each day. It is useful to add a section on the 4-H Liability Waiver/Code of Conduct form for guardians to list people authorized to pick their child up from camp. This way you can ensure that campers are only picked up by approved people.

It is also very important that you create an emergency contact sheet. This sheet should include the name of each camper along with his or her guardian and/or emergency contact information and any allergies or medical issues. This sheet should be kept in a folder with all the Liability/Code of Conduct forms and on or near the camp leader at all times. Having this information consolidated into one form and easily accessible will greatly help in the case of an emergency. Make sure all camp staff members know the location of this folder.

Each camper will need a chair and table space for the duration of the camp. It will also be helpful to have a dry-erase board and markers, chalkboard and chalk, or flipchart and markers in order to display journal questions each day. If this is not a possibility, you can print out a copy of the daily journal questions for campers and have them copy or paste the questions into their journals.

Sustainable You! Summer Camp is focused on teaching one theme per day during the week-long camp. Set-up will vary from day to day because of changing themes. Detailed descriptions of any necessary set-up for each activity is given within daily descriptions.

# Sustainable You! Summer Camp

## 4-H Aggie Adventures for Kids

### **GETTING STARTED:**

Each day starts with a journaling activity. On the first day of camp, campers will decorate their journals until all campers arrive. On days 2-5 of the camp, campers will work on pre-determined journaling activities while they wait for all campers to arrive. The journaling activities are described in the activities section of each day. Sustainable You! Summer Camp was designed to encourage youth to think about ways in which they can implement sustainable change into their lives and the lives of those around them in the communities in which they live. Journaling provides an opportunity for campers to reflect on the things they already know and also gives them the opportunity to write down new things they learn over the course of the camp. The act of writing down thoughts actually allows the camper to learn the material better through individual exploration. This activity is fun and encourages camper's creative abilities and provides a way to take the things learned at camp with them after the camp is over. Journals are also a great evaluation tool and can be used by the instructors to gauge if their teaching is effective. For more information on how to use the journals for evaluation, contact Utah 4-H.

After the journaling activity is done, each day includes a game to play as a group. These group games shouldn't be competitive in nature and should be inclusive to all campers. This allows all campers to feel part of the team and doesn't pit campers against one another.

This curriculum contains an activity where campers weigh the daily waste generated by snack time (dividing it into trash, recycling, and compost). Specific times designated for snack time HAVE NOT been scheduled in this curriculum, nor have specific times to weigh the waste. This is an optional activity depending on whether you anticipate your camp/campers will produce food waste. Specifics are left up to the camp facilitator and may vary depending on the daily schedule and campers' needs. In the past, campers have kept their snack time waste until the end of each day, weighing it before they go home. The instructor then records the weights on the Wacky Waste Weight Chart found in Appendix D.

The times listed throughout this curriculum are the suggested times for a 5-day camp, held for 3 hours per day (9 a.m. - noon). The suggested length of time to complete each activity is listed. Times and activities may be adapted to fit the needs of different camps. There are additional and optional activities described throughout in case the main activities described are not possible or ideal for you.



# EXAMPLE OF CAMP LETTER

Aggie Adventures for Kids

## SUSTAINABLE YOU! SUMMER CAMP

Dear Campers,

We're excited to have you join us at the 4-H Aggie Adventures Sustainable You! Summer Camp where we'll perform fun, hands-on activities that teach the basics of sustainability. Over the course of the week, we'll learn about the five major themes of sustainability: land, air, food, energy, and water. Background information on each of these themes is provided at the start of each day.

The Sustainable You! Summer Camp will be held (Date) from (Time to time) in (Room Number) at (Location). Enclosed in this packet you will find:

- **4-H Waiver of Liability/Code of Conduct form**—The liability form included must be completed and signed by a parent or guardian before students are allowed to participate in camp. Please bring the signed waiver with you on the first day of camp.
- **Directions to the (camp location and/or drop-off/pick-up location)**
- **Checklist of what to bring to camp**
- **Camp Agenda**

Camp staff can be reached at (number) during camp. Please only use this number in case of emergencies as camp staff will be busy during the camp leading your child in fun activities.

Please don't hesitate to contact us if you have any questions or concerns.

We'll see you soon!

(Camp director/leader name and contact information)

# YOUTH COUNSELOR

## Information and Responsibilities

### *(For the Youth Counselor)*

We are excited to have you participate as a youth counselor in our Aggie Adventure Summer Camp Program. The Aggie Adventure Camps are designed to give youth opportunities to explore the world around them. As a counselor, you will assist the camp staff in running these camps. We look forward to working with you this summer.

We have included some important information that will help you as counselors to create a positive camp experience for everyone.

### **COUNSELOR RESPONSIBILITIES:**

- Counselors will have their own small group of campers (based on total camp enrollment). Because of this, counselors must model appropriate behaviors at all times. Any counselor that does not display appropriate behaviors will not be allowed to participate in the program.
- Counselors are expected to teach their group in small-group activities and help manage all campers during large-group activities. Some camps will take field trips that require leaving campus. During field trips, counselors are responsible for keeping track of their groups.
- Counselors will be given staff t-shirts that they must wear during the camps. All other attire should be modest and weather appropriate, as we will be spending time outdoors.

### **DAILY PROCEDURES:**

- Be at the camp 30 minutes before camp starts to help set up.
- Stay after camp ends for approximately 30 minutes or until camp is cleaned up.
- Know the activities that you will be teaching your groups that day (counselors will be provided the camp activities in advance).
- Have a positive attitude and help campers have a good time at the camps. If you are having fun, the campers will, too.
- Weigh trash, recycling, and compost at lunch if you have chosen to partake in this activity.

### **SCHEDULE:**

- Each counselor has been assigned specific weeks to come and volunteer at the camps. Once you have agreed to work at a camp, you must come on time every day you are scheduled.
- If something comes up and you have advanced notice that you will be unable to work a specific camp, you may call another counselor and see if he or she is willing to trade camps with you. If this happens, please notify the camp staff of the change immediately.

### **COUNSELOR INCENTIVES:**

- Upon completion of 100 volunteer hours, or five camps, counselors will receive a life skill activity of their choice (piano lessons, ski pass, horseback riding lessons, guitar lessons, etc.).
- Incentives will be arranged with camp staff before counselors begin their volunteer hours.
- Counselors will receive their incentives at the end of the summer camp program.

### **EMERGENCIES:**

- If any accidents happen, report them to the camp staff immediately.
- In case of an emergency, help keep the campers calm and follow directions given by camp staff.

# UTILIZING

## The Youth Counselor

*(For the Facilitator)*

### **GOALS:**

- To teach knowledge and life skills that enhance quality of life.
- To create opportunities that promote positive youth development.

### **COUNSELOR RESPONSIBILITIES:**

- Counselors will have their own small group of campers based on total camp registration. Because of this, counselors must model appropriate behaviors at all times. Any counselor that does not display appropriate behaviors will not be allowed to participate in the program.
- Counselors are expected to teach their group in small-group activities and help manage all campers during large-group activities. Some camps will take field trips that require leaving campus. During field trips, counselors are responsible for keeping track of their groups.
- Counselors will be given staff t-shirts that they must wear during the camps. All other attire should be modest and weather appropriate as we will be spending time outdoors.
- Counselors are encouraged to interact with ALL campers in appropriate manners. They need to know that they are also considered “adults” in this situation.

### **DAILY PROCEDURES:**

- Counselors are required to be at the camp 30 minutes before camp starts to help set up.
- Counselors are also required to stay after camp ends for approximately 30 minutes or until camp is cleaned up.
- Counselors should get to know the activities that they will be teaching their groups that day (counselors will be provided the camp activities in advance).
- Counselors should be reminded to have a positive attitude and help campers have a good time at the camps. If they are having fun, the campers will too.

### **COUNSELORS IN THE CLASSROOM/INVOLVEMENT:**

- Counselors should ALWAYS be encouraged to work with their groups and be involved in the activities for the day.
- It’s important that counselors are encouraged to work with campers. Camps can be effective for campers as well as counselors.
- Counselors can be an effective classroom management tool. They should be encouraged to walk around their group and help their campers. By encouraging participation by all campers, behavioral and disruptive issues will be decreased.
- It’s also important to realize that counselors are not only there to be the “run-around” people. Keep them involved throughout each activity.
- Always encourage TEAMWORK among counselors and campers. It’s important that this is emphasized.

# SUGGESTED DAILY TOTE

## Aggie Adventures for Kids

In addition to the supplies needed for various experiments, activities, and games each day, there are supplies you will use every day of camp. We suggest creating the “everyday” tote that includes:

### SUPPLIES:

- Camera
- Journals for each camper – see activity in Appendix C for directions on how the campers can make their own journals
- Pencils
- Crayons/colored pencils/markers
- First aid kit
- Name tags
- Dry erase board and markers, chalkboard and chalk, or flipchart and markers OR a copy of the daily journal questions for each camper
- Stamps/stickers/stencils/etc.
- Table covers
- Sunscreen
- Bug spray – if necessary
- Extra water bottles
- Glue
- Scissors

## Materials Kit

### Aggie Adventures for Kids

If you wish to teach the Sustainable You! Summer Camp on an annual or biannual basis, preparing this materials kit will prove helpful. However, if you know you can easily find many of these items on an as-needed basis then that will work as well. We suggest to prepare a kit for each day. These various items are to be used as specified in activity pages. Use the following checklist to familiarize yourself with the items you will need.

### LAND KIT:

- Pictures of landfill
- Pictures of compost bins
- Examples of recycled/2nd life materials (before and after)
- Composting bin?
- Tarp
- Examples of “stuff” labeled with the resources used to make each object
- “Do the Worm” PowerPoint
- 5 trowels
- 5 spray bottles
- Power drill and drill bits

# Materials Kit (CONTINUED)

## Aggie Adventures for Kids

### AIR KIT:

- Handkerchief
- Large empty container

### FOOD KIT:

- Pictures of food items and the ingredients they come from
- Pictures of coconut, cashews, and pineapple for “What is Local Food?” Activity
- Laminated map of the USA
- Laminated map of the world
- 15 laminated maps of the world
- 15 dry erase markers
- Food packages for “Food Origin Activity”
- Packages for “Practical Packaging Activity”
- Power drill and drill bits (in Land Kit)
- 3 screwdrivers
- Staple gun
- 5 spray bottles (in Land Kit)
- Reference list (Appendix B)

### ENERGY KIT:

- Energy PowerPoint
- Timer
- Hot glue gun
- Copper nails
- Galvanized nails
- 2 box fans
- 2 multi meters
- Solar oven
- LED light
- 2 wind turbine kits (including hub, generator, PVC stand)
- 3 alligator clips
- Drawing Utensils
- Paper and/or white boards

### WATER KIT:

- Clear container to hold 2 cups of water
- Clear, 1-cup measuring cup
- Clear, 1/2 cup measuring cup
- Eyedropper
- 2 kick nets
- 2 dip nets
- 2 air pumps with tubing and air stones
- Plastic spoons – can be reused over and over – DON’T THROW AWAY!
- Petri dishes
- Magnifying glasses
- 5 laminated copies of aquatic insect dichotomous keys
- Laminated pictures of aquatic insect larval and adult stages
- Life box – containing bag of soil and bottle of water
- Dice and posters for “What is here to stay” activity (9 of each)
- pH test kit
- Litmus paper
- Thermometer
- Turbidity test kit
- Refractometer
- Dissolved oxygen test kit
- Nitrate test kit
- Phosphate test kit
- Scale
- 5 pairs of tweezers
- Laminated diagram of the water cycle
- Two glass jars
- Gravel
- Sand
- Plastic cup
- Coffee filters

# GROCERY LIST

## and Daily Supplies

\*This list includes items that should be gathered closer to the date you choose to launch your camp. If you have not assembled materials kits in advance (see prior pages), you will need to acquire those supplies as well. Your local county Extension office may have several needed supplies.

### DAY 1 - Land

#### Items for Journaling

- 3 bins, individually labeled “Trash,” “Recycling,” and “Compost”

#### Items for Stuff, Stuff, and More Stuff

- Computer, screen, and projector if showing online videos
- List of products that can be recycled in your community and how/where they can be recycled

#### Items for Vermicomposting

- (per camper) Red worms - at least 6 worms per camper
  - Can be purchased online or from Verlo Otley NightCrawlers 801-205-7371 (allow 3-5 business days for shipping) \* must be Red worms NOT earthworms
- (per camper) small Rubbermaid® tote or 3-gallon bucket
- (per camper) 1 lid for bucket, tote, or bin
- (per camper) Dirt - enough to fill container of the way full
- (per camper) 1-2 old newspapers and 1-2 cardboard egg cartons to shred for worm bins
- (per camper) -1/4 cup coffee grounds
- (per camper) A handful of food scraps- banana peels, apple cores, orange rinds, celery stalks, carrot trimmings, lettuce. NO DAIRY OR MEAT PRODUCTS!!

### DAY 2 - Air

#### Items for Understanding Inversions activity

- 4 identical clear jars (rim must be small enough to be covered completely by a standard playing card)
- Blue and yellow food coloring
- Deck of playing cards
- Towel

#### Items for Tree Planting

- Shovels/trowels
- Gardening gloves
- Tree for planting
- Mulch/compost

#### Items for Filtering Fun! Activity

- Clear adhesive tape
- Clear drinking glass
- Spoon
- Straw
- Magnifying glass

# GROCERY LIST

## and Daily Supplies

\*This list includes items that should be assembled closer to the camp date, in addition to the pre-made materials kits.

### DAY 3 - Food

#### Items for Grown in Utah activity

- Prize for winning team – optional
- Supplies necessary for preparing local food recipe - optional

#### Items for Create Your Own Garden Box activity

- Supplies needed for ONE box:
  - 4"x1" pine board (6-foot long, cut board into four pieces, 2-15 inch pieces and 2-21 inch pieces. The lumber store can usually cut the board for you.)
  - 8, 1 1/4 inch galvanized screws
  - 2 screen door pull handles (optional)
  - Black landscape fabric (comes in a large roll), cut into a rectangle 31 inches long x 25 inches wide. This will sit in the bottom of the garden box and should cover the bottom and up the sides.
  - 1/4 inch mesh wire hardware cloth (comes in a large roll), cut into a rectangle at least 25 inches long x 19 inches wide. This will cover the bottom of the garden box and needs to be long enough to come up the sides of the box a few inches.
  - About 10-15 cups of potting soil
  - Various packets of vegetables and hers from Grown in Utah list.
  - Duct Tape, this will be used to tape around the sharp edges of the hardware cloth. If you buy different patterns they will act as a "decorative" piece on the boxes.
- A cup to scoop soil out of container and into the garden boxes.

### DAY 4 - Energy

#### Items for Understanding Energy

##### PowerPoint activity

- Computer
- Projector
- Screen

#### Items for What's Your Carbon Footprint activity

- Computers with access to the Internet

##### Items for Fueled Fun activity

- White boards or paper
- Markers

#### Items for Wind Turbine Time! Activity

- Wooden Dowels (1/4 inch diameter, 5 inches long)
- Cardboard of varying thicknesses
- Cardstock paper or poster board
- Paper cups (small, like Dixie cups)
- Hot glue sticks

#### Items for Solar Brownies activity

- Brownie mix
- Baking pan
- Ingredients called for in brownie mix
- Bowl
- Mixing tools and measuring tools
- Timer

#### Items for The Potato Battery activity

- 2 potatoes

# GROCERY LIST

## and Daily Supplies

\*This list includes items that should be assembled closer to the camp date, in addition to the pre-made materials kits.

### **DAY 5 - Water**

#### **Items for What Is That! Activity**

- Blank paper (1 sheet/camper)

#### **Items for Water is Important activity**

- 5-gallon Bucket
- Towel

#### **Items for Water is Here to Stay Activity**

- 9 bowls or tubs to hold beads
- 9 different colors of beads – enough of each color for each camper to collect several
- String/bracelet material to create bracelets

#### **Items for Macro Aquatic Invertebrate activity**

- Rubber boots or waders – optional
- Buckets
- Additional tubs and nets if necessary for your group size

#### **Items for Water Quality Testing**

- Jar of tap water for turbidity test
- Jar for waste water

#### **Items for Bottle Vs. Tap activity**

- Store bought water bottle (Dasani, Nestle, or Aquafina)
- 2 small drinking glasses (preferably not single use plastic cups)
- Reusable water bottle.

#### **Items for Filtration Station Activity**

- 2 Glass Jars
- Sand
- Gravel
- 3-4 Coffee Filters
- Dirty Water
- A Plastic Cup with a Hole Cut in the Bottom



# DAY 1: LAND

## SUSTAINABLE YOU! SUMMER CAMP

### LAND LEARNING OBJECTIVES

1. Differentiate between trash, recycling, and compost
2. Learn about the value of preserved open space
3. List essential resources provided by natural land (water, air, soil, food)
4. Learn how to vermicompost and create a vermicompost bin



# DAY 1: Land

## 4-H Aggie Adventures for Kids

### BACKGROUND INFORMATION:

The first day of Sustainable You! Camp focuses on land. Within this theme, campers will learn about the importance of “open space” or preserved land and the benefits and resources it provides us. They will also learn about natural resource use, how we dispose of our waste or garbage, the effect that waste has on our land, and ways in which they reduce the amount of waste they generate.

#### Open Space

For the purposes of this curriculum, we use the terms “open space,” “preserved land,” and “non-developed land” interchangeably. Open space is defined as “undeveloped land that is protected from development by legislation.” Thus, when you talk about or show the campers open space, it should be a space with no development (buildings, structures, roads, parking lots, landscaping, etc.) on it and in as close to a natural state as possible. Ideally this would include a nature preserve, national park, state park, or a local park maintained in natural conditions. If these types of areas are not available, you could use an empty field or simply show pictures of open space.

Open space provides humans and the environment with many benefits, and is very important to the function of ecological systems. A few of the many benefits provided by open space are given below:

- Open spaces, especially protected wetlands, function as a natural water filter. As our drinking water flows from rivers and streams into reservoirs or wells, these open spaces help filter out pollutants and sediments. As water flows through wetlands or vegetated land, pollutants and sediment are filtered out by the plants. Thus, our drinking water arrives at our well or water treatment plant cleaner than it would be without these natural filters in place. In addition to serving as a filter for human consumption, open space filters pollutants and sediments out of water that is used by plants and animals. The presence of open space helps keep clean water available for the wildlife that depend on it.
- Preserving open space helps prevent erosion. As water runs over a landscape, it inevitably takes with it some of the sediment or dirt within that landscape. Preserving open space that is well vegetated with native plants helps keep that sediment in place, as the roots of plants prevent sediment from washing away. This helps maintain healthy soils and keeps our rivers and streams clean.
- Open space helps buffer development from flooding. Maintaining vegetated “buffer zones” along rivers and streams or along coastlines ensures that if flood waters rise, the soil and vegetation within that buffer zone can help absorb some of that excess water. This protects our homes and businesses from flooding.
- Open space is important for nutrient cycling. Nutrient cycling is the process of dead plant and animal matter undergoing decomposition via fungi and/or bacteria and the nutrients within that matter returning to the soil. This process helps keep soil fertile and helps maintain the presence of vital nutrients in our environment. These nutrients are necessary for all plants and animals to survive. Without open space, the nutrient cycle would be greatly diminished and nutrients would be limited.
- Open space is also very important for carbon sequestration. This is the process in which plants take up carbon dioxide in the air and convert it into plant biomass. That is, they use carbon dioxide to create sugars and grow through the process of photosynthesis. Thus,

# DAY 1: Land (CONTINUED)

## 4-H Aggie Adventures for Kids

plants help remove excess carbon dioxide from the environment. Decreasing plant cover on land reduces the ability of the environment to remove carbon dioxide from our atmosphere, thus helping to mitigate the rate of climate change. This also relates to the air-themed activities we will conduct as part of this camp.

- Open space provides vital habitat for wild plants and animals. Without preserved open space many of these organisms would have nowhere to go, or they would not be able to secure the resources they need for survival. Examples include the Florida panther, bison, pronghorn, and many more.
- In addition to the benefits listed above, open space also provides beautiful places for us to recreate and enjoy.

Despite the necessary benefits that open spaces provide humans and wildlife, development is also necessary for our human population. Developed land provides us with many benefits as well, such as protection from the elements and a generalized location for goods and services. We cannot simply label developed land as “good” or “bad.” We have to ask the questions: Good for whom? Good for how long? What is the cost of developed land to the environment? While developed spaces are good for human uses, they can have negative impacts on the benefits listed above and also wildlife. Creating an effective balance between open space and developed land is a constant process. However, there are ways in which we can “develop” our land while keeping the environment in mind. A few of these ideas are listed below.

- When we build buildings or structures, we can try to leave as much of the land undisturbed as possible and we can leave as much of the native vegetation in places as possible. We can also use natural, on-site, or locally available materials
- We can landscape our yards, parks, and businesses with native plants that maintain the functions listed above that do not require excessive amounts of water and nutrients to grow in the environment. Plants that are native to an area are adapted to survive with the amount of water and nutrients they would naturally receive from that area. When we use plants that grow naturally in different areas, we often have to provide them with increased water and nutrients in order for them to survive in our environment.
- We can keep water conservation in mind when we build. To do this we can plant native plants that don't require more water than what they receive naturally in the environment. We capture rainwater for non-drinking water uses. For instance, you could construct rain barrels to collect water for your landscaping.
- We can take steps to ensure our development does not add pollution to the environment during both the construction phase and once the structure is built.
- We can take steps to make the surfaces of our development as permeable as possible. The way we currently build parking lots and road surfaces does not allow rain water to soak into the ground. Instead, it hits the hard surfaces and runs straight off into ditches and our rivers and streams – taking with it any dirt or pollutants present on the surface. We could construct parking lots and roads and driveways out of permeable materials that allow water to soak through the surface and into the ground. This would help filter and clean the water before it enters our rivers and it would recharge groundwater reserves.

# DAY 1: Land (CONTINUED)

## 4-H Aggie Adventures for Kids

### **Trash, Recycling, and Composting**

When we throw things away, we put them in the trash can and often set the trash can at the end of our driveway and it magically disappears. Campers that have curbside garbage pick-up might have no idea where their garbage actually goes. Campers who have to take their garbage to a landfill, may understand where it goes, but not what happens to it after they drop it off. All garbage that we throw away goes to a landfill. At the landfill, the garbage is buried under layers of dirt with the idea that the materials will eventually break down. However, many of these materials take a very long time to break down. For example, over 50 percent of plastics are for one-time disposable use, yet research has shown that most plastics are not biodegradable, are extremely durable, and will persist in landfills for decades, if not millennia.<sup>1</sup> Throwing items away simply takes the resources those items are made from out of circulation and ensures that the nutrients present in those resources will not return to the environment for a very long time. The average person generates 4.5 pounds of waste per day. This is 1.8 pounds more than most people produced back in 1960.<sup>2</sup>

Ways to reduce the amount of garbage we generate include source reduction (designing or purchasing products that will reduce the amount of material that will later have to be thrown away), recycling (the recovery of useful materials, such as paper, glass, plastic, and metals, from the trash to use to make new products), and composting (collecting organic waste, such as food scraps and yard trimmings, and storing it under conditions designed to help it break down naturally. The resulting compost can be used as a natural fertilizer). Recycling garbage helps reduce the amount of resources used to create products as it uses materials already harvested to create new products instead of simply throwing those resources away and having to harvest new resources to create a new product. It was recently found that Americans throw away almost 40 percent of all their food.<sup>3</sup> Much of this food could be composted and recycled into nutrient-rich soil and fertilizer. Note, if you mention this information to the campers, you can let them know they will learn more about food the next day, where the entire day's theme is about food. In 2017, Americans generated about 250 million tons of trash and 94 million tons of this waste was recycled and composted, equivalent to a 35.2 percent recycling rate. On average, we recycled and composted 1.58 pounds of our individual waste generation of 4.50 pounds per person per day.<sup>4</sup> What can be recycled is different in different areas, so make sure to find out what types of materials can be recycled in your area.

In order to decrease the amount of garbage we generate, one of the most important things to teach campers is reduce, reuse, recycle – in that order. There are many ways we could reduce the amount of materials we use and throw away (reusable water bottles instead of plastic, one-time use water bottles, reusable cloth napkins instead of paper towels/napkins, reusable grocery bags instead of plastic grocery bags, etc.). Once we have reduced the amount of materials we use to begin with, we can attempt to reuse the materials we do use (plastic food tubs used to store leftovers, egg cartons used as seedling starters, etc.), and recycle the majority of remaining materials (either through recycling or composting).

# DAY 1: Land (CONTINUED)

## 4-H Aggie Adventures for Kids

For fact sheets on reusing, recycling, and composting in Utah, visit: <http://extension.usu.edu/sustainability/htm/land>.

1. Hopewell, J., Dvorak, R., & Kosior, E. (2009). Plastics recycling: Challenges and opportunities. *Philosophical Transactions*, 364. Available at: <http://rstb.royalsocietypublishing.org/content/364/1526/2115.full.pdf+html>

2. "Center for Sustainability & Commerce." How Much Do We Waste Daily? N.p., n.d. Web. 08 Oct. 2013.

3. USDA (2013). USDA and EPA Launch U.S. Food Waste Challenge. U.S. Department of Agriculture. Retrieved from: [http://www.usda.gov/wps/portal/usda/usdahome?contentid=2013/06/0112.xml&navid=NEWS\\_RELEASE&navtype=RT&parentnav=LATEST\\_RELEASES&deployment\\_action=retrievecontent](http://www.usda.gov/wps/portal/usda/usdahome?contentid=2013/06/0112.xml&navid=NEWS_RELEASE&navtype=RT&parentnav=LATEST_RELEASES&deployment_action=retrievecontent)

4. National Overview: Facts and Figures on Materials, Wastes and Recycling. (2020, March 13). Retrieved from <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials>

# Starter Activity

4-H Aggie Adventures for Kids (9:00 - 9:15 a.m.)

## Journal Decorating and “Peek-A-Who” Game

### What to Do:

1. As campers arrive and are checked-in, give each one a journal and inform the campers that they can decorate the outside of the journal any way they would like using the materials located on the tables. Allow campers to decorate their journals until everyone has arrived. They can continue to decorate their journals each morning when they arrive if they do not finish on the first morning.
2. Once all campers have arrived, welcome them to camp and give them a basic introduction to the camp (camp title, the basics of what they will learn at camp, how many days they will be at camp, etc.). Introduce yourself and all other camp leaders/counselors and then invite the campers to come sit in a circle in your predetermined location.
3. Tell the campers that they are going to be playing a name game called Peek-A-Who and explain the game to them.
  - a. Tell the campers that in this game they have to remember each other’s names.
  - b. Invite them to share their name and their favorite thing to do outside with the group one at a time.
  - c. Make sure everyone hears each other’s names at least once.
  - d. Have everyone stand up and divide campers into two groups and separate them.
  - e. Next, have the camp facilitator and a volunteer hold a tarp or blanket between the two groups so that the campers on each side of the tarp/blanket cannot see each other.
  - f. Have each group QUIETLY pick a member to walk toward the tarp.
  - g. The two individuals will approach the tarp facing each other with the tarp in between.
  - h. Once the individuals are at the tarp, the tarp is dropped and whoever says the name of the other person first wins. The other must join the winner’s team.
  - i. The point of the game is to get all of the campers on your team.
  - j. Let other members have turns approaching the tarp and trying to say each other’s name first as the tarp/blanket is dropped.
  - k. When one team acquires all the campers they win (or end when activity has gone long enough).

TIME: 15 minutes

GRADE LEVEL: 4-6

### OBJECTIVE:

Decorating journals provides an activity for the campers while all participants are arriving. During the game, campers will have the opportunity to introduce themselves to the group and get to know each other.

### MATERIALS:

For Journals:

- A journal for each camper  
– see optional activity in Appendix C on how to make journals
- Pencils
- Colored pencils/markers/crayons
- Stickers/stamps/stencils/etc.

For Game:

- Large tarp or blanket

### PRIOR TO ACTIVITY:

You may want to cover tables if you are worried campers will get ink or markings on the table surfaces during the journal decorating activity. Find a comfortable spot inside or outside to sit in a circle with campers.

# Starter Activity (CONTINUED)

## 4-H Aggie Adventures for Kids

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### Reflect:

- Have the campers talk with a peer, then the group, something “sustainable” they do. This will allow for a good conversation about what sustainability is, leading into the next activity of the camp introduction.
- Ask the campers to share one new thing they learned from each other. Why is it great to make new friends?

### Apply:

- Encourage the campers to share with their parents the sustainability behaviors their friends are doing. This could provide new ideas for their families to try.

# Intro To The Camp

4-H Aggie Adventures for Kids (9:15 - 9:30 a.m.)

## What to Do:

1. Tell the campers that the title of this camp is “Sustainable You.” Ask them what they think “living sustainably” means. Give them an opportunity to answer. Once they have answered, provide them with the full definition of living sustainably: using natural resources in a way that does not permanently damage or diminish those resources.
2. Ask the campers if they know what “natural resources” are. Give them an opportunity to answer. Once they have answered, provide them with the correct, full definition of natural resources: something that people can use that comes from nature. People do not make natural resources, but gather them from the earth. Examples of natural resources include air, soil, water, oil, coal, gold, plants, animals, even the sun and the wind. Human survival depends upon natural resources, and everything man-made is, at its basic level, made up of natural resources.
3. Tell the campers that over the course of the week they will be learning about many of the natural resources we rely on for survival: land, air, water, food, and sources of energy. They will also learn about ways they can live sustainably and things they can do in order to not damage or diminish our natural resources. Each day they will focus on a different resource. The first day, today, will focus on land.
4. Ask the campers why they think it is important to live sustainably or not damage or diminish our natural resources. Give them time to answer. Once they have answered, engage campers further with their own thoughts and guide them towards their own ‘true’ definitions. Your answer could be: so that we can ensure there are enough natural resources for our use during our lifetimes, but also for use by future generations. It is a long way off for most of them, but one day they will have children of their own, and grandchildren, and great-grandchildren. Living sustainably now will make sure there are enough natural resources (air, land, food, water, and energy sources) for those people to survive and thrive.

TIME: 15 minutes

GRADE LEVEL: 4-6

### OBJECTIVE:

Provide students with an introduction to the camp, what they will be doing/ learning, and basic knowledge of the camp topic.

### MATERIALS:

- None

### PRIOR TO ACTIVITY:

Familiarize yourself with the information, materials, and activities associated with this summer camp. Look over the materials list, the background information, and activity pages for each day, and the resources available in Appendices A and B.



# Intro To the Camp (CONTINUED)

## 4-H Aggie Adventures for Kids

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5. Tell the campers that during camp, they will have the opportunity to learn interesting facts, participate in fun activities, and complete cool building projects. If campers will come prepared to participate each day, they will become certified Sustainability Experts with the knowledge and skills needed to live more sustainably. Emphasize that this certificate entitles kids with a teacher status, where they have a responsibility to teach others the sustainability skills they have learned. The camp sustainability certificate can be found online at <http://utah4h.org/htm/resource-library/4-h-kits-for-checkout/sustainable-you-guide/>.

### Reflect:

- Have the campers think about what natural resources they depend on in their daily lives. What can they do during their daily routine to help protect those vital resources?

### Apply:

- Narrow the conversation down to a couple of specific things the campers can do during their daily routine to be more sustainable, such as bike to soccer practice or visit the farmers' market. Once a few specific behaviors are selected, have the campers tell you why those actions could help the earth as a whole.

# Journal Activity

4-H Aggie Adventures for Kids (9:30 - 9:50 a.m.)

Tell campers to open up to the first page of their journals and label that page “Day 1: Land, Morning” or paste the copy of questions onto the first page.

## What to Do:

1. Have campers sit on the floor or at a table so that each has room to work.
2. Tell the campers they are going to be using the journals they decorated at the beginning to record their thoughts throughout the week. Tell them that they will be asked questions each day when they arrive and asked to record their thoughts on those questions in their journals. **IT IS IMPERATIVE THAT THE CAMPERS KNOW THAT THERE ARE NO RIGHT OR WRONG ANSWERS AND THAT IT IS OKAY IF THEY DO NOT KNOW THE ANSWER TO A QUESTION!** If they don't know an answer, they should simply write “I don't know.” The point of these questions is to see how much the campers learn each day. For many of the questions, they won't know the answer at the beginning of the day, but will by the end of the day. Explain that journaling is a way to explore our thoughts and expand them.
3. Tell campers to open up to the first page of their journals and label that page “Day 1: Land, Morning” or paste the copy of questions onto the first page.
4. Tell campers to answer the questions. **REMAND THEM THAT THERE ARE NO WRONG ANSWERS --** tell them to write as much as they can about each question.
  - a. If you put something in the trash can, what happens to it?
  - b. If you put something in the recycling bin what happens to it?
  - c. If you put something into the compost bin what happens to it?
  - d. What can you do to reduce waste?
  - e. Why is open/non-developed land important?
5. Once everyone has completed their questions, have them set their journals aside.
6. Tell the campers that as they learn new things about the daily topic they should write it down in their journals.

TIME: 20 minutes

GRADE LEVEL: 4-6

## OBJECTIVE:

Throughout the camp, journals will be used by campers to record thoughts and ideas. The journal will not be graded\* and is to be used as a method to increase the camper's ability to critically think about issues regarding sustainability.

\*OPTIONAL: If you would like to use the journals as an evaluation tool to measure changes in knowledge or attitudes as a result of the camp, have the students complete the journal activity at the beginning of each day and have them complete the same exact activity at the end of each day. Once the camp is over, you can keep the journals and evaluate the changes in answers. You can then mail the journals back to campers. Make sure the campers clearly label their journal entries for evaluation, such as “Day 1: Morning, Day 2: Afternoon,” etc. so you can find the sections to be evaluated if they use their journals for additional activities throughout the week. Also make sure they clearly label the questions asked during the activity by either numbering their answers or copying the question in their journals. If you are using the journals for evaluation purposes, it is very important that you

# DAY 1: Journal Activity (CONTINUED)

## 4-H Aggie Adventures for Kids

### Reflect:

- Ask the campers if anyone would like to share their answers to the questions. Discuss the answers the campers provided, as well as guiding them with your insight. You don't have to fully explain the answers at this time, just provide a basic understanding. Campers will learn more about each question/topic throughout the rest of the day. Ask the following questions:
- How does writing things down helps us learn?
- Are words written down in a book of any worth if all we do is read them? (They need to be applied.)
- When would it be appropriate to use their journals this week? (Every day!)
- Are there any right or wrong answers to the questions they will be asked to write about? (NO!)

### Apply:

- How could they use their journal at home? They could share what they have written down with their family to teach them sustainability concepts. However, we suggest not allowing campers to take the journals home each day, as they may not remember to bring them back the next day. Campers could also use their journals to keep track of their family's sustainable practices long after the camp has ended - number of garbage bags taken to the landfill each week, number of bins taken to the recycling center each week, number of buckets of soil generated from their compost bin, etc.
- Ask the campers to pay attention tonight or this week to what is thrown away at their house. Could these items be used for a different purpose? Tell them to be creative and think of other uses for things we ordinarily throw away. You could have the campers share their observations and ideas at the beginning of each day.

allow the campers to answer the questions themselves. You should not lead them or give them hints. You want to make sure you are evaluating exactly what they know and learned. For further information on how to use the journals as an evaluation tool, contact Utah 4-H.

#### MATERIALS:

- Camper Journals
- Pencils
- Colored pencils/markers/ crayons
- Dry erase board and markers with journal questions written on it OR one copy of Day 1 Journal Questions (Appendix C) for each camper
- Glue, if pasting journal questions into journals
- Scissors, if pasting journal questions into journals
- 3 buckets or bins individually labeled "Trash," "Recycling," and "Compost"

#### PRIOR TO ACTIVITY:

Write the journal questions on the board OR make enough copies of the Day 1 Journal Questions (Appendix C) so that each camper has one to copy or paste into his or her journal. Place the trash, recycling, and compost bins in front of the campers so all campers can see them. Familiarize yourself with the questions and their answers so you can explain the answers to the campers once they have completed the activity.

# Nature Walk and Scavenger Hunt\*

4-H Aggie Adventures for Kids (9:50 - 10:35 a.m.)

\*As an alternative you could have campers bring their bikes and bike helmets on the first day of camp and complete this activity as a bike ride. This is only possible if you have safe, bike-friendly sidewalks, paths, or roads, and the location of your scavenger hunt is within biking distance for the kids.

## What to Do:

1. Tell the campers that you are going on a nature walk or bike ride.
2. Let them know they will be looking at developed and non-developed land. They will learn what the difference is between the two.
3. Tell them that along the way they will be doing a scavenger hunt. (If opting for the bike option, notify the campers beforehand what they need to look for and that you will talk about it as you take some rest breaks.)
4. Pass out the Scavenger Hunt papers to campers and make sure all have something to write with. As they see the things listed on the scavenger hunt page, they should cross them off and write a word in the space that will remind them of where they saw it. Remind the kids that they shouldn't damage plants or anything else they come across during the scavenger hunt (the theme being to respect and improve the environment).
5. Go on the nature walk/bike ride in the previously decided area and help the campers identify natural and man-made environments and objects.
6. Once you come to an area where non-developed land can be seen, point out some of the key resources/services that non-developed land provides. (See background section for this day to learn more about these resources/services.)
7. Give the campers a chance to look around at the open, non-developed space and identify plants, insects, and animals living there. If time allows, have them draw a picture in their journals of what they see.
8. Remind campers to look for things listed on their scavenger hunt sheet.
9. Resume the nature walk/bike ride and travel to a developed space. Ask the campers to observe this area and write down their thoughts and what they see in their journals. Ask them to compare it with the non-developed land. How is it different? What features do

TIME: 45 Minutes

GRADE LEVEL: 4-6

## OBJECTIVE:

This walk (or bike ride) allows campers the opportunity to see developed versus non-developed land and identify the differences between the two. Campers will learn about the importance of open space by learning about the ecosystem services open land provides. (See background section for this day to learn more about ecosystem services.)

## MATERIALS:

- Scavenger hunt sheet found in Appendix E - (1 per camper or per group)
- Pencils
- Bikes, if biking instead of walking
- Helmets, if biking instead of walking
- Binoculars (optional)
- Camper journals (optional)
- Water bottles, sunscreen, bug spray, hats, and snack if necessary

# Nature Walk and Scavenger Hunt (CONTINUED)

## 4-H Aggie Adventures for Kids

the campers see on the developed land? What services does the developed land provide? (A place for our houses, electricity lines, water lines, businesses, roads, sidewalks, etc.) Are there as many places here for animals, insects, and plants to live? What are the pros and cons of developed space?

10. Remind campers to look for things listed on their scavenger hunt sheet.
11. Move on and finish the nature walk/bike ride.
12. After you reach the end of the walk/bike ride, have campers sit down and discuss with them the questions listed in the “Reflect” section.
13. If time allows, assign each camper to a specific 3 ft. x 3 ft. plot of land. Ask them to take 5 minutes and observe this plot of land. What insects live there? What plants live there? What does the soil look and feel like? Are there any signs of animal tracks? Have them write their observations in their journals

### Reflect:

- Ask the campers to list the items from the scavenger hunt that they saw. Where did they observe these items – developed or non-developed land? What are some things that they remember seeing/hearing that weren't on the scavenger hunt page?
- Ask campers to describe the differences they observed between developed and non-developed land?
- Ask the campers to name some of the things that humans build on the land? (Houses, buildings, playgrounds, schools, etc.) What are these objects made out of and where do we get the resources to build these things?
- Is developed land good or bad? (See background section for this day for comments on this question.)
- What are some things we could do in our yards and at local buildings so the animals and plants that lived there before us still have the resources they need to survive? What are things we could do that would allow the land to still provide the services and resources that it naturally provides?
- Ask the campers how they can respect non-developed/conserved/protected land.

### PRIOR TO ACTIVITY:

An area should be identified that presents both developed and non-developed land. Examples of developed land include housing developments, shopping centers, office parks/business centers, even parks that are not “natural” in their landscaping. Examples of non-developed land include empty lots or fields and parks that are natural in their landscaping. Abandoned lots provide an opportunity to see the resiliency of natural systems when given a chance.

# Nature Walk and Scavenger Hunt (CONTINUED)

## 4-H Aggie Adventures for Kids

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### Apply:

- Encourage the campers to plant trees and native plants in their yard if they are able to. Planting plants and gardens that are beneficial for specific animals, such as birds, butterflies, or bees ensures that those animals can still survive in developed habitats. See Utah State University's Center for Water-Efficient Landscaping for journal articles and fact sheets on this topic at <http://cwel.usu.edu/>.
- Encourage campers to see development through a sustainable lens and to encourage their parents to adapt their yards so that native species of animals and plants will continue to inhabit and thrive in the area.
- We can do our part to be sustainable by observing the natural systems around us BEFORE we build the things we need. Earth has natural systems that we can take advantage of like ecosystem services; our development should be harmonious with the natural systems that surround us.

# Stuff, Stuff, and More Stuff

4-H Aggie Adventures for Kids (10:35 - 10:55 a.m.)

## What to Do:

1. Tell the campers that we are going to talk about the “stuff” we buy and where it all goes when we are done using it.
2. Ask campers to start naming “stuff” that they own -- (cell phones, computers, clothes, refrigerators, plastic bags, books, forks, spoons, radios, towels, food...anything).
3. Ask them to tell you what those different things are made out of. (See the Environmental Protection Agency Natural Resources guide for help: [http://www.epa.gov/osw/education/quest/pdfs/unit1/chap1/u1\\_natresources.pdf](http://www.epa.gov/osw/education/quest/pdfs/unit1/chap1/u1_natresources.pdf).) Ask them if they can tell you exactly what resources go into each product (trees into paper, oil into plastic, cotton into clothes, etc.). Also, have campers think about what resources are used in the process of making products, such as water used to make microchips for phones. Then tie in to other camp themes - land, water, etc.
4. Ask campers where these resources come from. (Earth)
5. Ask them what we do with this stuff when we are done with it or it gets broken. (Throw it in the garbage.) Is that sustainable? Are Earth’s resources infinite? (Some of them are not.)
6. Ask campers what happens to this “stuff” when we put it in the garbage.
7. Show campers a picture of a landfill. This is that place that we call “away.” All of our garbage just sits there and it takes hundreds and thousands of years to break down. (See background section for this day for more information on the life of products in a landfill.)
8. Ask the campers to guess how many pounds of garbage Americans throw away every day. (250 million tons/year<sup>1</sup> - that is equal to 500,000,000,000 pounds! If we divide that by the days in a year, Americans throw away 1,369,863,013 pounds of garbage every day.)
9. Ask campers what we could do with these materials instead of throwing them in the trash. (Recycle and Compost)
10. Show campers some examples of recycled materials. Use the examples provided in the materials kit. Explain what they were before and what they are now. Help the campers to understand that we do not need to throw everything in the garbage. Some of this “garbage” could be used to make other things, which is a more sustainable option (uses less resources).

TIME: 20 Minutes

GRADE LEVEL: 4-6

## OBJECTIVE:

Campers will learn about municipal solid waste (MSW) and the depletion of natural resources. Campers will learn alternative ways to process “garbage” that are less resource depleting and can actually create 2nd life products. They will also learn about composting.

## MATERIALS:

- Examples of “stuff” that we own and would throw away (cell phone, clothes, books, paper towels, plastic food tubs, water bottles, etc.)
- Picture(s) of landfill
- Picture(s) of a compost bin
- Examples of recycled materials (2nd life before and after)
- List of recyclable materials for your area
- Computer, screen, and projector if you plan to show the suggested videos
- Examples of products that can be used to reduce waste



# Stuff, Stuff, and More Stuff (CONTINUED)

## 4-H Aggie Adventures for Kids

11. An optional activity, if you have time, would be to show videos here about the recycling process ([http://www.youtube.com/watch?v=\\_GP3JuiX5BY](http://www.youtube.com/watch?v=_GP3JuiX5BY) and <http://www.youtube.com/watch?v=Y68tBxVrnXg>). Another good video shows how a plastic milk jug can be turned into a fence post: <http://www.youtube.com/watch?v=-JQYwF4VyiY>.
12. Discuss with your campers what can be recycled in your community and how they can recycle those materials. To do this you will have to find out what the recycling program in your community accepts and if there is curbside pick-up for recyclables or if recyclables have to be taken to a drop-off location.
13. Ask the campers if we can recycle food waste. They will likely say no. We can't recycle it in the same way we recycle other garbage – such as cans or paper. But we can recycle it by composting. Show a picture of a composting bin and ask if anyone knows how it works. Tell them that inside the bin are organisms that are able to eat and break down organic waste, things like food scraps and coffee grounds. These organisms then turn that stuff into a nutrient rich material called compost. Can anyone guess what these organisms are? (Worms!) What is compost? (Soil!). So compost is basically using worms to turn our food waste into more soil!
14. Ask the campers to guess what percentage of all of the food that is grown in America gets thrown away without being eaten. (The answer is about 40 percent, meaning 40 percent of all the food that is produced in America, whether it makes it into our refrigerators and cupboards at home, or not, ends up in the landfill.<sup>2</sup>)
15. By recycling and composting, we can ensure that our needs are met and that future generations will have resources to build the things they need and that our land won't be completely taken up by landfills!

### PRIOR TO ACTIVITY:

It is important to learn that there is no “away” and that everything we build and buy goes somewhere when it is disposed of. These things affect the land and people all through their “lifecycles.” It would be helpful for the instructor to look up and be familiar with the materials that can and cannot be recycled in your community. You should also be aware of how and where people can recycle materials in your community (curbside recycling or drop-off locations). It would be beneficial for the instructor to look over some of these websites to get a basic understanding of Americans' waste behaviors.

- <http://www.epa.gov/epawaste/nonhaz/municipal/index.htm>
- <http://www.epa.gov/osw/nonhaz/municipal/msw99.htm>

### Reflect:

- What could we do instead of throwing everything away? Discuss with the campers the concept of Reduce, Reuse, Recycle – in that order. In order to lessen our use of resources and the amount of space our garbage takes up in landfills, we must first reduce our use of resources. Examples of ways we can reduce the waste we generate include: using cloth napkins over and over instead of one-time use



# Stuff, Stuff, and More Stuff (CONTINUED)

## 4-H Aggie Adventures for Kids

paper napkins, using glass containers to store leftovers instead of one-time use foil and plastic wrap, using reusable water bottles instead of plastic water bottles, and using reusable shopping bags instead of plastic grocery bags. There are examples of all of these objects in the materials kit. You can show these products to the campers as you discuss them. Of the things we must purchase, make sure to reuse them as much as possible before getting rid of them. Use plastic food tubs as leftover containers instead of throwing them away, and give old cell phones, toys, and electronics to women's shelters or thrift stores instead of simply throwing them away. Once you have reduced the amount of stuff you use and reuse what you have, recycle and compost as much of your waste as possible. If everyone followed the three R's regularly, we would produce a lot less waste. If you have time, a fun video to show regarding reducing waste when eating out can be found here: <http://www.youtube.com/watch?v=esHhKXKagZ8>.

- What is something you are used to just throwing in the garbage that is actually recyclable? (Answers could include soda cans, plastic water bottles, grocery bags, and food containers.)
- What habits would you have to establish to be more effective at recycling in your home? (Answers may include putting a recycling bin in the house, learning what materials are recyclable, and helping family members recycle as well.)

### Apply:

- Before you go out and buy a new object, think about if you really need it. Does the one you currently own still function? Could you use something else you already have to meet your needs? Could you borrow one from someone you know and maybe lend them something as well?
- Encourage campers to go home tonight and talk with their families about how they can reduce, reuse, or recycle at least one thing in their home. Have campers report about their decisions the next day at camp.

1.EPA. (2014). Municipal Solid Waste (MSW) in the United States 2012 Infographic. Retrieved from: <http://epa.gov/osw/nonhaz/municipal/infographic/index.htm#04> or <http://epa.gov/osw/nonhaz/municipal/msw99.htm>

2.USDA. (2013). USDA and EPA Launch U.S. Food Waste Challenge. Retrieved from: [http://www.usda.gov/portal/usda/usdahome?contentid=2013/06/0112.xml&navid=NEWS\\_RELEASE&navtype=RT&parentnav=LATEST\\_RELEASES&deployment\\_action=retrievecontent](http://www.usda.gov/portal/usda/usdahome?contentid=2013/06/0112.xml&navid=NEWS_RELEASE&navtype=RT&parentnav=LATEST_RELEASES&deployment_action=retrievecontent)

# Do the Worm! (Make Vermicompost Bins)

4-H Aggie Adventures for Kids (10:55 - 11:40 a.m.)

## What to Do:

1. If you have access to a laptop and a projector, show the PowerPoint presentation entitled “Do the Worm” located online at <http://utah4h.org/htm/resource-library/4-h-kits-for-checkout/sustainable-you-guide/>.
2. After viewing “Do the Worm” as a group, tell the campers they are all going to have the opportunity to make their very own vermicompost bin.
3. Pass out pre-drilled bin/bucket and a lid to everyone making a worm-composting bin.
4. Fill the bin/bucket 1/3 to 1/4 deep with dirt.
5. Add finely shredded newspaper/egg cartons. The campers can shred these items themselves if you don't have a paper shredder. Just have them tear the paper and egg cartons into small pieces.
6. Add between 1/2 cup to 1 cup of coffee grounds.
7. Mix with either a trowel or your hands.
8. Put at least 6 red worms in each camper's container.
9. Add a few food scraps (an apple core, 1/2 a banana peel, orange rind, etc.)
10. Mix gently with hands (trowels could injure the worms).
11. Add a little water with a spray bottle IF NEEDED (you may not need to add water). Soil shouldn't be dry, just slightly moist. It should feel like a well wrung out sponge.
12. Put the lid on.
13. Remind the campers that they shouldn't put meat or dairy products in their compost bin, as this will cause a foul odor to develop and will also make the worms sick.
14. Keep the bins at camp until the end of the week to monitor camper use of the bins, worm health, etc.

TIME: 40 Minutes

GRADE LEVEL: 4-6

## OBJECTIVE:

Campers will build a functional worm-composting bin to take home and use in their household.

## MATERIALS:

- Do the Worm! PowerPoint (optional) – found online at <http://utah4h.org/htm/resource-library/4-h-kits-for-checkout/sustainable-you-guide/>
- Computer (optional)
- Projector (optional)
- Screen (optional)
- 1 bin/bucket and lid per camper (See Appendix K for photos of worm compost bins made at previous Sustainable You camps)
- Red worms (can be purchased online by searching red worms or composting worms)
- Dirt (either gather or purchase)
- Cardboard egg cartons and old newspapers (will be shredded)
- Trowels (for mixing all materials together)
- Used Coffee grounds (obtain from home or local coffee shop, usually free)
- Food scraps (fruit,

# Do the Worm! (CONTINUED)

## 4-H Aggie Adventures for Kids

### Reflect:

- What happens to the food we throw away?
- What percent of compostable food scraps do you think Americans throw away each year? (96 percent!)
- What could we do with the nutrient rich soil that our vermicompost bin will create?
- Why would it be beneficial to have a worm-composting bin?
- Does the bin smell bad?

### Apply:

- It was recently found (2011) that Americans throw away almost 40 percent of all the food that is produced and bought in the United States without ever eating it.<sup>2</sup> What are some things that you can do to help your family create less food waste? (Only buy what you will use, use things before their expiration date, plan meals together, share abundance with your neighbors, when ordering food at a restaurant don't order more than you can realistically eat.)

1.EPA. (2014). Municipal Solid Waste (MSW) in the United States 2012 Infographic. Retrieved from: <http://epa.gov/osw/nonhaz/municipal/infographic/index.htm#04> or <http://epa.gov/osw/nonhaz/municipal/msw99.htm>

2.USDA. (2013). USDA and EPA Launch U.S. Food Waste Challenge. Retrieved from: [http://www.usda.gov/wps/portal/usda/usdahome?contentid=2013/06/0112.xml&navid=NEWS\\_RELEASE&navtype=RT&parentnav=LATEST\\_RELEASES&edeployment\\_action=retrievecontent](http://www.usda.gov/wps/portal/usda/usdahome?contentid=2013/06/0112.xml&navid=NEWS_RELEASE&navtype=RT&parentnav=LATEST_RELEASES&edeployment_action=retrievecontent)

vegetables, grains, clean egg shells- NO MEAT OR DAIRY PRODUCTS OR HEAVILY PROCESSED FOODS, THESE ARE BAD FOR THE WORMS AND WILL MAKE THE BIN STINK!)

- Water in a spray bottle
- Power drill
- Large drill bits

### PRIOR TO ACTIVITY:

Gather materials listed and ensure there is enough for each camper and instructor. Review the PowerPoint lecture, "Do The Worm," available on the flash-drive included in the materials kit. If using a cordless drill ensure battery is charged. It is a good idea to drill the holes in the tubs in advance. This makes the project go much quicker, as it is hard for campers to drill the holes and you might not have enough drills for every camper to drill the holes simultaneously. It is also a good idea for the instructor to make a worm compost bin well in advance of the camp and get used to how to use it. You can view pictures of vermicompost bins made at previous Sustainable You camps in Appendix K.

# Landfill Tour! (Alternative activity)

## 4-H Aggie Adventures for Kids

### What to Do:

1. Everyone should meet together at the landfill (riding together or separately is up to the person facilitating this camp).
2. Make sure that every camper has his or her journal and something to write with.
3. Before touring the landfill, lead the campers to think about the following questions:
  - What is the most common material you see?
  - (If it is windy) What is blowing around? (Usually garbage bags/grocery bags)
  - What are some things that you see that surprise you?
  - What does it smell like? Why?
4. Meet the tour guide at previously specified point.
5. Go for tour of the landfill.
6. If the tour is being led by someone working for Solid Waste Management, ask them the following questions:
  - a. How many tons of garbage are dumped here each day?
  - b. What percentage of items in the landfill are recyclable?
  - c. What is the most common thing in this landfill?
  - d. How long do some of these items take to break down?
  - e. What things would be considered hazardous waste?
  - f. What should we do with our household hazardous waste?
  - g. Are there any facts that you wish citizens of this community knew about the landfill or the things that it contains?
  - h. What is done with green waste?
7. After the tour is over, thank the tour guide.
8. Allow campers 10 minutes to write any reflections in their journals about the tour to the landfill. Reiterate the statistics shared with the campers and anything that you felt impressed with.
9. Show the campers the EPA info-graphic entitled "Together We Can Make A Difference". It can be found in the supplemental materials or at this link: <http://www.epa.gov/osw/nonhaz/municipal/infographic/index.htm>

TIME: 40 Minutes - 1 hour

GRADE LEVEL: 4-6

#### OBJECTIVE:

Campers will visit a local landfill/solid waste management area. Through observation campers will classify what they see the most of, usually plastic materials like plastic bags and containers. After the tour some interesting solid waste facts will be shared with campers to increase their knowledge on how much we throw away as a society and what we can do to reduce it. This tour should allow the campers to connect with the idea that when they throw something "away" that there is actually "no away" and all the stuff we buy, use and throw away goes somewhere.

#### MATERIALS:

- Journals
- Writing utensil

# Landfill Tour! (CONTINUED)

## 4-H Aggie Adventures for Kids

### Reflect:

- How many pounds are in 1 ton? Answer: 2,000 pounds
- How many tons of municipal solid waste do Americans create every year?
  - 250 million tons!<sup>1</sup> That's the equivalent of 33,333,333 adult male African elephants! (1 adult male African elephant can weigh up to 15,000 pounds or 7.5 tons<sup>2</sup>)
    - It also is equivalent to about 685 empire state buildings (Empire state building weighs 365,000 tons<sup>3</sup>)
- How many tons of this municipal solid waste end up in landfills or are incinerated?
  - 134 million tons<sup>1</sup> (this is the equivalent of 17,866,666 adult male African elephants<sup>2</sup>, or 367 Empire State Buildings)
- What did you see the most of?
- What are some things that surprised you?
- What are some things we can do to create less solid waste in our lives?

### Apply:

- Next time you are at the store shopping, look for products that have less packaging or no packaging at all.
- Bring your own bags when shopping to save one from going into the landfill.
- Anytime you can abstain from using single-use items DO IT!
- Bring your own reusable containers to take leftovers from restaurants.

### PRIOR TO ACTIVITY:

Contact local landfill or Solid Waste Management agency and ask if they give tours. Schedule a time to come with the campers and have a representative take you through. If formal tours aren't available, find out if there is a landfill you could visit with the campers to observe without a formal tour. If there is no landfill in your area within a reasonable distance, you could locate a community dumpster and view it with the campers.

Remind the campers that they will need to bring their camp journals with them because they will be asking and answering questions during the tour.

1. EPA. (2014). Municipal Solid Waste (MSW) in the United States 2012 Infographic. Retrieved from:

<http://www.epa.gov/osw/nonhaz/municipal/infographic/index.htm>

2. Wikipedia. (2014). Elephant. Retrieved from: <http://en.wikipedia.org/wiki/Elephant>

3. Tauranac, J. (1997). The Empire State Building: The Making of a Landmark. Retrieved from: [http://](http://www.thecityreview.com/tauranac.htm)

[www.thecityreview.com/tauranac.htm](http://www.thecityreview.com/tauranac.htm)

# Clean Up and Journal Activity

4-H Aggie Adventures for Kids (11:40 a.m. - Noon)

## What to Do:

1. Have the campers help clean-up from the worm composting activity.
2. Have the campers sit down in a space where they have enough room to write.
3. Show the campers the same journal questions from the morning and have them label a new journal page “Day 1: Land, Afternoon.”
4. Have the campers answer the same questions from the morning in their journal. Remind them that there are no right or wrong answers. If their answer in the afternoon would be the exact same as their answer in the morning, they can simply write “same.” However, encourage them to answer the questions with any new information they learned. If you are not going to use the journals for evaluation, you can simply discuss the journal questions with the campers as opposed to having them write the answers down again.

## Reflect:

- If time allows, have the campers share with the group how their answers changed as a result of what they learned that day.

## Apply:

- Send campers home with USU Extension fact sheets on reusing, recycling, composting and/or vermicomposting in Utah, found for free at: <http://extension.usu.edu/sustainability/htm/land>. Encourage them to share what they learned today, as well as information in the fact sheets, with their families/friends.

TIME: 20 Minutes

GRADE LEVEL: 4-6

## OBJECTIVE:

Objective: Clean up after creating a worm compost bin and have campers answer the same questions from the morning in order to gauge their level of increased knowledge on the topics of land, garbage, recycling, and composting.

## MATERIALS:

- Journals
- Pencils
- Journal questions on whiteboard
- Reuse, vermicomposting, and/or additional fact sheets of interest (available at: <http://extension.usu.edu/sustainability/htm/land>)

## PRIOR TO ACTIVITY:

Prepare to guide campers if they have any questions by reviewing the background information for today.

# DAY 2: AIR

## SUSTAINABLE YOU! SUMMER CAMP

### AIR LEARNING OBJECTIVES

1. Identify three sources of air pollution
2. Discuss ways to improve air quality
3. List alternatives to single-driver transportation



# DAY 2: AIR

## 4-H Aggie Adventures for Kids

### BACKGROUND INFORMATION:

The second day of Sustainability Camp focuses on air, including air quality and climate change. Within this theme, campers will learn about Utah's winter inversions, different sources of pollution, and ways to improve our air quality. In this background section, you will be provided with information about air quality, inversions, and climate change.

#### Air Quality

Air quality is the degree in which the air we breathe is free of pollution (also referred to as particulate matter). Particulate matter air pollution has a considerable impact on public health and in 2017, was ranked as the 4th leading cause of mortality worldwide (ca. 5 million annual deaths).<sup>1</sup>

The Environmental Protection Agency's (EPA) National-Scale Air Toxics Assessment is commonly used to identify indicators of pollution in our air. Air toxins are those pollutants closely tied to development of cancer, asthma, and other serious health impacts. These toxins include, but aren't limited to, acetaldehyde, acrolein, benzene, butadiene, formaldehyde, polycyclic organic matter, naphthalene, and diesel particulate matter. Identifying the level of these toxins in our air allows us to identify top emission sources and to take action to reduce those pollutants. For more information on toxic air pollutants, visit the EPA's Toxic Air Pollutants webpage: <http://epa.gov/air/toxicair/>.

#### Utah's Inversions

Although your town may not experience the winter inversion that most of Utah faces each year, this information will be useful to you and your campers because air pollution continues to rise and inversions are of growing concern to the state of Utah. Utah has a naturally occurring inversion in the winter given the landscape of tall mountains with cities in valleys below. During cold periods in the winter, extremely cold air gets trapped below in the valleys, while warm air stays higher above. This is a deviation from the normal atmospheric conditions (cold air above and warm air below).

Surrounded by tall mountains and subject to frequent winter atmospheric inversions, the Wasatch Front in Utah is particularly susceptible to episodes of high particulate matter (PM) 2.5 air pollution. PM2.5 are tiny particulates in the air known as atmospheric aerosol. This is a fine particle, with a size of less than 2.5 micrometers in diameter. Consistent violation of the 24 hour average U.S. EPA National Ambient Air Quality Standards (NAAQS) for PM 2.5, resulted in designation of non-attainment as identified by the Clean Air Act. Nonattainment means that areas of Utah do not meet the EPA's standards for ozone pollution. In Cache Valley, Utah, the majority (>80%) of PM 2.5 (CVPM) has a mean geometric diameter of less than 1 micrometer in diameter.<sup>2,3</sup> This tiny



# DAY 2: AIR (CONTINUED)

## 4-H Aggie Adventures for Kids

particulate size efficiently penetrates to the general circulation or to the brain, causing widespread cardiovascular (circulatory system) and cardiopulmonary (heart and lungs) pathologies than larger PM.<sup>4,5,6</sup> Major sources of PM 2.5 pollution in Utah include vehicle emissions, wood smoke, and methane, primarily from cattle.

Visit Salt Lake City's webpage on winter inversions for excellent background of what an inversion is, how to put PM 2.5 into perspective, sources of PM 2.5 pollution, and ways that you can help: <http://www.ci.slc.ut.us/winter-inversions-what-are-they-and-what-we-can-all-do-help>.

### **Climate Change and Global Warming**

According to the EPA, climate change refers to major changes in temperature, precipitation, wind patterns, and other climatic factors that last for a long period of time (<http://www.epa.gov/climatechange/glossary.html>). As stated on the National Aeronautics and Space Administration (NASA) website, "most climate scientists agree the main cause of the current global warming trend is human expansion of the 'greenhouse effect' -- warming that results when the atmosphere traps heat radiating from Earth toward space."<sup>7</sup> Major gases associated with increasing the rate of global warming include water vapor, carbon dioxide (CO<sub>2</sub>), methane, nitrous oxide, and chlorofluorocarbons (CFC's).<sup>7</sup> Humans have increased the concentration of carbon dioxide in the air by a third since the beginning of the industrial revolution. Carbon dioxide stemming from burning coal and oil and clearing land is commonly seen as the most major force driving climate change.<sup>7</sup>

1. Ritchie, H., & Roser, M. (2017, April 17). Air Pollution. Retrieved from <https://ourworldindata.org/air-pollution>

2. Mangelson, N.F., Lewis, L., Joseph, J.M., Cui, W.X., Machir, J., et al. (1997). The contribution of sulfate and nitrate to atmospheric fine particles during winter inversion fogs in Cache Valley, Utah. *Journal of the Air & Waste Management Association*, 47: 167-75.

3. Silva, P.J., Vawdrey, E.L., Corbett, M., Erupe, M. (2007). Fine particle concentrations and composition during wintertime inversions in Logan, Utah, USA. *Atmospheric Environment*, 41: 5410-5422.

4. Nemmar, A., Vanbilloen, H., Hoylaerts, M.F., Hoet, P.H., Verbruggen, A., et al. (2001). Passage of intratracheally instilled ultrafine particles from the lung into the systemic circulation in hamster. *American Journal of Respiratory and Critical Care Medicine*, 164: 1665-1668.

5. Frampton, M.W. (2006). Inflammation and airborne particles. *Clinics in Occupational and Environmental Medicine.*, 5: 797-815.

6. Frampton, M.W. (2007). Does inhalation of ultrafine particles cause pulmonary vascular effects in humans? *Inhalation Toxicology*, 19 , 75-79.

7. National Aeronautics and Space Administration (NASA). 2014. Global climate change: Causes. Retrieved from: <http://climate.nasa.gov/causes>.

# Starter Activity

4-H Aggie Adventures for Kids (9:00 - 9:15 a.m.)

## Journaling / “Steal the Ogre’s Garbage” Game

### What to Do:

1. As campers arrive at camp, give them their journals and instruct them to answer the journal questions on the board. They can work on this until all campers have arrived.
  - Why is clean air important?
  - What pollutes our air?
  - How can you improve the air you breathe?
  - Draw a city with no air pollution and nothing in the city that creates air pollution.
2. Remind the campers to start on a new page in their journal and to title it “Day 2: Air, Morning.” Also remind them that there are no right or wrong answers. If they don’t know an answer, they should simply write “I don’t know.”
3. Once everyone has answered the questions, gather the journals from the campers and put them in a safe place OR have the campers put their journals back into their backpacks for use later on during the day.
4. Tell the campers that as they learn new things about the daily topic, they should write it down in their journals.
5. When all campers have arrived and completed their journal questions, move to the predetermined location and have them stand in a large circle.
6. Select one camper to stand in the middle while the other campers form a circle around her/him. This camper in the middle is the “ogre.”
7. Place the handkerchief (the ogre’s garbage) on the ground between the ogre’s feet.
8. Give the campers the game instructions.
  - a. The campers in the circle are trying to steal the handkerchief. More than one camper can try to steal the handkerchief at the same time.
  - b. If the ogre touches the other campers in their attempt to steal the handkerchief, they are out.
  - c. The game is over when either someone steals the handkerchief without being touched OR the ogre is able to touch all of the campers before the handkerchief is stolen.
  - d. The person who steals the ogre’s garbage (handkerchief) gets to be the ogre next OR if the ogre touches everyone she/he gets to choose who is the ogre next.

TIME: 15 Minutes

GRADE LEVEL: 4-6

### OBJECTIVE:

Throughout the camp, journals will be used by campers to record thoughts and ideas. The journal will not be graded and is to be used as a method to increase the camper’s ability to critically think about issues regarding sustainability. Campers will also play a group game each morning to help them learn a bit more about each other and feel connected to the rest of the campers.

### MATERIALS:

#### For Journal Activity:

- Camper journals
- Pencils
- Colored pencils/markers/crayons
- Dry erase board and markers with journal questions written on it OR one copy of Day 2 Journal Questions (Appendix C) for each camper
- Glue, if pasting journal questions into journals
- Scissors, if pasting journal questions into journal

#### For Game:

- Handkerchief

# Starter Activity (CONTINUED)

## 4-H Aggie Adventures for Kids

### Reflect:

- Ask the campers if anyone would like to share their answers to the questions. Discuss the answers that campers provided, as well as the correct answers. You don't have to fully explain the answers at this time, just provide a basic understanding. Campers will learn more about each question/topic throughout the rest of the day.

### Apply:

- Ask the campers to pay attention this week to what things they or their families do that may contribute to air pollution or help prevent air pollution. Ask them to keep track of how many car trips they take in a week and if their cars idle while they are in them. Tell them to be creative and think of other ways they could get around, or other ways they could help prevent air pollution. You could have the campers share their observations and ideas at the beginning of each day.

### PRIOR TO ACTIVITY:

Write the journal questions on the board OR make enough copies of the Day 2 Journal Questions (Appendix C) so that each camper has one to copy or paste into their journal. Familiarize yourself with the questions and their answers so you can explain the answers to the campers once they have completed the activity. You will also need to identify a large, safe, comfortable space where the campers can stand in a large circle to play the game.

# Understanding Inversions

4-H Aggie Adventures for Kids (9:15 - 9:30 a.m.)

## What to Do:

1. Ask the following questions to encourage a brief discussion:
  - What does air quality mean?
  - Where can you find information on air quality? This is a chance to tell the campers about Purple Air to monitor air quality in their area.
  - What is an inversion?
  - Why do you think the air quality can be bad when there is an inversion?
2. Tell the campers you will be conducting two experiments to show them how atmospheric inversions work.
3. Tell the campers to pay attention to what is different between the two scenarios.

## Regular Air Demonstration (Cold goes on top of warm)

1. Take jar of really cold water and top it off (so that water surface is level with top of rim- completely full) with more really cold water.
2. Take jar of really warm water and top it off with hot water so that the water surface is level with rim of container.
3. Place playing card on top of cold water container so that it seals off opening.
4. Take the cold container (with card on top) and quickly and carefully turn it upside down, placing it on top of the warm water container so that the rims are together with only the playing card in between.
5. Quickly and carefully remove the playing card.
6. The cool water and the warm water will mix as the cool air falls down and the warm air moves up. A layer of green water should appear (as blue and yellow mix) in the middle where the two containers meet.
7. This is a good representation of how air normally moves during a non-inversion period. Cold air comes from above and the warm air down low circulates upward (like when the sun warms the earth and the heat dissipates up and it creates a circulation (convection) of air.

TIME: 30 Minutes

GRADE LEVEL: 4-6

## OBJECTIVE:

This demonstration will teach the campers about how gases in the atmosphere move and trap particulate matter. Campers will also learn about how the shape of an area can contribute to how air and pollution move through the landscape. Due to Utah's historical inversions during the winter and their correspondence with trapping high levels of particulate matter, campers will be encouraged to think about what they can do to help with air pollution.

## MATERIALS:

- 4 identical clear jars/containers (label 2 warm, and 2 cold)
- Blue food coloring
- Red food coloring
- Warm water from tap or thermos (colored yellow)
- Cold water from tap or thermos (colored blue)
- Deck of playing cards
- Large container to perform experiment in (to catch any spillage)
- Cellophane wrap or other item as alternate to playing card
- Towel (in case of spill)

# Understanding Inversions (CONTINUED)

## 4-H Aggie Adventures for Kids

### Inversion Demonstration (warm goes on top of cold)

1. Top off the cold jar of water with more cold water so that the water is level with the rim.
2. Do the same with the warm water.
3. Place playing card on top of the warm container.
4. Quickly and carefully turn the warm water container over and place it on top of the cold container so that the rims are together with only the card separating them.
5. Pull the card out quickly and carefully.
6. The two colors do not mix.
7. There is no air circulation (convection) going on under these circumstances. This represents our atmosphere during an inversion. The cold air gets trapped down in the valleys with the warm air on top. There is no air convection so all the emissions from our factories, wood burning stoves, and automobiles gets trapped down low. This is what creates RED air days in Utah.

### Reflect:

- How can you find out what the air quality in your area is going to be for the day? (You could look to the Utah Department of Environmental Quality for their air quality reports.)
- What are some things you could do to help reduce air pollution?
- Is this demonstration something you could do at home to teach your family about the science behind atmospheric inversions?

### Apply:

- If your town has a transit system, try using it this week.
- Instead of getting a ride to a friend's house, try riding a bike, skateboarding, or roller blading.
- Teach your friends and family about Utah's air inversions (especially if they occur where you live), and explain the science behind how air circulation is impeded when we have hot air above and cold air below (inversion).

### PRIOR TO ACTIVITY:

Person carrying out experiment should have watched the linked video or one similar found on the Internet. Add food dye to the two separate containers of water, one color in each container. Heat the water that has been dyed red in the microwave or on a stove. The blue water should be stored in the refrigerator until the time that the experiment is performed. If no refrigerator or hot water is available on site, prepare both cold and hot water in advance and store in thermoses.

To see the inversion demonstration, visit:

<https://www.youtube.com/watch?v=LPvn9qhVFbM>.

# Pollution Detectives Bike Ride or Walk

4-H Aggie Adventures for Kids (9:30 - 10:15 a.m.)

## What to Do:

1. Explain to youth the general path that you will be traveling. Tell them that as they ride or walk, they should look for potential sources of pollution such as:
  - Automobiles, factories with smoke stacks, construction sites, homes with log burning fireplaces, etc.
2. Campers should take note of these sources of pollution in their journals. As an option, you can give a prize to the camper who listed the most (accurate) sources of air pollution.
3. Remind the campers that the people emitting the air pollution aren't bad people and that we shouldn't place blame on the "people." Sustainability is about attaching solutions to processes and products that aren't sustainable in the long run. We separate the problem from the person.
4. Make sure everyone has proper safety gear for the bike ride and knows how to operate a bicycle or understands the rules of walking as a group.
5. Pair campers up in groups of two to three.
6. Provide each group with a Pollution Detectives Tally worksheet, found in Appendix F.
7. Tell campers that as a group, they will stop at one point of the ride/walk and observe a road, filling out the first side of their tally worksheet.
8. Go on the ride/walk.
9. When viewing an area where a lot of cars are passing, encourage the campers to pay attention to how many people are in each individual vehicle, are they a single occupant, or multiple occupants?
  - a. Why is this important and how does it tie to sustainability? (Single occupant vehicles emit as much pollution as multiple occupant vehicles, carpooling is a much more sustainable way of getting around, it decreases traffic congestion and decreases emissions.)
  - b. What types of cars emit more pollution? (Typically older and bigger vehicles.)
10. If viewing a factory that has a smoke stack or a group of homes where smoke is visibly coming from chimneys, ask the campers to come up with solutions. Could the factory install a filter on their stack to make the emissions cleaner?

TIME: 45 Minutes

GRADE LEVEL: 4-6

## OBJECTIVE:

Campers will discuss other ways to commute aside from driving and the benefits of biking. During this activity campers will have the opportunity to get outside and look for the things in their community that may be contributing to air pollution. These potential sources will be noted in campers' journals and ways to remedy these situations can be discussed.

## MATERIALS:

- Individual camper's bikes
- Helmets
- Journals
- Pencil or pen
- Pollution Detectives Tally found in Appendix F
- Prize for camper who accurately identifies the most sources of pollution (optional)

# Pollution Detectives (CONTINUED)

## 4-H Aggie Adventures for Kids

11. Stop at one point of the ride/walk and have campers individually journal regarding the types of pollution they have noticed.
12. Stop at another point of the ride/walk and have campers complete the first page of the Pollution Detectives Tally worksheet.
13. Finish the ride or walk and have all the campers sit in a circle.
14. Talk with the campers about the different sources of pollution they saw.
15. As an option, present the camper who correctly identified the most sources of pollution with a prize.
16. Work through the second side of the Pollution Detectives Tally worksheet with the campers. Tell them you assigned an air pollution value to each vehicle type. The number assigned is an estimate of the level of air pollution each type of vehicle emits for each person it carries, compared to other vehicle types. The higher the number, the more the pollution. Explain, however, that this is a very rough estimate as some vehicles are more efficient than others. Help the campers work in their groups to come up with the estimated air pollution values, and if time allows, help the campers present their results in the form of a graph or pie chart. For more information on this activity, see EPA Traffic Tally curriculum at: <http://www.epa.gov/airnow/teachers/toolkit/teachers-toolkit-3-5-508.pdf>.
17. Do the campers have some ideas on how to solve these sustainability issues?

### PRIOR TO ACTIVITY:

Familiarize yourself with potential pollution sources such as different modes of transportation, industrial buildings, mines, construction areas, etc. Is there a location in your area where campers can see some of these things? Remember, in trying to tackle issues of sustainability we don't want to work against each other. Try to get campers to think of ways to work with local businesses and residents to decrease the amount of air pollution in your area.

# Pollution Detectives (CONTINUED)

## 4-H Aggie Adventures for Kids

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### Reflect:

- Does your city have a public transit system?
- Who could you carpool with to school/events?
- Could you ride your bike to your friend's house instead of getting a ride?
- What are some other things you can do?

### Apply:

- Taking alternative modes of transportation is not only better for air quality, it is healthier for you. By combining exercise and transportation, you are able to benefit yourself and the environment.
- Ask your parents if they will try carpooling to work with a fellow employee. If you don't take a bus to school and your parents take you, see if you could also pick up your friends on the way.
- Tell you parents and friends about what you learned today, and how air quality affects everyone. Help with the solution by providing specific tips to others about what they can do to help as well.



# Let's Plant A Native Tree/Shrub/Plant!

4-H Aggie Adventures for Kids (10:15 - 11:15 a.m.)

## What to Do:

1. Explain to the campers that they will be engaging in an action that will help air quality. This action will also have effects beyond air quality such as aesthetic beauty, water filtration, nutrient recycling, and providing habitat for local animals and insects. Tie in to other camp day themes, including water, land, food and energy.
2. When conducting this activity, it is important to notify the campers about the specifics of planting a tree/shrub/plant properly. Don't forget to mention facts like:
  - a. Coniferous trees (keep their leaves/needles year-round) should be planted on the north side of houses/buildings in cool climates because they don't shed their leaves like deciduous trees do in the winter. This means that they (conifers) provide shade year round and you wouldn't want them shading your home from the warm sunlight in the winter.
  - b. Conversely, deciduous trees (lose their leaves for part of the year) should be planted on the east, south or west parts of property because they will provide shade in the summer and in the winter they will still allow for direct sunlight to warm the house.
  - c. Trees should be planted at least 15 feet away from the foundations of buildings. They should also be planted at least 5 feet away from things like retaining walls, sidewalks, driveways, and patios.
  - d. If the tree is a fruit tree, think about where it would be most likely to be beneficial on the property. Is there a location that would allow easy access to fruits as you walk by to other locations? (For more on this, research permaculture online.)
3. Pass out tools to the campers and give instructions.
4. Dig a hole that is twice the size of the root ball.
5. The hole should be shallow enough that at least 1/2 - 1 inch of the top of the root ball will be above ground when covered with dirt.
6. Supplement the soil with compost, 1 part supplement to 3 parts native soil.
7. Take care that the tree is stable, and stake down if necessary. Never use wire to stake a sapling -- it can strangle the trunk, killing the tree.

TIME: 1 hour

GRADE LEVEL: 4-6

### OBJECTIVE:

This activity will help youth understand how trees, shrubs, and plants help air quality.

### MATERIALS:

- Shovels
- Hand trowels
- Native tree/shrub/plant for planting
- Water
- Buckets
- Compost/mulch

### PRIOR TO ACTIVITY:

Talk to a local business owner/resident who may be interested in planting a native tree/shrub/plant on his or her property in a location that is going to be watered regularly (If such a business/person isn't available, talk about planting a tree/shrub/plant theoretically with props so that campers leave the activity with the knowledge of how to do it themselves). Take care when selecting the type of species to ensure that it can survive in the local climate. Selecting a species that is native to the area, like a big tooth maple, will help to ensure its survival. Note that if planting a tree, the best time to plant is in the early fall because there is less risk of drought and heat-related

# Let's Plant! (CONTINUED)

## 4-H Aggie Adventures for Kids

8. Water the tree with about 15 gallons of water.
9. Teach the campers that the sapling (if planting a tree) will need to be watered regularly until it has established deep roots. This may take a year or so.
10. Once the tree/shrub/plant is planted, have the campers return all the tools to a specified area.
11. Teach the campers that trees, shrubs, and plants can act as filters in the air by catching particles on their leaves and branches. Teach them that during photosynthesis, plants take CO<sub>2</sub> and combine it with water and in turn make sugar and oxygen. So plants help transform greenhouse gases into oxygen.

### Reflect:

- Why would planting trees, shrubs and/or plants improve air pollution?
- Having done this activity do you feel that planting a tree/shrub/plant is harder or easier than you expected? Could you help your family do this in your yard?

### Apply:

- Encourage the campers to plant native trees/shrub/plants in their own yard if their families will allow it. Trees increase aesthetic beauty of landscapes, provide shade (reduce cooling costs in the summer, can act as wind barriers (reducing heating costs in the winter), reduce CO<sub>2</sub> emissions, filter pollutants out of the air, and keep soil from drying out (water retention).
- Teach your friends about the benefits of plants and how they help clean up pollution. (Filter the air, take in CO<sub>2</sub>, and also filter water.) One tree can absorb as much as 48 pounds of carbon dioxide per year, and can sequester 1 ton of carbon dioxide by the time it is 40 years old.<sup>1</sup>

1.NC State University. (n.d.) Tree Facts. Retrieved from: <http://www.ncsu.edu/project/treesofstrength/treefact.htm>

problems. Do research to figure which species would be best for the site selected. Research on the proper way to plant a tree is provided at the following links:

- <http://www.wikihow.com/Plant-a-Tree>
- <http://www.treepeople.org/how-plant-tree>

The book 'Gaia's Garden' could serve as a resource if you wish to discuss companion planting. For example, you could also plant yarrow, echinacea, or at least one companion plant to emphasize relationships found in nature - and talk about the important role of bees. An optional activity for this would be to draw a tree on a board (including roots) and ask the campers 'What does a tree provide' - write answers around the tree. Then ask campers 'What does a tree need' and write those answers in a different color. Campers will see through their answers that trees provide many services, but require very little to survive.

# Filtering Fun!

4-H Aggie Adventures for Kids (11:15 - 11:35 a.m.)

## What to Do:

1. Tell the campers they are going to filter pollutants out of the air. This activity is similar to how trees filter (clean) pollutants out of the air.
2. Pass out pieces of clear adhesive tape to campers.
3. Tell them they need to place the clear tape with the sticky side out (so it can catch dust particles) somewhere in the room that isn't at risk for air currents knocking the tape over.
4. Have the campers sit down after placing their tape in a location of their choice.
5. Show the campers the glass of water and explain that it has been uncovered and has been sitting since the night before.
6. Ask for a volunteer to come to the front and with a magnifying glass look at the surface of the water.
7. What does the volunteer see? (Dust particles floating around.) Have the volunteer tell the other campers what he or she observed.
8. Have the camper sit back down.
9. Ask the youth where the dust came from that was floating on the surface of the water.
10. Take a spoon or straw and tell the campers that the dust sitting on the surface is like the pollution in the air during wintertime inversions. It is stagnant and doesn't move around. Our air is polluted with something called PM 2.5, which stands for particulate matter that is 2.5 microns in diameter or smaller.
11. Teach the campers how small PM 2.5 is by explaining the following. If you took a hair follicle, blew it up to the size of a hula hoop, then put a beach ball inside, that would be a dust particle. Then if you put a marble inside, that would be PM 2.5 -- it's so small it passes through our body's main defense system (the skin) and lodges in our organs.
12. By using the straw or spoon to stir the water in the glass, we are mimicking what happens when a storm finally comes through and either snows/rains. It knocks the pollution out of the air and stirs the air up.

TIME: 20 Minutes

GRADE LEVEL: 4-6

### OBJECTIVE:

In this activity campers will use two methods to capture particles in the air. They will learn about the different sizes of air pollution and their potential health effects.

### MATERIALS:

- Clear adhesive tape
- Clear drinking glass
- Water
- Magnifying glasses
- Spoon
- Straw

### PRIOR TO ACTIVITY:

Place a clear glass of water (uncovered) out the night before you teach this activity in the room/outdoor space where the activity will occur. Before the activity starts, carefully bring the glass to where you will be teaching. Take care not to swish the water around because dust particles should have settled on the surface of the water through the night.

- <http://myasadata.larc.nasa.gov/804-2/dust-for-kids/>

# Filtering Fun! (CONTINUED)

## 4-H Aggie Adventures for Kids

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13. Ask the campers to think about what things have the ability to filter pollutants out of the air. (Plants and machines.)
14. Either at the end of this activity, or toward the end of the day, have campers gather their pieces of tape to look closely and talk about what has gathered on the tape. Ask them to think about normal dust particles vs. harmful air pollutant particles and to also think about other creative ways to decrease the number of harmful particles in our air.

### **Reflect:**

- Where do you think air pollution comes from?
- Where in our body do these pollutants get trapped when we breathe them in? (Brain, sinuses, and lungs)
- What can you do to help decrease air pollutants?

### **Apply:**

- Do these activities with your family at home.
- Teach your friends and family about the different sizes of air particles and how they can affect your health.

# Clean Up and Journal Activity

4-H Aggie Adventures for Kids (11:35 - Noon)

## What to Do:

1. Have the campers help clean up from the day's activities.
2. Have the campers sit down in a space where they have enough room to write.
3. Show the campers the same journal questions from the morning and have them label a new journal page "Day 2: Air, Afternoon."
4. Have the campers answer the same questions from the morning in their journal. Remind them that there are no right or wrong answers. If their answer in the afternoon would be the exact same as their answer in the morning, they can simply write "same." However, encourage them to answer the questions with any new information they learned. If you are not going to use the journals for evaluation, you can simply discuss the journal questions with the campers as opposed to having them write the answers down again.

## Reflect:

- If time allows, have the campers share with the group how their answers changed as a result of what they learned that day.

## Apply:

- Send campers home with Biking as an Alternative Mode of Transportation fact sheet through USU Extension, found at: <http://extension.usu.edu/sustainability/htm/air>. Encourage them to share this sheet with their family and/or friends. Gauge their excitement for biking by a show of hands. Perhaps the campers will now wish to bike more often with their families and/or friends to travel on short trips.
- Tell campers to explore the Purple Air map, found at: <https://www.purpleair.com/map?opt=1/mAQI/a10/cCO#1/25/-30>. Use prompts like "Does your neighborhood have good or bad air quality? Why may that be? What actions could be taken to address poor air quality in your area?" Let the campers know that they will have a journal activity on this topic the following day.

TIME: 20 Minutes

GRADE LEVEL: 4-6

### OBJECTIVE:

Clean up and have campers answer the same questions from the morning in order to gauge their level of increased knowledge on the topics of air pollution and air quality.

### MATERIALS:

- Journals
- Pencils
- Journal questions on whiteboard
- Biking as an Alternative Mode of Transportation fact sheet (available at: <http://extension.usu.edu/sustainability/htm/air>)

### PRIOR TO ACTIVITY:

Prepare to guide campers if they have any questions by reviewing the background information for today.

# DAY 3: FOOD

## SUSTAINABLE YOU! SUMMER CAMP

### FOOD LEARNING OBJECTIVES

1. Define “local food” and the benefits of shopping local
2. Define a food mile and learn about where our food comes from
3. Build an herb garden to take home
4. Learn about product packaging and how to make informed decisions about packaging



# DAY 3: Food

## 4-H Aggie Adventures for Kids

### BACKGROUND INFORMATION:

This day of Sustainability Camp focuses on food. Major topics include local food, food miles, food packaging, and Utah agriculture.

#### **Local Food**

To eat locally means reducing the distance between production and consumption of food products. According to the 2008 Farm Act, a product can be marketed as locally or regionally produced if its end-point purchase is within 400 miles from its origin, or within state boundaries.<sup>5</sup> “Local” is usually defined, however, on a smaller scale and is often described as products produced and sold within county lines. For more information on local food, including the economic, environmental, mental, physical, and social benefits, and where to buy locally in Utah, visit: [http://extension.usu.edu/files/publications/publication/Sustainability\\_2012-09pr.pdf](http://extension.usu.edu/files/publications/publication/Sustainability_2012-09pr.pdf).

#### **Why is Buying Local Important?**

According to the USDA’s 2007 Census of Agriculture results, 301,300 acres of land in Utah were developed between 1982 and 2007.<sup>1</sup> This loss calculates to more than 50 acres a day. When farmers are able to sell directly to restaurants or consumers, however, research shows that they increase their income and the rate of farmland loss is decreased.<sup>2,3</sup> In addition, local food sourcing is linked to generation of economic development in local communities, fostering public health outcomes related to food security, addressing food safety problems linked to the spread of disease via large-scale agriculture by using shorter supply chains, fostering a better sense of community, and providing opportunities for both farmers and restaurants to advertise environmental sustainability that creates positive public perceptions and embracement.<sup>4</sup> Local food sourcing not only helps sustain small-scale farms but also supports more diverse products and a wider variety of seeds and crops as opposed to monoculture farming associated with large-scale agriculture.<sup>5</sup>

When farmers sell to consumers and restaurants locally, they have more decision over the methods of production and processing they choose, and they learn more entrepreneurial business skills.<sup>5,6</sup> This is associated with longer-term economic impacts for rural communities in that “a climate of entrepreneurship and risk-taking” is encouraged.<sup>7</sup>

This means that the benefits associated with sourcing locally extend beyond the farmer to the community as a whole. This has been demonstrated by Dave Swenson, an economist at the University of Iowa, who has found through multiple studies that replacing imported with locally grown goods creates jobs and boosts local retail returns in industries throughout an entire state.<sup>8,9,10</sup>

# DAY 3: Food (CONTINUED)

## 4-H Aggie Adventures for Kids

It also has been proven through weighted average source distance calculations that it helps the environment by reducing carbon emissions associated with grocery store food items (known as food miles) (Pirog & Benjamin 2003).

### **Food Miles**

A food mile refers to the distance food travels. Calculating the impact of food miles involves taking into account fossil fuel consumption, air pollution, and greenhouse gas emissions associated with how far that food has traveled (food miles). According to the Journal of Environmental Science and Technology, the average food item found on grocery store shelves has traveled more than 5,000 miles from farm to fork.<sup>11</sup> This distance is the equivalent of driving from Salt Lake City to Miami, Florida, and back again! Researchers also estimate that 15 percent of our nation's entire energy use is used to feed Americans.<sup>12</sup> This energy use relates to one of the major themes of this camp: Energy!

### **Utah Agriculture**

Locally grown and processed foods in Utah represent 15 percent of the state's economy.<sup>13</sup> For information and videos about agriculture in Utah, visit the Utah Department of Agriculture and Food website: <http://ag.utah.gov/>. Appendix I lists types of food commonly grown in Utah. Also, for the Utah State Agriculture Overview produced by the USDA National Agricultural Statistics Service, visit: [http://www.nass.usda.gov/Statistics\\_by\\_State/Ag\\_Overview/AgOverview\\_UT.pdf](http://www.nass.usda.gov/Statistics_by_State/Ag_Overview/AgOverview_UT.pdf).

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# DAY 3: Food (CONTINUED)

## 4-H Aggie Adventures for Kids

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# Starter Activity

4-H Aggie Adventures for Kids (9:00 - 9:15 a.m.)

## Journal Activity and Predator and Prey Game

### What to Do:

1. As campers arrive at camp, give them their journals and instruct them to answer the journal questions on the board. Remind the campers of the Purple Air at-home activity because one of the questions refers to their experience with the activity. They can work on this until all campers have arrived.
  - a. What did you learn about the air quality in the area you live in? What can you do to help keep the air healthy?
  - b. Why buy local food?
  - c. What is a food mile?
  - d. Draw a picture of where the food in your school lunch box comes from.
2. Remind the campers to start on a new page in their journal and to title it "Day 3: Food, Morning." Also remind them that there are no right or wrong answers. If they don't know an answer, they should simply write "I don't know."
3. Once everyone has finished, have the campers set the journals aside.
4. Tell the campers that as they learn new things about the daily topic, they should write it down in their journal.
5. Move to the predetermined location and explain the game to the campers.
  - a. Tell the campers that they will be playing a game called Predator and Prey. Remind them that they have learned about open space and that this game ties into that. Animals often feed in open space. Open space provides the plant matter that prey animals feed on, as well as habitat for predators to hide while they stalk their prey. They will be using the open space they are standing in to recreate that situation.
  - b. Ask for a volunteer. This person will be the predator. He or she will go and stand in the middle of the open area in which the game is to be played.
  - c. The other campers will all choose an animal they are familiar with to be during the game.
  - d. With the predator standing in the middle of the field, the other campers should all line up on one end of the field facing the predator.

TIME: 15 Minutes

GRADE LEVEL: 4-6

### OBJECTIVE:

Throughout the camp journals will be used by campers to record thoughts and ideas. The journal will not be graded and is to be used as a method to increase the camper's ability to critically think about issues regarding sustainability. Campers will also play a group game each morning to help them learn a bit more about each other and feel connected to the rest of the campers.

### MATERIALS:

#### For Journal Activity:

- Camper Journals
- Pencils
- Colored pencils/markers/crayons
- Dry erase board and markers with journal questions written on it OR one copy of Day 3 Journal Questions (Appendix C) for each camper
- Glue, if pasting journal questions into journals
- Scissors, if pasting journal questions into journal

#### For Game:

- None

# Starter Activity (CONTINUED)

## 4-H Aggie Adventures for Kids

- e. A camp leader will start calling out characteristics of animals such as, “Anything with feathers!” All those campers who have chosen to be an animal that has feathers must try to run to the opposite end of the field without being tagged by the predator. If they are tagged, they also become a predator.
- f. The leader keeps calling out characteristics for each round.
- g. The game ends when all the prey has been tagged or time is up.
- h. Connect predator-prey relationships to the food chain and the day’s theme of food.

### Reflect:

- Ask the campers if anyone would like to share their answers to the questions. Discuss the answers campers provided, as well as the correct answers. You don’t have to fully explain the answers at this time, just provide a basic understanding. Campers will learn more about each question/topic throughout the rest of the day.

### Apply:

- Ask the campers to pay attention this week to the food they eat in their homes. They can keep a list tonight of all the things they had for dinner and try to think of where those items came from. They could look at the item packaging, or bring the packaging to camp tomorrow, to determine where the item came from.

### PRIOR TO ACTIVITY:

Write the journal questions on the board OR make enough copies of the Day 3 Journal Questions (Appendix C) so that each camper has one to copy or paste into his or her journal. Familiarize yourself with the questions and their answers so you can explain the answers to the campers once they have completed the activity. You will also need to identify a large, safe, comfortable space where the campers can play the game. The game requires campers to run from one end of the space to another while trying to avoid being tagged. The leaders should set game boundaries and notify campers when they are out of bounds. This game works best in a space about 10 yards x 30 yards.

# What Is Local Food?

4-H Aggie Adventures for Kids (9:15 - 9:30 a.m.)

## What to Do:

1. Ask the campers if they know what plants and animals make up their food. Ask the campers where an apple comes from (apple tree). Where does bread come from (wheat)? Where do tortilla chips come from (corn)? Where does salsa come from (tomatoes and other vegetables)? Where do hamburgers come from (cow meat)? Where does chocolate come from (cocoa bean)? All of these plants and animals that make up our food are grown or produced on a farm or ranch somewhere in the world.
2. Ask the campers if they know where their food comes from. This question asks them to think about the production location of their food. If the campers go with their parents to the grocery store and they buy red peppers, orange juice, bananas, a chocolate bar, and hamburger, where do they think those items, or their ingredients, come from? Were they grown/raised in Utah, another state in the United States, or in another country?
3. Ask the campers if they know what a food mile is? Allow the campers to answer. Once they have provided answers, share the full, correct definition with the campers.
  - a. A food mile is the distance your food travels from production to consumption. This takes into account the associated fossil fuel use, air pollution, and greenhouse gas emissions as a result of the long distance your food travels.
4. The average grocery store item travels up to 5,000 miles! That would be like driving from Salt Lake City and to Miami, Florida, and back again! Show the campers these distances on the U.S. map. Even though cows are raised in Utah, the hamburger in our grocery stores might come from a different state. Even though we can grow some vegetables in Utah, the vegetables we buy in grocery stores may come from a different state or country. Some of the items we buy can't be grown in Utah (such as cocoa), so they have to come from a different state or country.
5. Show the campers the pictures of the coconuts, pineapples, and cashews.
6. Ask the campers if they know how far these items have to travel to get to the United States? (As you share the origin locations for each item, indicate the country/state of origin on the world map.)

TIME: 15 Minutes

GRADE LEVEL: 4-6

### OBJECTIVE:

In this activity campers will learn about local food, what a food mile is, where local food comes from, how it can benefit the local community, and how it can be more sustainable than other options.

### MATERIALS:

- Pictures of food items and the ingredients they come from
- Pictures of coconut, cashews, and pineapple
- Laminated map of USA and the world

### PRIOR TO ACTIVITY:

Hang the laminated maps of the USA and the world up in a place where all students can see them. Familiarize yourself with the background information associated with this day's topic.

This website calculates food miles traveled by common grocery store foods and may be helpful to the instructor. Be mindful that these distances are from country of origin to the capital of the United States, so distances may be further or closer to Utah, depending on the direction traveled.

- <http://www.foodmiles.com>

# What Is Local Food? (CONTINUED)

## 4-H Aggie Adventures for Kids

- a. Coconuts mainly come from Thailand. Thailand is about 8,000 miles away from Utah.<sup>1</sup>
  - b. Pineapples – The United States gets its pineapple from Hawaii, which is almost 2,900 miles away from Utah.<sup>2</sup>
  - c. Cashews – the worlds’ top producer of cashews was Nigeria in 2010. Nigeria is about 7,200 miles away from Utah.<sup>3</sup>
7. Ask the campers if they know what is meant by “ local food.” Give the campers an opportunity to answer. Once several youth have answered, teach them the following: Local food is food that minimizes the distance between production and consumption. Local food is generally considered to be food that is consumed within 400 miles of the place it was grown/produced or that was grown/produced within the same state it is being consumed.

### Reflect:

- Ask the campers what they think the pros and cons are of using food that comes from far away.
- Ask the campers what they think the pros and cons are of using “local food.” (See background information for this day for more information.)
- How is buying local food more sustainable than buying non-local food?
- Who do you know that has a garden? What are some of the things that are grown there?
- Is there somewhere in your yard that you could plant a few edible plants?

### Apply:

- Encourage the campers to attend a gardeners/farmers market this week with their family.
- Critically think about where the ingredients came from in the food that you eat this week. How many food miles did they travel?
- Ask your parents if you can plant a small family garden.

1,2, 3. Wikipedia. (2014). Pineapple, Coconut, Cashew. Retrived from <http://en.wikipedia.org/wiki/Pineapple>, <http://en.wikipedia.org/wiki/Coconut>, and <http://en.wikipedia.org/wiki/Cashew>

# Food Origin Activity

4-H Aggie Adventures for Kids (9:30 - 10:00 a.m.)

## What to Do:

1. Split the campers into groups of two or three.
2. Tell the campers you are going to hand each group one food wrapper. Each wrapper will have an ingredients list and likely a statement about where the product was produced or distributed. Tell the groups they will try to figure out where the ingredients came from. Campers will match their ingredients with the “Origin of Production” sheet in Appendix G to see where the majority of each ingredient is produced. For example, a granola bar with chocolate and cashews would indicate that the cashews may have come from India and the chocolate may have come from Ghana. They will not be able to figure out the location of all the ingredients and can choose just one or multiple countries listed for each ingredient. Once the groups have identified the production location of major items on their ingredients list, they can make a note/draw a star with dry erase markers on their map regarding where each ingredient originated from. They can also include a note/star for where the product was produced or distributed, if their item contained that information.
3. Pass out food wrappers, maps, and markers to each group.
4. When all groups have figured out their product, ask each group to stand up and present their food item and their map.
5. If available, on a larger map pin the wrappers on the area considered the “origin” of the product. This is for the campers to look at during the reflection period and throughout the week.
6. If a group finishes quickly, you can give them another food item to explore before addressing everyone together.
7. Have the groups present their findings to each other by randomly selecting one at a time when they are ready.

TIME: 30 Minutes

GRADE LEVEL: 4-6

### OBJECTIVE:

In this activity campers will determine the production location of various food items. Campers will learn how to figure out where food is grown or raised, where it is manufactured, and how far it has to travel to get to their plate.

### MATERIALS:

- Wrappers from various food items with their ingredients list clearly visible
- Copy of the “Origin of Production” sheet found in Appendix G, one copy per group
- Laminated world maps – one map per group
- Dry-erase markers

### PRIOR TO ACTIVITY:

Familiarize yourself with the “Origin of Production” list so you can better help the campers in this activity.

# Food Origin Activity (CONTINUED)

## 4-H Aggie Adventures for Kids

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### Reflect:

- Why are certain countries producing such a diverse range of products?
- Are there any products that came from places they didn't expect?
- Are they surprised at the many places their food item ingredients included?
- Can we grow any of the ingredients in these products in Utah?
- Why do you think it would be more sustainable to use food from Utah in these products?

### Apply:

- Next time you are at the grocery store with your family, remember to look at the country of origin of your products when buying them. Are there other options that were sourced closer to home?
- Is there a product that you and your family could grow yourselves?
- Is there a local farmer in your area that you could buy produce from?
- Could you make some of the items you purchase out of local foods? Salads from veggies you grow, granola bars from foods grown by local farmers, or hamburgers from cattle raised by local ranchers?

# Practical Packing

4-H Aggie Adventures for Kids (10:30 - 10:50 a.m.)

## What to Do:

1. Lead the campers through the following:
  - a. Why is our food packaged? (To keep food together, preservation, protection from damage, makes transportation easy.)
  - b. What are some of the different types of packaging that you can think of? (Plastic, cardboard, glass, tin, aluminum)
  - c. What are some of the pros and cons of these different types of materials? Do you think some might take longer to break down in a landfill than others? Can some of them be recycled while some cannot?
2. Tell the campers that they are going to complete an activity in which they need to answer questions about differently packaged items. They will be given various items with different types of packaging and they will be given a sheet with questions on it. They need to discuss the answers to the questions with their partner for each item. The campers don't necessarily have to write down the answers on the sheet, they just need to observe and discuss the answers with their partners. Once they have looked at all of their packages, they need to pick one item that has unnecessary packaging and think of ways they could change the packaging to make it more sustainable.
3. Divide the campers into groups of two to three students.
4. Give each group the "Practical Packaging" worksheet (Appendix H).
5. Give each group three to four products that are packaged differently. Each group should receive a variety of packaging types: products that include unnecessary packaging, products that are minimally packaged, packaging that can be recycled, etc.
6. When the groups have had a chance to complete the activity, ask each group to pick one item they think is packaged in a sustainable way (uses the fewest resources in its packaging and is recyclable or compostable) and one item they think is packaged in an unsustainable way. They will present these items to the rest of the campers. They will also present on alternative ways to package the unsustainably packaged item.

TIME: 20 Minutes

GRADE LEVEL: 4-6

### OBJECTIVE:

Campers will learn about packaging (both food and non-food items) and its contribution to solid waste in our landfills. Campers will work in teams to evaluate which types of packaging are the most sustainable and to brainstorm better alternatives to less sustainable packaging.

### MATERIALS

- Different examples of packaging
- Practical Packaging Worksheet- found in Appendix H

### PRIOR TO ACTIVITY:

Read over the description below. Familiarize yourself with items in the grocery store that are heavily packaged unnecessarily.



# Practical Packing (CONTINUED)

## 4-H Aggie Adventures for Kids

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### Reflect:

- How does packaging contribute to solid waste in our landfills?
- How can you decrease the amount of packaging you throw away? (When buying items, judge which choice has the least packaging. Example: individually wrapped cookies versus cookies bought in bulk with only one wrapper/container.)
- Can you think of some items that many people buy that have a lot of packaging?

### Apply:

- Next time you go shopping by yourself or with your family, pay attention to the amount of packaging on products. Is there another option that doesn't have as much packaging?

# Tour a Local Farm

## Interview A Local Farmer

4-H Aggie Adventures for Kids (11:00 - Noon)

### Tour a Local Farm/Interview a Local Farmer

#### What to Do:

1. Arrive 5 minutes early to the farm with the campers to show respect for the farmer's time.
2. Let the campers know where they are, who the farmer is, and what is grown. (Produce, animal feed, dairy products, etc.)
3. Encourage the youth to ask questions about what the different plants are and why the farmer chose to plant them.
4. Thank the farmer for the opportunity to come and tour the farm.
5. During the tour ask the farmer about the different plants. Why did the farmer choose to plant that? Can it be sold? What is going to be done with the produce come harvest time? Will it be available for purchase in a local store, farmers/gardeners market?
6. After the tour is over, have the campers thank the farmer.
7. Ask the campers to answer the following questions in the Day 3 section of their journals.
  - a. What was something that you thought was cool about the farm/grower?
  - b. Which plants would you like to plant in your garden if you had one?
  - c. How is buying food from local farmers better than buying the same items at the grocery store? (Helps the local economy, vegetables/fruit have higher nutritional value when picked ripe.)

TIME: 1 Hour

GRADE LEVEL: 4-6

#### OBJECTIVE:

Youth will interview local producer(s). Question samples: Why is local food important? How does local food help our town? This activity will allow the youth the opportunity to make a connection with where food comes from. Through touring the farm they will increase their knowledge about how food is grown and what types of produce can be grown in the area. If a farm tour cannot be done, contact a local grower in advance and ask him/her to come in to talk about his or her farm, show pictures, and if possible, share a few products with the campers.

#### MATERIALS:

- Journals
- Writing utensils

# Tour a Local Farm (CONTINUED)

## 4-H Aggie Adventures for Kids

### Reflect:

- How could you support this local farmer?
- What were some plants/foods grown on the farm that looked good to eat?
- How would growing your own food be healthier for you as well as better for the environment?

### Apply:

- Try to attend a local farmers market and meet the producers there.
- Tell your family and friends about your tour of the farm. What were some interesting things that you learned while on the field trip?
- Join a Community Supported Agriculture (CSA) program, where you pay an amount up front and get local produce during the entire growing season.
- Start or expand your own “farm” at home by growing a garden with your parents.

### PRIOR TO ACTIVITY:

Find a local farmer in your area who will allow the campers to come out and take a farm tour or secure a local grower to come in and talk with the campers. Ask if someone will be available to walk your group through the farm and explain what food is grown there. Don't worry if it isn't harvest season, as the campers will still get to experience the variety of plants growing.

# Create Your Own Garden Box

## 4-H Aggie Adventures for Kids

### What to Do:

\*Visit <http://extension.umd.edu/growit/photos-salad-box-construction> to view photos of the garden box construction and look in Appendix L for a pictures of the boxes used at previous Sustainable You camps and Appendix I for the list of foods grown in Utah.

1. Give campers their own set of four boards (two 21" boards and two 15" boards).
2. Have a camp leader help the campers use the power screwdriver to attach the boards together with the screws. They will create a 21" x 15" inch frame.
3. Have a camp leader help the campers staple the hardware cloth to the bottom of the wood frame. The hardware cloth should cover the bottom of the box and come up the sides of the box about 1-2 inches. This serves as the bottom to the garden box.
4. Have the campers select a pattern of duct tape and use it to tape over the sharp edges of the hardware cloth on the sides of the garden box.
5. Have a camp leader help the campers attach the door pulls to the 15" sides of the box. These handles will help the campers pick up their garden box.
6. Have the campers lay a piece of landscape fabric on the inside of their box. This fabric should cover the bottom of the box and come all the way up the sides of the box. This fabric will allow water to drain out while keeping the soil inside the box.
7. Have the campers add enough soil to their garden box to cover the bottom with about 2-3 inches of soil.
8. Show the campers the large list of foods grown in Utah.
9. Have the campers choose one vegetable and one herb from the list. Once they have decided and have their seeds, have them plant the seeds in the soil. They should use their index finger to "dig" out a shallow line in the soil. Sprinkle seeds in the line, and gently cover the seeds with soil.
10. Campers can repeat this planting procedure, creating a new line for their seeds every 1/2 to 3/4 inch along the length of their box.

TIME: 50 Minutes

GRADE LEVEL: 4-6

### OBJECTIVE:

In this activity youth will build their own miniature garden box to take home. The campers will be planting vegetables and herbs that are often grown in Utah.

### MATERIALS:

Supplies needed for ONE box:

- 4"x1" pine board (6 foot long, cut board into 4 pieces, 2-15 inch pieces and 2-21 inch pieces. The lumber store can usually cut the board for you.)
- 8 - 1 1/4 inch galvanized screws
- 2 screen door pull handles (optional)
- Black landscape fabric (comes in a large roll), cut into a rectangle 31 inches long x 25 inches wide. This will sit in the bottom of the garden box and should cover the bottom and up the sides
- 1/4 inch mesh wire hardware cloth (comes in a large roll), cut into a rectangle at least 25 inches long x 19 inches wide. This will cover the bottom of the garden box and needs to be long enough to come up the sides of the box a few inches.

# Create Your Own Garden Box (CONTINUED)

## 4-H Aggie Adventures for Kids

11. Once all seeds have been planted, spray a little bit of water on the soil. The soil should be damp, not dry or sopping wet.
12. Tell campers that they can take their boxes home and place them in a sunny place in their yard or on their porch or deck. They need to make sure the soil remains moist in the boxes. In a few weeks they should see their lettuce sprouting! When it is big enough, they can pick it and use it to make their own salad or as garnish on their sandwich or hamburger!

### Reflect:

- How would growing your own vegetables be more sustainable than buying them?
- What other plants could you grow?
- How can you use the lettuce you grow in this box? On your sandwiches in your school lunch? On your burgers for dinner? In salads? Feed it to your pet rabbit?
- Was making this garden box and planting the lettuce harder or easier than you previously thought?

### Apply:

- Encourage the campers to go home and make additional garden boxes with their families. They can even make the boxes elevated so it is a garden table.
- Encourage the campers to go home and discuss with their parents if they are able to plant a vegetable garden in their yard.
- Encourage campers to make a garden box as a birthday present for a friend!

- About 10-15 cups potting soil
- Various packets of vegetables and herbs on the Grown in Utah list.
- Duct Tape to tape around the sharp edges of the hardware cloth. If you buy different patterns, this will act as a “decorative” piece on the boxes.

Tools needed to complete the project:

- Power drill with  $\frac{1}{8}$ ” drill bit and Phillips screwdriver bit
- Staple gun and staples
- Screwdriver
- Scissors
- A cup to scoop soil out of container and into the box
- Water in a spray bottle

PRIOR TO ACTIVITY:

- Precut the wood for the number of boxes you will need. You can tape together two 21” boards and two 15” boards with masking tape so they are separated out for each box.
- Predrill pilot holes into the two ends of the 15” boards using the  $\frac{1}{8}$  inch drill bit. These holes will be the location of the screws connecting the short ends of the box to the longer ends.
- Precut the hardware cloth for the number of boxes you will need.
- Precut the landscape fabric for the number of boxes you will need.

# Create Your Own Garden Box (CONTINUED)

4-H Aggie Adventures for Kids

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- Charge power drill(s).
- If you need to save time or don't think the campers can handle the drilling and stapling, you can screw the wood boxes together, put the door handles on them, and staple the hardware cloth on the boxes. This way, all the campers need to do is put duct tape on the box, add soil, and plant their seeds.

# Clean Up and Journal Activity

4-H Aggie Adventures for Kids (11:40 - Noon)

## What to Do:

1. Have the campers help clean up from the garden box activity.
2. Have the campers sit down in a space where they have enough room to write.
3. Show the campers the same journal questions from the morning and have them label a new journal page “Day 3: Food, Afternoon.”
4. Have the campers answer the same questions from the morning in their journal. Remind them that there are no right or wrong answers. If their answer in the afternoon would be the exact same as their answer in the morning, they can simply write “same.” However, encourage them to answer the questions with any new information they learned. If you are not going to use the journals for evaluation, you can simply discuss the journal questions with the campers as opposed to having them write the answers down again.

## Reflect:

- If time allows, have the campers share with the group how their answers changed as a result of what they learned that day.

## Apply:

- Send campers home with Local Food Movement fact sheets through USU Extension, found at: <http://extension.usu.edu/sustainability/htm/food>. Encourage them to try out at least one new behavior to help support local growers, such as visiting the local farmers market or seeking local labelling at the grocery store.

TIME: 20 Minutes

GRADE LEVEL: 4-6

### OBJECTIVE:

Clean up after creating the garden boxes and have campers answer the same questions from the morning in order to gauge their level of increased knowledge on the topic of local food.

### MATERIALS:

- Journals
- Pencils
- Journal questions
- The Local Food Movement fact sheet (available at: <http://extension.usu.edu/sustainability/htm/food>)

### PRIOR TO ACTIVITY:

Prepare to guide campers if they have any questions by reviewing the background information for today.

# DAY 4: ENERGY

## SUSTAINABLE YOU! SUMMER CAMP

### ENERGY LEARNING OBJECTIVES

1. Define between renewable and non-renewable energy
2. List different sources of energy and their pros and cons
3. Investigate solar and wind energy





# Day 4: Energy

## 4-H Aggie Adventures for Kids

### BACKGROUND INFORMATION:

During this day, campers will learn about the difference between renewable and non-renewable energy. After the day's activities have been completed, campers should be able to list different sources of energy with their associated pros and cons. Campers will also investigate solar and wind energy. Some fundamental information for understanding energy is given below.

#### Energy

There are many sources of energy found on, and in, the earth. The ultimate source of energy is the sun, which produces energy by fusing atoms of hydrogen together to make helium. This process gives off incredible amounts of energy. This energy is emitted through space and bombards the earth. Until the sun burns out, which won't happen for a very long time, the energy emitted will continue to infiltrate the earth every second of every day.

Humans have designed many machines and processes to harness various forms of energy. Some sources of energy, like coal and oil, are finite and after they are used up we will no longer have access to them. Others, like solar energy, are abundantly available and won't "run out" in the near future. Humans use energy in a variety of ways and for many purposes. The types of energy used, and their associated by-products, have an effect on our worlds' natural systems.

Historically humans burned plant matter to create energy. This energy was used to cook food and to keep warm. This practice of burning plant material still persists today in many parts of the world for the same purposes, although many countries in the developed world no longer use fuel sources like wood for their primary energy source.

During the industrial revolution coal-powered machines became very popular because coal was so abundant and could produce more energy than simply burning wood. Machines that used this fuel source were quickly adopted and helped to further development throughout the world. Little thought was given to the by-products that this fuel source produced. Slowly some of these side effects began to be seen. In the United Kingdom, so much coal was being burned that the ash and soot in the air covered plants and streets. It polluted the air causing many people respiratory and other health problems. People started to notice that coal, although abundant and very useful, had some negative aspects as well.

Since the early 1900s, oil has been used to make fuels such as gasoline and diesel. For a long time it seemed the earth had endless deposits of oil. Oil could be used for so many things: fertilizers, plastics, medicine, fabric, and fuel. Oil was a wonder substance and was cheap because of its abundance. Around the 1970s, scientists foresaw that oil was not infinite and that it would someday run out. The cost of oil began to increase and continues to do so today. It is now known that oil can also have a lot of negative impacts on human health and the environment. The side effects caused when we drill for oil can be very damaging and dangerous, polluting our water supply and damaging our lungs.

# Day 4: Energy (CONTINUED)

## 4-H Aggie Adventures for Kids

One problem with fuels that have to be burned is their associated gaseous by-products, such as carbon dioxide (this relates to what was learned on 'air' day). Carbon dioxide is a greenhouse gas, which means that it has the ability to trap or reflect heat energy. The name greenhouse gas refers to its (the gases) ability to act like a greenhouse. Greenhouse gases allow light energy from the sun to pass through them in the atmosphere but reflect and absorb the heat energy that is bounced back from the earth. Think about your car on a hot summer day when the windows are all rolled up. Energy from the sun in the form of light comes through the window, that light energy heats up your dashboard, steering wheel, and seats, and the heat from those hot surfaces gets trapped in the car. This is the same thing that happens in our atmosphere. It is important to have greenhouse gases in the atmosphere to keep the earth warm enough for life to live on it. If not for these greenhouse gases, the earth would be way too cold. However, if the concentrations of greenhouse gases, such as carbon dioxide, are too high, weather patterns can change rapidly as well as ocean currents. These changes have an effect on local ecosystems both on land and in the water, which in turn affect human populations.

Carbon dioxide concentration levels currently are higher than they have been for thousands of years. We know this because we can measure the amount of carbon dioxide in the atmosphere in the past by taking samples of air bubbles frozen in arctic ice. The overwhelming majority of scientific information points to a direct correlation between atmospheric greenhouse gas concentrations and changes in global climate patterns.

In order to slow these changes in climate patterns, we need to reduce the amount of greenhouse gases in the atmosphere. One way we can do this is by switching to alternative fuels and energies that don't add new carbon dioxide and other greenhouse gases to the atmosphere when they are used. These include renewable energy sources such as wind and solar. Many countries are trying to implement renewable energies that have less of an effect upon global climate change, human health, and the environment.

The campers will have the opportunity to learn about both solar and wind power while studying this theme of sustainability.

### **Forms and Uses of Energy (Review PowerPoint for Utah specific sources)**

Energy comes in a few different forms such as: kinetic, potential, thermal, chemical, electrical, sound, and nuclear. Basic examples of some of these are given below.

- Kinetic energy – the energy something possesses when it is in motion, like a baseball flying through the air. That ball has energy, which is released when it hits the catchers' mitt or the baseball bat. Machines like wind turbines use the kinetic energy created by the wind pushing on the blade of the turbine to spin a generator that then creates electrical energy.
- Potential energy – think about a huge boulder sitting on top of a hill. That boulder has potential energy in it, which would be released if it were to be rolled down the hill.
- Thermal energy – this is the energy given off by the movement of the molecules inside something; the faster the molecules move and vibrate, the hotter the object is. The molecules

# Day 4: Energy (CONTINUED)

## 4-H Aggie Adventures for Kids

in boiling water are vibrating much faster than the molecules in room temperature water. Think about “old faithful” geyser in Yellowstone. This is a great example of geothermal energy.

- Chemical energy – think about how your body breaks down food to give you energy. The food had chemical energy stored in its sugar molecules and your body takes that sugar and converts it into another molecule used to trigger muscle fibers.
- Electrical energy - All matter in the universe is made up of atoms. Like magnets that have a positive and a negative end, some atoms are more positively charged and others more negative. The negative charge comes from something called an electron. Electricity is the flow of these electrons from a negative area to a positive area. We use electrical energy to power most of our household appliances. More and more cars are being converted to electrical energy as it does not produce harmful gaseous emissions.
- Nuclear energy – this is the energy given off when a molecule of one element is turned into another element. This process gives off massive amounts of energy.

Where does energy come from?

- When we burn solids (coal, wood, and fiber), liquids (oil), or gases (natural gas) we create energy.

How do we use energy?

- This energy is often used to generate steam; the movement of the steam is harnessed to spin generators that create a flow of electricity.

What are the by-products of using energy?

- Different sources of the energy give off various by-products. Some of these by-products are more harmful than others. Some of the by-products of using energy are called greenhouse gases. These gases are contributing to global climate change as they accumulate in greater amounts in the atmosphere.

How does the greenhouse effect work?

- Think about you car sitting in a parking lot on a hot summer day if all of the windows are rolled up, the inside of the car can get really hot! The energy from the sun comes through the windshield and windows and heats up your dashboard and seats. This heat then radiates off of these parts of the car and it is that heat that gets trapped inside the car. This is the same way the atmosphere works. Energy from the sun comes through our atmosphere and warms up the surface of the earth. This energy is then transformed into thermal energy and radiates back up.

How are greenhouse gases affecting global climate change?

- Greenhouse gases in the atmosphere trap the heat being radiated from the surface of the earth, not allowing it to go back out into space. We need a certain amount of these gases to keep the earth warm enough, but if they (greenhouse gases) become too abundant in the atmosphere, the temperature of the earth can increase. One greenhouse gas that you have probably heard about is Carbon Dioxide or CO<sub>2</sub>. Scientists can measure how much carbon dioxide has been in Earths’ atmosphere throughout history. Current CO<sub>2</sub> levels are MUCH higher than they have been historically, and are rising as more and more people on earth use machines that create CO<sub>2</sub> emissions.

# Starter Activity

4-H Aggie Adventures for Kids (9:00 - 9:15 a.m.)

## Journal Activity and Electric Train Tag

### What to Do:

1. As campers arrive at camp, give them their journals and instruct them to answer the journal questions on the board. They can work on this until all campers have arrived. Remind the campers to start a new page in their journal and title it "Day 4: Energy, Morning." Also remind them that there are no right or wrong answers. If they don't know an answer, they should simply write "I don't know."
  - a. What is renewable energy?
  - b. What is non-renewable energy?
  - c. Why is energy important?
  - d. Draw as many sources of energy as you can.
2. Once everyone has finished, have them set their journals aside.
3. Tell the campers that as they learn new things about the daily topic, they should write it down in their journal.
4. Tell the campers they will be playing a game called Electric Train Tag and explain the instructions.
  - a. In this game, there is one person who will be the electric train. Everyone else is single driver fossil fuel cars (option: connect back to the traffic tally conducted on air day).
  - b. The electric train will stand in the middle of the playing field and will cover his/her eyes and count to 15.
  - c. Once the train stops counting, he/she will run and attempt to tag single driver cars.
  - d. Create boundaries, where if people go over, they must automatically join the train (watch for campers who run past the boundary and ensure they join the train).
  - e. If tagged, campers must link hands with the train  
\*NOTE - only the very ends of the train can tag, not the middle. Be sure to point this out before beginning. This rule encourages the train to work together as a team and trap the cars.
  - f. Once everyone has joined the train, or if you feel it is time to move on to the next activity/round, call out that time is up for this round and either move on to the next activity, or to another round.

TIME: 15 minutes

GRADE LEVEL: 4-6

### OBJECTIVE:

Throughout the camp, journals will be used by campers to record thoughts and ideas. The journals will not be graded and are to be used as a method to increase the camper's ability to critically think about issues regarding sustainability. Campers will also play a group game each morning to help them learn a bit more about each other and feel connected to the rest of the campers.

### MATERIALS:

For Journal Activity:

- Camper Journals
- Pencils
- Colored pencils/markers/crayons
- Dry erase board and markers with journal questions written on it OR one copy of Day 4 Journal Questions (Appendix C) for each camper
- Glue, if pasting journal questions into journals
- Scissors, if pasting journal questions into journals

For Game:

- None

PRIOR TO ACTIVITY:

# Starter Activity (CONTINUED)

## 4-H Aggie Adventures for Kids

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### Reflect:

- Ask the campers if they would like to share their answers to the questions. Discuss the answers that campers provided, as well as the correct answers. You don't have to fully explain the answers at this time, just provide a basic understanding. Campers will learn more about each question/topic throughout the rest of the day.

### Apply:

- Encourage the campers to go home tonight and make a list of everything in their house that uses energy. Have them think of ways they could reduce the amount of energy those objects use. You can have the students share their observations and thoughts the next day at camp.
- In order to conserve energy, encourage campers to unplug unused electronics (including cell phone chargers!), turn off lights, turn down the thermostat in the winter, and bundle up instead, choose to not cool the house in the summer during the hours when no one is home, and ride bicycles or skateboards to friends' houses rather than getting rides in automobiles.

Write the journal questions on the board OR make enough copies of the Day 4 Journal Questions (Appendix C) so that each camper has one to copy or paste into their journal. Familiarize yourself with the questions and their answers so you can explain the answers to the campers once they have completed the activity. You will also need to identify a large, safe, comfortable space where the campers can play the game. The game requires campers to run in an open space. This works best if played in an open field.

# Understanding Energy

4-H Aggie Adventures for Kids (9:15 - 9:30 a.m.)

## What to Do:

1. Tell the campers that in the PowerPoint they will learn about various forms of energy and where they come from.
2. Ask the campers to list as many forms of energy as they can, as well as their sources.
3. Give the campers time to answer.
4. Direct their attention to the screen.
5. Go through PowerPoint presentation allowing the campers to ask questions if they have any.
6. Ask the campers the questions listed in the “reflect” section.

## Reflect:

- Did any of the facts about Utah’s energy surprise you?
- How do the types of energy resources Utah uses the most affect the environment and the people who live here?
- What types of energy would you like to see more of in Utah?
- What do you think is the most important use of energy in your life (driving? Powering your electronics? Lighting your house so you can see?)

## Apply:

- Encourage the campers to share what they’ve learned about Utah’s energy sources with their family and friends.
- Draw a picture of what your dream home/yard would be like and how it could be powered.

TIME: 15 minutes

GRADE LEVEL: 4-6

### OBJECTIVE:

Campers will learn about the various forms of energy currently available in the world as well as energy generation in the state. A discussion about the pros and cons of each will be conducted.

### MATERIALS:

- PowerPoint presentation entitled “Understanding Energy” (found online at <http://utah4h.org/html/resource-library/4-h-kits-for-checkout/sustainable-you-guide/>)
- Computer
- Projector and screen
- Chart showing Utah’s energy sources with percentages as well as by-products (found in Appendix B)

### PRIOR TO ACTIVITY:

Instructor should become familiar with the PowerPoint presentation and with local energy resources. For Utah, see the statistics listed under the Energy Section in Appendix B.

# What's Your Carbon Footprint?

4-H Aggie Adventures for Kids (9:30 - 9:50 a.m.)

## What to Do:

1. Tell the campers they are going to be doing an activity online that will help them see what impact their lifestyle has on the environment, specifically on the amount of CO<sub>2</sub> being emitted into the atmosphere as a result of things they do every day.
2. You can either have each camper do this activity (like at a local school or library on the computers) or you could have a few campers go through the questions and have all the campers watch. They can answer the questions on a sheet of paper and see how they compare to the campers who actually went through the website questions.
3. Teach the campers that CO<sub>2</sub> (carbon dioxide) is a greenhouse gas. What this means is that it has the ability to trap heat. Greenhouse gases are like blankets that trap heat inside the atmosphere and warm up the earth.
4. Certain things we do in life emit CO<sub>2</sub> - like driving, heating our homes, and things we buy in the store. By learning different ways to do things, we can reduce the amount of greenhouse gas emitted into the atmosphere and do our part to slow climate change.
5. As an optional demonstration, place the light of two heat lamps over two thermometers - one in a cup and one in a cup wrapped in a plastic ziplock bag.. Monitor the rate of temperature rising with each thermometer. This activity shows the basic idea behind the greenhouse effect.

## Reflect:

- What are some factors that you think you/your family could change?
- Could you ride your bike more often to friend's houses/school?
- How would buying things made/grown locally reduce CO<sub>2</sub> emissions? Think transportation.

## Apply:

- Look for ways to reduce your carbon footprint at home.
- Have your family take these quizzes and talk about what could be done to reduce your family's footprint.

TIME: 20 minutes

GRADE LEVEL: 4-6

## OBJECTIVE:

This activity allows the campers to use a computer program to learn about their environmental impact. This activity is a good way for campers to establish a baseline of how their lifestyle contributes to greenhouse gas emission and resource use and also provides some hints and tips on things to change in order to lead a more sustainable lifestyle.

## MATERIALS:

- Computers that have access to the Internet for campers to use.
- Optional: Two heat lamps, two cups, two thermometers, and a ziplock bag.

## PRIOR TO ACTIVITY:

Generate your own Carbon Footprint data and become familiar with the computer programs using one of the following websites:

- <http://www.parkcitygreen.org/Calculators/Kids-Calculator.aspx>
- <http://www.nature.org/greenliving/carboncalculator/>



# Fueled Fun

4-H Aggie Adventures for Kids (10:00 - 10:45 a.m.)

## What to Do:

1. Tell the campers to think back on things they have done this past week with energy in mind. What sources of energy were used? Where does that energy come from?
2. Have the campers make a list of 3-5 of these activities along with type of energy used and where the energy comes from. Provide the reference list located in Appendix B that explains the different sources of energy.
3. Next, the campers will draw a picture of the activity that used the most energy. Tell them to be prepared to share their picture with the rest of the group and talk about energy.
4. Have the campers present their pictures. Ask them if there were opportunities to save energy, incorporate renewable energy during their activity, or use alternative modes of transit (biking, walking, public transit, etc.)

## Reflect:

- What did you learn from the other campers?
- Where does the energy come from that fuels the activities we take part in?
- What are some ways you can save energy?
- What effect does this energy have on the environment (what are its by-products)?

## Apply:

- Share with your family and friends the things you learned. Talk to your family about different ways to save energy. Are there changes your family is willing to work on?

TIME: 45 minutes

GRADE LEVEL: 4-6

### OBJECTIVE:

Get campers thinking of different ways they use energy on a daily basis. Introduce new ways to save energy or incorporating renewable energy into their homes.

### MATERIALS:

- Markers
- White boards (or paper)
- Reference list (Appendix B)

### PRIOR TO ACTIVITY:

Visit <http://www.energy.utah.gov/> to find resources in your area. Because this is a summer camp based upon sustainability, it may be beneficial to first contact those energy providers who provide renewable energy (wind, water, solar, biofuels, geothermal, etc). If none are available in your area, any energy company will do.

-energy sheet, include renewable energy.



# Explore Alternative Energy (Solar And Wind)\*

4-H Aggie Adventures for Kids (10:45 - 11:40 a.m.)

\*This activity is adapted from the Wired for Wind activity developed for the 2011 4-H National Youth Science Day Science Experiment. To see the full activity visit: <http://www.4-h.org/4-h-national-youth-science-day/past-experiments-archives/>

## What to Do:

1. Tell the campers they are going to explore using the renewable energy sources of solar and wind to generate power.
2. First, they are going to mix up some brownie mix and use a solar oven to cook the brownies.
3. While the brownies are cooking, they are going to design their own blades for a wind turbine and test their blades' effectiveness at generating power from wind.
4. Ask for volunteers to help you complete each step of the brownie mix making process (one person can add oil, one can add water, one can add eggs, one can mix, one can pour batter into pan, etc.)
5. Once the brownie mix is in the pan, take the brownies out to the solar oven and explain how the oven works.
  - a. The oven is like a greenhouse, it traps heat from the sun's rays inside and the internal temperature rises. This high temperature will be used to cook the brownies. Solar ovens can be used to cook almost anything you could cook in a regular oven.
6. Have a camp leader go out and check the brownies periodically (about every 15 minutes), starting at the 45 minute mark to determine when they are done by dipping a toothpick or fork into the middle and seeing if the batter sticks.
7. Once the brownies are in the oven, have the campers move back inside to the "design" space for the wind turbines.
8. Tell them they are going to design wind turbine blades, attach those blades to a small turbine model, and test how well their blades do at producing energy from wind. The campers can use any of the materials on the table - cardstock, cups, poster board, cardboard, etc. to cut out blades. They can also make the blades any shape they want. As they design their blades, they should think

TIME: 60 minutes

GRADE LEVEL: 4-6

## OBJECTIVE:

In this activity, campers will explore the use of solar and wind as forms of renewable energy. Campers will bake brownies in a solar oven and design their own wind turbine blades and test the energy output their blades produce.

## MATERIALS:

For Solar oven Brownies:

- Brownie mix (including all necessary ingredients; make sure the brownie mix and ingredients do not cause allergy problems for any campers)
- Solar Oven - contact your local County Extension Office, or build your own by searching for instructions online. Two good starting points are: <http://www.hometrainingtools.com/build-a-solar-oven-project/a/1237/>; and <http://www.instructables.com/id/How-to-Make-a-Simple-Cardboard-Solar-Oven/>
- Sunny day
- Timer
- Measuring cups required for brownie ingredients
- A spoon or whisk to mix brownie batter
- Bowl to mix brownies in

# Explore Alternative Energy (CONTINUED)

## 4-H Aggie Adventures for Kids

about what shape, size, and material might be best at “capturing” the wind and forcing the blades to turn on turbine with the greatest speed. Encourage the campers to draw their blades on their material with a pencil and then cut the blades out. The campers can also make any number of blades for their turbine – 2, 3, 5, 6. One of the things they can test is what number of blades works best.

9. Once campers have cut out their blades, have a camp leader help them use the hot glue gun to attach their blades to the wooden dowels.
10. Once the glue on their blades has cooled, have the campers take their blades to the “testing” area where a camp leader will help them put their blades into the wind turbine hub.
11. Once the blades are secure in the turbine hub, turn on the box fan and have the students hold the turbine in front of the fan. They can hold the turbine in different orientations to the fan to test which orientation produces the most energy. While the campers are holding their turbine in front of the fan, have them watch the multimeter to see how much energy their wind turbine produces.
12. Once they have tested their turbine, encourage the campers to go back to the “design” space and create new blades that might produce more energy based on what they learned during their testing phase.
13. A camp leader can keep track of the amount of energy generated by each camper. That way at the end, the campers can take a look at the turbine(s) that generated the most energy and analyze and discuss why they think those designs were most effective.
14. The brownies may finish cooking while campers are still designing turbines. If this happens, simply have a camp leader remove the brownies from the oven and set them aside until the campers have finished the wind turbine activity.
15. Once the wind turbine activity is completed and the brownies are done, it’s snack time! Have a camp leader pass out brownies to the campers. While the campers are enjoying their brownies, reflect with them on what they learned about solar and wind energy.

- Brownie pan
- Non-stick spray if required for brownies

For Wind Turbine:

- Wind turbine kit - contact your local County Extension Office, search how to build your own online, or order a kit online. Here is one starting point: <http://store.kidwind.org/catalog>
- Multimeter – contact your local County Extension Office or buy your own through a web search
- Cardstock, poster board, and/or cardboard of varying thickness
- Paper cups
- Box fan
- Access to an electrical outlet for fan
- Wooden dowels – (1/4 inch diameter, 5 inches long)
- Hot glue gun and glue
- Scissors
- Pencils

PRIOR TO ACTIVITY:

Make sure you know if any of the campers have food allergies like gluten sensitivity, lactose intolerance, etc... there are lots of recipes on the Internet for brownies that meet these needs. There are also a lot of brownie mixes sold in some stores that meet these needs. Set the solar oven up outside and let it preheat.

# Explore Alternative Energy (CONTINUED)

## 4-H Aggie Adventures for Kids

### Reflect:

- Which turbine had the highest energy output? Why do you think that is?
- Which type had the lowest? Why?
- Which type of turbine spun the fastest?
- Did rotor speed correspond with energy output?
- Which design most resembles a large-scale turbine?
- Ask campers their thoughts about cooking with a solar oven? Do the brownies taste the same as ones cooked in a “regular” oven? Did it take just as long or longer to cook the brownies in a solar oven?
- Are there things that you would like to try and cook in a solar oven if you had one?

### Apply:

- Provide the students with instructions on how to build their own solar oven. This way they can build one and use it to cook things at home.
- Encourage them to go home and tell their parents about what they learned about solar and wind energy.
- Ask their parents if they can buy or make a solar oven.

The oven should be set up in a way that the sun’s rays shine directly into it at a 90 degree angle. If you need to prop the solar oven up on books/bricks/ etc. make sure the plexi glass cover of the oven bisects the sun’s rays at 90 degrees. Set up all of the materials and ingredients you will need to make the brownies on a table where all campers can see and help mix.

Set up wind turbines and fan in a “testing area.” Set up cardstock, paper cups, dowels, glue, scissors, and pencils in a “design area” where the kids will work. For additional information on the activity and wind turbines in general, view the Wired for Wind activity in full at <http://www.4-H.org/4-H-national-youth-science-day/past-experiments-archives/>. It would also be helpful for the leader to create a set of effective wind turbine blades that produce a high amount of energy. The leader can use these blades as examples during the reflection period. Don’t show the example blades to campers at the beginning as they might just copy that example.

If you do not have access to the materials kit provided for this camp, search online for how to build or order your own wind turbine kit.

# Potato Battery

## 4-H Aggie Adventures for Kids

Optional activity if time allows.

### What to Do:

1. Have a volunteer camper come to the front and assist you.
2. Tell the campers that you are going to be generating electricity using a potato.
3. Ask them if they think it can be done.
4. Show them the individual components used to make the battery (potato, galvanized nails, copper nails, alligator wire clips, LED bulb, and the multimeter).
5. Have the volunteer stick one galvanized nail and one copper nail into potato A, make sure that there is about 1/4 - 1/2 inch of the nails that have not been pushed into the potato (this is where we will attach the alligator clips to the nails).
6. Have the volunteer repeat this with potato B.
7. Next give the volunteer one of the alligator clips, have him or her connect one end of the alligator clip to the galvanized nail on potato A and the other end of the alligator clip to the copper nail on potato B.
8. Next give the volunteer another alligator clip and have him or her connect it to the copper nail on potato A, then hand the volunteer another alligator clip and hook it to the galvanized nail on potato B.
9. Show the group the multimeter and explain to them that this instrument is used to measure the flow of electricity.
10. Have the volunteer hook the alligator clip coming off potato A to the multimeter probe. Have the volunteer hook the alligator clip coming off potato B to the other probe.
11. Show the group that this potato is generating a current.
12. The instructor should show the group the LED light bulb.
13. Ask the group if they think this potato is going to be able to light up this little LED.
14. Next have the volunteer hook the alligator clips that were on the multimeter to the LED light bulb.
15. Have someone turn off the lights in the room, the darker the better. The LED should be illuminated.

TIME: 15 - 30 minutes

GRADE LEVEL: 4-6

### OBJECTIVE:

Campers will watch a demonstration in which a potato is used to power a small LED light bulb.

### MATERIALS:

- 2 Potatoes
- 2 Copper nails
- 2 Galvanized nails
- 3 Alligator wire clips (jumper wires) (found in materials kit)
- LED light bulb (found in materials kit)
- Multimeter (found in materials kit)

### PRIOR TO ACTIVITY:

- The instructor should watch an online video presentation of the experiment to become familiar with steps. Try doing this activity before presenting it to ensure an understanding of how to hook up the wiring.
- <http://www.wikihow.com/Create-a-Potato-Battery>

# Potato Battery (CONTINUED)

## 4-H Aggie Adventures for Kids

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### Reflect:

- Discuss with the campers how the potato battery works. It has to do with the alkalinity of the potato and the metals the nails are made out of. The electrons flow from negative to positive. This flow of electrons is called current. Electrical current is like water moving in a river. As the electrons flow through the LED light, they cause it to turn on.
- What other vegetables do you think would work in this experiment?
- Can you think of some renewable energy sources that require batteries to store the electricity they produce? (Wind and solar)
- Could you do this experiment at home?

### Apply:

- Go home and tell your family/friends about this experiment. Better yet, do this activity for your family at home! The camp leader can create an activity instruction sheet to send home with campers so they can repeat this activity at home.

# Clean up and Journal Activity

4-H Aggie Adventures for Kids (11:40 a.m. - Noon)

## What to Do:

1. Have the campers help clean-up from the day's activities.
2. Have the campers sit down in a space where they have enough room to write.
3. Show the campers the same journal questions from the morning and have them label a new journal page "Day 4: Energy, Afternoon."
4. Have the campers answer the same questions from the morning in their journal. Remind them that there are no right or wrong answers. If their answer in the afternoon would be the exact same as their answer in the morning, they can simply write "same." However, encourage them to answer the questions with any new information they learned. If you are not going to use the journals for evaluation, you can simply discuss the journal questions with the campers as opposed to having them write the answers down again.

## Reflect:

- If time allows, have the campers share with the group how their answers changed as a result of what they learned that day.

## Apply:

- Send campers home with Easy Steps to Reduce Your Energy Bill fact sheet and/or Our Energy Future article, available for free at: <http://extension.usu.edu/sustainability/htm/energy>, through USU Extension. Discuss one new behavior they could engage in with their families, such as turning out the light when leaving the room, or unplugging electronics when not in use.

TIME: 20 minutes

GRADE LEVEL: 4-6

### OBJECTIVE:

Clean up after the day's activities and have campers answer the same questions from the morning in order to gauge their level of increased knowledge on the topic of energy.

### MATERIALS:

- Journals
- Pencils
- Journal questions
- Easy Steps to Reduce Your Energy Bill fact sheet and/or Our Energy Future article (available at <http://extension.usu.edu/sustainability/htm/energy>)

### PRIOR TO ACTIVITY:

Prepare to guide campers if they have any questions by reviewing the background information for today.

# DAY 5: WATER

## SUSTAINABLE YOU! SUMMER CAMP

### WATER LEARNING OBJECTIVES

1. List at least three ways to conserve water
2. Learn about stream ecology and the importance of water in the environment



# Day 5: Water

## 4-H Aggie Adventures for Kids

### BACKGROUND INFORMATION:

Water is one of the most important natural resources our planet provides for us. It is necessary for survival – human, plant, and animal. About 71 percent of Earth’s surface is covered with water. This figure makes it seem like water is an abundant resource on Earth. However, 97 percent of all the water on Earth is stored in the oceans and is salty, which means it is unavailable for human use. Fresh water (non-salty) is found on Earth in rivers, lakes, streams, underground, in the air, and frozen in ice caps and glaciers. Only about 3 percent of all the water on Earth is fresh water. Of this 3 percent, about 80 percent of it is frozen in ice caps and glaciers. This leaves about 0.6 percent of all of Earth’s water as fresh, non-frozen water available for human consumption. Of this 0.6 percent, only about 0.003 percent is surface water found in lakes and streams. The rest is found deep underground and is difficult to access.<sup>1</sup> Even though the majority of Earth’s surface is covered by water, fresh water available for human consumption is still a scarce resource. All of the water we are ever going to have on Earth is here already. New water is not generated after we use it. Water simply moves through the water cycle, from clouds, to rain, to water in rivers, streams, and underground, to the ocean, and back to the clouds. Thus, it is vitally important that we minimize our water usage and keep our water clean and unpolluted. Water we use in our homes and our yards means there is less water in the environment for plants and animals. In addition, pollutants in water are very hard to remove. It is important for campers to understand that the water they use in their homes (for drinking, cooking, bathing, filling their fish bowl, etc.) comes from the environment. Water for use in homes and businesses is pumped from a river, lake, or reservoir, moved to a water treatment plant to be cleaned and treated for human consumption, and then pumped to individual homes and businesses. Once we use water in our faucet, bathtub, or toilet, it is pumped to a wastewater treatment facility where it is cleaned and returned to the environment. Thus, the same water we use will be used by plants and animals in the area, and the water we use will go back out to the environment and eventually be recycled – through the water cycle – back to our homes.

Some wastewater is also referred to as graywater. Graywater is the wastewater that comes from bathtubs, showers, washing machines, and faucets. In Utah, wastewater from other parts of your home like your toilet or kitchen sink is considered blackwater and could potentially be a health hazard. Though not suitable as drinking water, graywater can be a great resource for irrigation, watering fruit trees and shrubs with woody stems that serve as additional filters for any contaminants that may be present. Additional benefits include reducing the amount of energy and chemicals used on landscapes along with reducing the amount of water we waste. To learn more about water resources and graywater, visit: <https://extension.usu.edu/sustainability/topics/water/index>

The term water quality refers to the quality and the properties of water. When discussing water quality, one is usually referring to how much pollution or dirt is in the water, the salinity of the water, the temperature of the water, and so on. Water quality is important because we drink water, we recreate in the water (swim, eat fish that accumulate pollutants, etc.), and plants and animals need specific water parameters in which to live. Changes in water quality can have significant effects on plants and animals. Measuring water quality is important so we know what is in our water, when it is in the water, where it is coming from, and how we can treat it.



# Day 5: Water (CONTINUED)

## 4-H Aggie Adventures for Kids

There are several parameters that should be included when discussing water quality. A few of them are listed below.

### **Salinity**

Salinity is the measurement of the amount of salt in water. The units for salinity are parts per thousand (ppt), which means that for every thousand molecules/parts of water, there are X molecules/parts of salt. Ocean water has a salinity of approximately 35 ppt. Freshwater has a salinity of 0 ppt – there is no salt in freshwater. Salinity is important because plants and animals have a certain range of salinities they can survive within. Salinity is a factor that influences where different types of organisms live. You can use a hand-held refractometer to measure salinity.

### **Temperature**

Water temperature refers to how hot or cold water is. Temperature can be measured in either degrees Fahrenheit or degrees Celsius. Temperature is an important factor because it can influence where different types of organisms live because organisms have specific ranges of temperature they can tolerate. Temperature can be measured using a hand-held thermometer.

### **pH**

pH measures the amount of hydrogen ions in water. This is the measurement for whether something is an acid or a base. pH ranges from 0-14, with values of 0-6.9 indicating an acid, 7 being neutral, and 7.1-14 indicating a base. The pH of water is important because organisms have a certain range of pH they can survive within. pH values outside of this range can be detrimental to the organisms. pH levels higher or lower than “normal” may indicate there is a pollutant in the water.

As a loose rule, the pH of water is usually between 6.5 and 8.5. The following guidelines can be followed when referring to pH measurements and water quality:<sup>2</sup>

6.5-7.5 = Excellent

6.0-6.4 and 7.6-8.0 = Good

5.5-5.9 and 8.1-8.5 = Fair

<5.5 and >8.6 = Poor

### **Dissolved Oxygen (DO)**

Dissolved oxygen (DO) refers to the amount of oxygen dissolved in the water. DO can be measured in two units. Parts per million (ppm) means that for every million molecules/parts of water there are a certain number of oxygen molecules (for example 4 ppm would mean there were 4 molecules/parts of oxygen per million molecules/parts of water). Percent saturation (% saturation) is the amount of oxygen dissolved in the water sample compared to the maximum amount that could be present at the same temperature. For example, water is said to be 100 percent saturated if it contains the maximum amount of oxygen at that temperature. A water sample that is 50 percent saturated only has half the amount of oxygen that it could potentially hold at that temperature. Sometimes water can become supersaturated with oxygen because of rapidly tumbling water. This

# Day 5: Water (CONTINUED)

## 4-H Aggie Adventures for Kids

usually lasts for a short period of time but can be harmful to fish and other aquatic organisms.

Aquatic organisms need DO to survive just as humans and terrestrial animals need atmospheric oxygen to survive. Low DO in water can result from several things, including eutrophication and high water temperatures. Cold water can hold more oxygen than warm water, so when water warms in summer months it loses its ability to contain high levels of DO. Eutrophication is the condition in which excess nutrients in the water lead to the overgrowth of phytoplankton. When phytoplankton blooms occur as a result of eutrophication, the massive amounts of phytoplankton that die of natural causes sink to the bottom and undergo decomposition. The process of decomposition uses up oxygen from the water, thus depleting DO and causing conditions known as hypoxia (oxygen depleted water) and dead zones (areas where there is not enough oxygen in the water to support life).

Aquatic organisms generally cannot survive in waters with DO values lower than 4 ppm. DO percent saturation values of 80-120 percent are considered to be excellent, and values less than 60 percent or over 125 percent are considered to be poor. Below are some general guidelines to follow when measuring DO:<sup>2</sup>

DO in ppm:

0-4 = Poor (animals generally cannot survive in water with DO less than 4 ppm)

4.1-7.9 = Fair

8.0-12.0 = Good

DO in % saturation:

91-110 = Excellent

71-90 = Good

51-70 = Fair

<50 = Poor

### **Turbidity**

Turbidity is the measurement for the amount of particles (sediment or algae) in the water or how clear the water is. High turbidity values mean the water is very turbid, has lots of particles in it, or is not very clear. Low turbidity values mean the water is clear and does not have many particles in it. Turbid water is caused when sediments enter the water or become suspended in the water. This is often the result of erosion, run off, or disturbance of the bottom (such as dredging, current, walking on the bottom, etc.). Turbidity is an important parameter of water because underwater plants require clear water so sunlight can reach them, and animals need clear water to see in. High amounts of sediment in the water can also clog the gills of filter feeders, such as mussels and some aquatic insects, and can suffocate the organisms. Turbidity can be measured using a secci disk, a turbidity meter, or a turbidity tube. The units of turbidity vary depending on the method of measurement.

A turbidity reading of 0 NTU (on a turbidity meter) indicates completely clear water. Below are some general guidelines to follow when measuring turbidity with a turbidity meter (in NTU units):<sup>2</sup>

# Day 5: Water (CONTINUED)

## 4-H Aggie Adventures for Kids

0-10 NTU = Excellent

10.1-40 NTU = Good

40.1-150 NTU = Fair

>150 NTU = Poor

### **Pollutants (nutrients, toxics)**

There are many types of pollutants in our waters. The term pollutant can include chemicals, litter, and nutrients. Our health and the health of aquatic and terrestrial organisms depends on clean, pollution-free water.

Nutrients are considered a pollutant when they are found in amounts in excess of what would naturally occur in the water. Sources of excess nutrients include fertilizers, septic systems, sewage treatment plants, animal waste, and industrial waste. Much of the nutrients from these sources enter the water when rainwater causes it to run off the land and into the water. Two problematic nutrients in many aquatic environments are nitrogen and phosphorus. Excess nutrients in waters cause a condition known as eutrophication. Eutrophication is when excess nutrients in the water cause the overgrowth of algae. Algae blooms make the water turbid, they block out sunlight needed for underwater plants, and they can cause oxygen depletion in the water. When the algae from a bloom die they sink to the bottom and undergo decomposition. The process of decomposition uses up oxygen from the water, thus depleting DO and causing conditions known as hypoxia (oxygen depleted water) and dead zones (areas where there is not enough oxygen in the water to support life). Phosphate and nitrogen can be measured either in ppm (parts per million) or mg/L.

As a general rule, nitrate and phosphate levels below 1 ppm are considered “good.” Nitrate values >10 ppm in drinking water is considered unsafe. Phosphate and nitrogen can be measured either in ppm (parts per million) or mg/L. Below are some guidelines to follow when measuring phosphorus and nitrogen in mg/L:<sup>2</sup>

#### Phosphate (mg/L)

0-1 = Excellent

1.1-4 = Good

4.1-9.9 = Fair

>10 = Poor

#### Nitrate (mg/L)

0-1 = Excellent

1.1-3 = Good

3.1-5 = Fair

>5 = Poor

# Day 5: Water (CONTINUED)

## 4-H Aggie Adventures for Kids

1 USGS: The Water Science School. "Where is Earth's Water"? <http://ga.water.usgs.gov/edu/earthwherewater.html>

2 Mitchell, M.K., and W.B. Stapp. 2008. Field Manual for Water Quality Monitoring. Kendall/Hunt Publishing Company, Dubuque, Iowa.

3 Says, D., Danya, Says, L., & Rosales, L. (2019, June 20). Water Filtration Experiment. Retrieved from [https://teachbesideme.com/water-filtration-experiment/?utm\\_source=feedburner](https://teachbesideme.com/water-filtration-experiment/?utm_source=feedburner)

4 Pierzynski, G. M. (2015, June 03). Soil: Earth's Largest Natural Filter. Retrieved from <https://www.wqpmag.com/soil-earths-largest-natural-filter>

# Starter Activity

4-H Aggie Adventures for Kids (9:00 - 9:15 a.m.)

## Journal Activity and “What is that?” Game

### What to Do:

1. As campers arrive at camp, give them their journal and instruct them to answer the journal questions on the board. They can work on this until all campers have arrived. Remind the campers to start a new page in their journal and title it “Day 5: Water, Morning.” Also remind them that there are no right or wrong answers. If they don’t know an answer, they should simply write “I don’t know.”
  - Why is water important?
  - Where does water go when you flush it down the toilet?
  - What can you do to conserve water?
  - Draw what water means to you.
2. Once everyone has finished, have them set their journals aside.
3. Tell the campers that as they learn new things about the daily topic, they should write it in their journal.
4. Tell the campers that they will be playing a game called “What is That” and explain the instructions to the campers.
  - Each camper will be given a piece of paper to write on. Each camper will start by writing a sentence at the very top of the page relating to water completing an action (like a rain drop singing a song, or a snowman dancing).
5. They will then pass their paper to the next camper and that camper has to draw what is happening directly below the sentence. (They should draw relatively small, they don’t want to take up the whole paper.) This camper will then fold the paper so the written description of the picture he or she drew is hidden.
6. Once the drawings are complete, have the campers fold their papers so that the sentence they drew disappears and all that can be seen is their drawing. They will then pass the paper clockwise once again. The next campers receiving the paper with the drawing will write what they feel the drawing is saying.

TIME: 15 minutes

GRADE LEVEL: 4-6

### OBJECTIVE:

Throughout the camp journals will be used by campers to record thoughts and ideas. The journals will not be graded and are to be used as a method to increase the campers’ ability to critically think about issues regarding sustainability. Campers will also play a group game each morning to help them learn a bit more about each other and feel connected to the rest of the campers.

### MATERIALS:

For Journal Activity:

- Camper journals
- Pencils
- Colored pencils/markers/crayons
- Dry erase board and markers with journal questions written on it OR one copy of Day 5 Journal Questions (Appendix C) for each camper
- Glue, if pasting journal questions into journals
- Scissors, if pasting journal questions into journal

For Game:

- Blank sheets of paper – at least one per camper for each round of the game
- Pencils

# Starter Activity (CONTINUED)

## 4-H Aggie Adventures for Kids

7. Repeat this process over and over until you wish to move on, or until campers have reached the bottom of the page.
8. Once you have completed the final round of passing, select random campers to read out loud the first and final sentence or show the way the pictures have changed over time
9. Let all campers have a brief moment to share their papers in small groups.

### Reflect:

- Ask if anyone would like to share their answers to the questions. Discuss the answers that campers provide, as well as the correct answers. You don't have to fully explain the answers at this time, just provide a basic understanding. Campers will learn more about each question/topic throughout the rest of the day.

### Apply:

- Encourage the campers to go home tonight and look for all the ways they use water. Have them think of ways they could conserve the amount of water they use in their home. You can have the campers report on this the next day at camp.

### PRIOR TO ACTIVITY:

Write the journal questions on the board OR make enough copies of the Day 5 Journal Questions (Appendix C) so that each camper has one to copy or paste into his or her journal. Familiarize yourself with the questions and their answers so you can explain the answers to the campers once they have completed the activity.

# The Importance of Water\*

4-H Aggie Adventures for Kids (9:15 - 9:30 a.m.)

\*This activity was adapted from the “A Drop in the Bucket” and “The Life Box” activities by Project WET<sup>1</sup>

## What to Do:

1. Tell the campers you are going to show them two demonstrations about how important and rare fresh water is on earth.
2. Tell the campers you are going to pass around a box called the Life Box. Inside this box are four things that are needed for life on earth. Each camper should open the box, look at what is inside, and try to figure out what the four objects inside are. Remind them these four objects are all things needed to sustain life. The campers should keep their ideas of the objects to themselves as they open and close the box. You will discuss what campers think the four objects are at the end, once everyone has had a chance to see inside the box.
3. Pass the box around and let each camper open it, look inside, and pass it to the next camper.
4. Once all campers have had an opportunity to look inside the box, ask them to tell you what the four things inside the box were. They will likely say water and dirt. Ask them if anyone figured out what the other two objects were – light and air.
5. Explain that these four items are necessary to sustain life. Water is one of these items. Water is so important because it is one of the few things that is absolutely necessary to sustain life – human life as well as plant and animal life.
6. Tell the campers that although the earth has an abundance of water, only a very small percentage is fresh water. Surprisingly even a smaller amount of freshwater is accessible to the humans and animals that need it. Because the world’s population keeps growing and growing, the amount of fresh water available per person is shrinking. It is important that all of us do our part to keep fresh water clean.
7. Explain to the campers that the water in the 5-gallon bucket represents all of the water on the earth. Ask the campers to name some of the places where water can be found on Earth. (Oceans, lakes, rivers, streams, clouds, ice caps, underground (groundwater), stored in the soil, and in the bodies of plants and animals.)

TIME: 15 minutes

GRADE LEVEL: 4-6

## OBJECTIVE:

Campers will learn about the importance and availability of useable freshwater on the earth through two demonstrations.

## MATERIALS:

- Life Box (includes a box with a lid and plastic bag full of soil and bottle of water inside)
- 5 gallon bucket
- Clear container that can hold at least 2 cups
- Clear 1-cup measuring cup
- Clear ½cup measuring cup
- Eye dropper
- Towel

## PRIOR TO ACTIVITY:

Fill the 5 gallon bucket with water. This represents all of the water on earth. It is from the bucket that you will be taking various amounts. Put the eyedropper in your pocket so that campers can’t see it. Become familiar with the percentages of water on the earth and the location. See the following chart showing the amount of water in each major reservoir on Earth.<sup>2</sup>

# The Importance of Water (CONTINUED)

## 4-H Aggie Adventures for Kids

8. Pick two campers to be volunteers and have them come to the front. Give one of the volunteers the 1-cup measuring cup. Ask this volunteer to remove 2 cups of water from the 5-gallon bucket and pour them into the clear container. Set the clear container holding the 2 cups of water somewhere so that the group can see.
9. Ask the campers to guess what these 2 cups of water represent. Give them time to guess. This is the amount of fresh water on planet earth. Of all the water in the world (the 5 gallon bucket), only 2 cups, or about 3 percent is fresh. The rest is salt water found in our oceans.
10. Ask the campers why we can't use salt water for things that we use fresh water for. (Drinking it would make us sick, because of its salinity it can break machines that need water to run because salt would build up in the moving parts, we can't water fields with it because the salt would change the soil and a lot of plants can't grow in salty soil.)
11. Move the 5-gallon bucket aside and tell the campers that for the rest of the time we will be discussing where the 2 cups of freshwater are found on the earth and in what physical state (liquid, solid, gas).
12. Give the second volunteer the 1/2 cup-measuring cup. Ask him or her to take 1/2 cup of water out of the container. Have the volunteer hold the 1/2 cup of water so the group can see it.
13. Ask the group what they think the 1<sup>1/2</sup> cups left in the container represent. (Polar ice caps.) Is this water available for human use? (No, it is frozen solid) About 2.1 percent of all the fresh water on earth is frozen in polar ice caps and glaciers. Allow the campers to answer the question. Explain that we need to set aside the container holding the 1 - 1/2 cups because humans can't use it.
14. Ask the group what the 1/2 cup of water being held by the volunteer represents. Give the group time to answer. (Groundwater and surface water - lakes, rivers, streams, and clouds.) This represents about 0.6 percent of all the fresh water on earth.

Salt Water in Oceans	97.2%
Ice Caps & Glaciers	2.14%
Groundwater	0.61%
Surface Water	0.009%
Soil Moisture	0.005%
Total	100%



# The Importance of Water (CONTINUED)

## 4-H Aggie Adventures for Kids

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15. Explain that surface water is water that is accessible to humans and animals for use (mainly for drinking) and that clean surface water is EXTREMELY important for organisms' survival on planet Earth. Ask the group to guess how much water should be removed from this remaining 1/2 cup of water to represent all the surface water on the planet.
16. After the group has guessed, take the eyedropper out of your pocket and suck some water out of the 1/2 cup.
17. Using the eyedropper, squeeze out one drop of this water onto your hand (you may also walk around and place one drop in the hands of the campers).
18. Explain that out of all of the water on planet earth, this one drop represents the fresh water that is available to humans and animals for drinking. This represents about 0.009 percent of all water on earth.
19. Remind campers again that of all the water on earth, only about 0.009 percent, or about one drop, is fresh water available for use by humans. This is why it is SO important to conserve water and ensure that it is clean and unpolluted. There isn't very much of it available for our use and we need to protect the little fresh water we have available to us.
20. Teach the campers that Utah is the second or third driest state in the United States<sup>3</sup> (depending on the season) and because of this we should all do what we can to conserve water. It is a precious resource in our state.

# The Importance of Water (CONTINUED)

## 4-H Aggie Adventures for Kids

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### Reflect:

- Ask the students to share their thoughts on the demonstration you just led. Are they surprised at the small amount of fresh water on earth? Even though it seems like the water coming out of the taps in their homes is limitless, it really isn't.
- What are some things that they could do to ensure safe drinking water in their city?
- Where does our water come from? It is pulled out of lakes and rivers in our area, processed and cleaned at a water treatment plant, and then piped into our homes. After we use it, it is piped to a wastewater treatment plant where it is cleaned and put back into the environment. So the water in our homes comes directly from the environment and is put back into the environment. It is constantly recycled and the water we use is the same water that plants and animals use before or after us.
- Who could you tell if you suspect that a lake, river, or stream has been polluted?

### Apply:

- Encourage the campers to share this demonstration with their families and friends. It is through sharing information that others can learn about sustainability issues and how to work together to solve them. The camp leader could provide an activity instruction sheet for campers to take home.

1. A Drop in the Bucket and The Life Box activities by Project WET. Project WET. 1995. pages 76 and 238.

2. Lesson 3: Project Flow <http://www.miseagrant.umich.edu/flow/pdf/U2/FLOW-U2-L3-MICHU-08-402.pdf>

3. <http://www.currentresults.com/Weather-Extremes/US/driest-states.php>

# Water is Here to Stay!

4-H Aggie Adventures for Kids (9:30 - 9:45 a.m.)

\*Adapted from the Incredible Journey activity by Project WET<sup>1</sup>

## What to Do:

1. Ask the campers if they know what the water cycle is. Give them time to answer. Once they have answered, tell them about the water cycle.
2. Tell them that they are going to play a game in which they will pretend to be a water molecule moving through the water cycle. Indicate the location of each station of the water cycle around the room. Tell them the rules of the game.
  - a. You will divide the campers so there are students at each station of the water cycle.
  - b. When you say start, they will pick up a bead from the station they start at and place it on their bracelet.
  - c. Then they will roll the dice at their station and proceed to the station that is shown on the face up side of the dice. If they roll a “stay” side, they will pick up another bead from the station they are at and roll the dice a second time. They must stay at their station, picking up a bead each time they roll, until they roll the picture of a different station to move to.
  - d. When they roll a new station, they will move to that station, pick up a bead, place it on their bracelet, and then roll the dice at that station.
  - e. The game will continue until the camp leader notices that most students have filled their bracelets.
3. Pass out a string to each camper and send campers to each station. Once all the campers are at a station and ready to go, say go and let the game begin.
4. When most students have filled up their bracelets, call the campers back to a meeting place to discuss the game. Camp leaders will have to help the campers tie their bracelets on.

TIME: 15 Minutes

GRADE LEVEL: 4-6

## OBJECTIVE:

Campers will learn about the water cycle and will come to understand that all of the water on earth is currently present. No new water is ever made. Thus it is important that we conserve and protect the water we have.

## MATERIALS:

- 9 dice
- 9 station posters
- A plastic tub or bowl with pony beads at each station - each station should have a different color of beads. You will need nine different colors.
- One piece of string for each camper to make a bracelet.

## PRIOR TO ACTIVITY:

Hang the station posters around the room. The stations should be spread out from each other. At each station, beneath the poster, place the corresponding dice (station is labeled with marker on one side of each dice) and the

# Water is Here to Stay! (CONTINUED)

## 4-H Aggie Adventures for Kids

### Reflect:

- Ask the campers what they noticed during this game. Were some places harder to get out of than others? They likely had to “stay” for a long time in the ocean and in glaciers. Why is that? There is so much water in the ocean that it takes a long time for one drop to evaporate. Water in glaciers is frozen, so in order for them to move, they had to “thaw” from the glacier, which might take a long time!
- Were there stations that were hard to get to? Soil? Plant? Animal? Why is this? Think back to our demonstrations earlier. There is so little water available for human, plant, and animal use that very little of the water on earth actually gets to these stations. Most of it is held up in the ocean, glaciers, clouds, or groundwater.
- Reiterate to the campers that all the water we are ever going to have on earth is already here – it just cycles through all the different “stations” or places on earth. So it is really important to protect the water we have. We won’t get any new water if it becomes polluted.

### Apply:

- When the campers take their bracelets home tonight, have them explain the game and bracelet to their parents.
- Encourage the campers to look around tonight to see if they can identify all the locations of water in the water cycle – clouds, river, plant, animal, groundwater, etc.

bowl or tub of pony beads. Cut lengths of string long enough so that campers can add beads to the string, then tie them off to create a bracelet. Tie a bead to one end of each string to start the bracelet. Review the water cycle, so you can discuss it with the campers after the activity.

1. Project Wet. (2014). Discover the Incredible Journey of Water through the Water Cycle.

Available at: <http://projectwet.org/flipped-day/water-cycle/>

# Aquatic Insects - They Need Water Too!

4-H Aggie Adventures for Kids (9:45 - 10:30 a.m.)

## What to Do:

### For Collecting:

1. Speak with the campers in an area where a river, stream, or lake is in view. Ask the campers to tell you what kinds of things are living in the water. (Most will say fish.) Ask them if there is anything else they can think of that lives in the water.
2. Tell them that they will be collecting and observing aquatic insects, a group of animals that rely on clean, fresh water to survive.
3. Have a discussion on water safety, and set boundaries and rules that are appropriate for the group.
4. Explain and demonstrate to campers how to use the nets to collect aquatic insects.
  - a. If using a kick net to collect insects, have two people hold the net (one on each pole) and enter the river downstream from where you are standing. They will need to hold the net perpendicular to the river, and stretch the net apart as much as possible. The idea is for the water to be flowing into/through the net. They should make sure the poles and bottom of the net are touching the river bottom. Hold the poles at a slight angle with the bottom of the poles facing upstream, toward you. You want the netting in between the two poles to create a sort of pocket for water and insects to flow into and get caught. Once the net is in place, you/the kicker should start using your feet and/or hands to move the rocks on the river bottom. This will dislodge the insects attached to the rocks, causing them to float up into the water column and float downstream into the kick net. Walk toward the net as you kick the rocks with your feet or overturn rocks with your hands. Once you/the kicker is close to the net, help the net holders pull the net out of the water and carry it to the river bank. Lay the net out flat on the river bank and use your hands or a plastic spoon to pick the aquatic insects off of the net and place them in a bucket/tub. The insects will be small, so look closely.
  - b. If using a dip net to collect insects, wade into the stream and place the bottom edge of the net on the bottom of the river, with the water flowing into and through your net. Either you or a partner can kick the rocks immediately in front of the net with your feet or use your hands to turn over the rocks. This

TIME: 45 minutes

GRADE LEVEL: 4-6

### OBJECTIVE:

Campers will find various organisms living in a local body of water. They will learn how the presence or lack of these organisms is an indicator of water quality.

### MATERIALS:

#### For Collection:

- Kick Net(s) USU Extension provides instructions for how to make your own, here <http://bit.ly/1m0qzBA>. Or order your own at the following links: <http://bit.ly/1ihlmBe>; <http://bit.ly/1iFt8V8>
- Dip Net(s) <http://bit.ly/1i8b9HU>
- Bucket(s)
- Waders or rubber boots for campers/leaders (optional, only if you don't want to get wet while collecting or if the water is too cold to stand in for a prolonged period of time)
- Battery operated air pump(s) with tubing and air stones <http://bit.ly/1oQkmoY>; <http://bit.ly/1i8bo5H>; <http://bit.ly/1mOrIt8>

#### For Investigation:

- Plastic tubs - one per five students
- Plastic spoons - a few per tub
- Petri dishes - a few per tub: <http://bit.ly/PxopfG>
- Magnifying glasses - a few per tub: <http://bit.ly/1ewcJ2d>

# Aquatic Insects (CONTINUED)

## 4-H Aggie Adventures for Kids

will dislodge the insects attached to the rocks, causing them to float up into the water column and float downstream into your net. Once you have done this, you can pull the net out of the water and use your hands or a plastic spoon to remove insects from the net and place them in a bucket/tub. The insects will be small, so look closely.

### For Observing:

1. If the insects are in buckets, dump them into shallow plastic tubs. Make sure there is enough water in the tubs to cover the insects and allow them to swim around.
2. Tell the campers they are going to identify the types of aquatic insects in the tub by using a dichotomous key. A dichotomous key is a tool we can use to help us identify objects. There are dichotomous keys that help us identify plants, flowers, trees, birds, animal tracks, even animal scat (poop!). A dichotomous key works best if you follow the questions it asks, as opposed to just matching up your organism with the pictures. Sometimes the pictures can be deceiving.
3. Campers can use the plastic spoons to “fish” insects out of the water, place them in a petri dish (with a little bit of water), and use the magnifying glasses to look closely at the insects. They can then answer the questions on the key to determine what type of insect they are looking at.
4. Once the campers have had time to investigate and identify the insects, ask them to tell you and the group some of the different insects they found.
5. Ask the campers if they noticed that most of the insects they identified were larva. Ask them what a larva is. A larva is one stage in an insect’s life cycle; it is the “juvenile” or “baby” stage - after egg but before adult. Most, or several, of the insects they identified are in the “juvenile” stage.
6. Ask the campers if they noticed that several of the larval insects they identified also have the word “fly” in their name. Ask them why they think that is. The answer is that many of the larval insects they identified will turn into adult insects that fly around in the air, as opposed to living under water. Many of the insects they identified will go through complete metamorphosis, in which their body form completely changes from the larval stage to the adult stage.
7. Use the flip cards to show the campers what each larval insect will look like when it becomes an adult. When it is time for the larval form to change into an adult, the insect will

- Copies of the Dichotomous Key (laminated) - a few per tub, found at <http://bit.ly/1kP31iV> or <http://bit.ly/1iFv1B9>
- Flip cards of Aquatic Insects (laminated; juvenile form on one side, adult form on the other side) - you can order your own online at <http://bit.ly/1gevS8y> or <http://bit.ly/1gtFQ6K>

### PRIOR TO ACTIVITY:

Scout out a sampling location that is safe for campers. For safety reasons, select a section of river/stream that is slowly to moderately moving and comes up no higher on you/your students than your knees. Rocky-bottomed rivers are the best location to find aquatic insects. However, underwater rocks are often slippery, so be careful when walking in the river. This sampling location should also have a spot along the banks for campers to sit in order to listen to instructions and look through collected samples.

# Aquatic Insects (CONTINUED)

## 4-H Aggie Adventures for Kids

crawl out of the water, and the adult form will “emerge” from the outer covering of the juvenile body.

8. Tell the campers that aquatic insects are often used as indicators of water quality. Some types of insects are very sensitive to pollution, while other types are somewhat tolerant or very tolerant of pollution. Mayflies, stoneflies, and caddisflies are very sensitive to pollution. Thus, if you find those types of insects in your river, you can infer that the water in the river is unpolluted. However, if you do not find these types of insects, it does not necessarily mean the water is polluted, those types of insects may be absent from the river for some other reason (the type of bottom in the river (sandy vs. rocky) for example). Craneflies, leeches, midge larvae, and blackflies are tolerant of pollution.

### Reflect:

- Based on the insects you found in your sampling, can you infer whether the body of water these insects came from is polluted or unpolluted?
- Ask the campers if they had ever heard of or seen the organisms before. Did they know they lived in almost every body of water?
- What is the importance of these organisms? They are a critical part of the food chain in aquatic ecosystems. If the water became polluted and these insects started to die, there would be fewer food items for fish in the rivers. This would upset the food web and the ecosystem would not function in its proper way.
- These insects are very sensitive to pollution so we need to protect our water, not just for ourselves, but for the other plants and animals that rely on it.

### Apply:

- Are there any rivers, lakes, or streams where you live? Teach your friends and family about macro aquatic invertebrates and how they indicate whether a body of water is clean or not.
- If you had fun doing this activity, look into becoming a citizen scientist by helping scientists in Utah monitor water quality: <https://extension.usu.edu/utahwaterwatch/>.

If you cannot transport all of the campers to a local stream or river, the camp leader can go to the site and collect the aquatic insects up to a day in advance. You will need at least two people to collect the insects. Once you collect the insects, keep them in a bucket in a cool place. The insects will start to die if the water warms to even room temperature. Keep an air pump on the insects at all times as they need a lot of oxygen to survive. Once the insects have been collected, you can complete the investigation portion of the activity at your camp location.



# Water Quality Testing

4-H Aggie Adventures for Kids (10:30 - 11:00 a.m.)

## What to Do:

1. Either take campers to a local body of water (stream, pond, lake, etc. - it could be the same location you sampled for aquatic insects) or collect water samples from a body of water and bring them into the camp in bottles. You could also collect water samples from the camp facilities or ask campers to bring water samples in from home.
2. Discuss water quality with the students.
  - a. What is water quality? Ask the students what “good” water looks like, tastes like, smells like. How about “bad” water? Usually the students will say that “bad” water is brown and dirty. But ask them if they can tell just by looking at water if it has chemicals in it. (No.)
  - b. Discuss the different parameters you might measure if you were testing water quality, what each parameter is, why it is important, and how you measure it. Let the campers try to think of the parameters as you list them on a board.
  - c. Ask the campers why water quality is important (see background information for this section). Water quality relates to how polluted or unpolluted the water is. It is important to know water quality in order to ensure the water is healthy for the plants and animals that rely on it in the wild, and also to ensure the water we use in our homes is safe for us to drink.
  - d. Ask the campers why we should measure water quality (see background information for this section).
3. Discuss safety issues with students before completing water quality tests. Do not put tablets or water in your mouth. You don't know what is in the water, and the tablets have chemicals in them that are not healthy for human ingestion. Once the activity is over, bring around a “waste” jar for them to dump their test tubes into.
4. Tell the campers that you are going to divide them into groups and give each group a different water quality test kit to use. Each kit has instructions on how to use it. The campers should follow the instructions in the kit to complete their test.
5. Divide the campers into groups and give each group a test kit.
6. Give the campers time to read their instructions and complete their tests.

TIME: 30 minutes

GRADE LEVEL: 4-6

## OBJECTIVE:

Campers will learn about water quality and how to test for several parameters associated with water quality.

## MATERIALS:

- 1 pH test kit OR Litmus paper
- 1 thermometer
- 1 turbidity test kit
- Jar of tap water to use for turbidity test
- 1 refractometer
- 1 dissolved oxygen test kit
- 1 nitrate test kit
- 1 phosphate test kit
- 1 jar for wastewater

## PRIOR TO ACTIVITY:

Scout out a sampling location that is safe for campers. For safety reasons, select a section of river/stream that is slowly to moderately moving and comes up no higher on you/your campers than your knees. This sampling location should also have a spot along the banks for campers to sit in order to listen to instructions and perform tests. This might be the same location you sampled for aquatic insects.



# Water Quality Testing (CONTINUED)

## 4-H Aggie Adventures for Kids

7. Once all the tests have been completed, gather the campers together and talk about the results (see background information for this section to discover what “normal” test results should be).

### Reflect:

- Have each group report their findings. Discuss as a group what “normal” conditions for each parameter are and if their test results fell within those normal parameters. If they did not, have the students hypothesize as to why their results might have been “abnormal.”
- Discuss with students ways that pollution can enter our waterways and ways in which we can prevent that from happening.

### Apply:

- If you had fun doing this activity, look into becoming a citizen scientist by helping scientists in Utah monitor water quality: <https://extension.usu.edu/utahwaterwatch/>.

If you cannot travel to a body of water, the camp leader can collect water samples in advance and have the campers test the water samples at the camp location. Or you could have the campers collect water samples from camp facilities or their homes and test those samples.

The camp leader should practice conducting each test with the provided instructions and should become familiar with the water quality information provided in the background section for this day.

# Bottle vs Tap - Who Will Win!

4-H Aggie Adventures for Kids (11:00 - 11:15 a.m.)

## What to Do:

1. Tell the campers that today they are going to learn some facts about bottled water. These may be some things they haven't heard before. Let the campers know that if they or their family drinks bottled water, it is okay and that nobody is pointing fingers. There might be a better alternative to bottled water and after this activity they may encourage their families to make different choices.
2. Ask the campers to tell you if they have ever drank bottled water before (most probably have).
3. Can they name any brands of bottled water that they have either had or seen?
4. Where do you think the water comes from that fills these brands of bottled water?
5. Dasani, Nestle, and Aquafina all draw from local public water supplies.
  - a. Water that is bottled and sold in the same state requires no FDA regulation/monitoring.
  - b. Tap water contamination incidents must be reported immediately to the public; the same is not true for bottled water.
6. How much do you think bottled water costs? What are some different prices? Some bottled water costs only \$0.89, others \$4.99 and even more. The same quantity of tap water (here in Utah) can cost less than a penny!
  - a. You can pay between 240 to 10,000 times more per unit volume for bottled water than tap water! Ninety percent of this cost is for bottling, packaging, shipping, marketing, retailing, and profit...but not for the water itself.
7. So do you think that bottled water tastes better than tap water? Let's test it out.
8. Place two identical cups in front of the campers. Pour bottled water into one and tap into the other (this works the best when the tap water and the bottled water are similar temperatures). REMEMBER WHICH IS WHICH as the facilitator. Now with your back turned away from the campers switch the cups around so that the campers don't know which one is which.
  - a. Invite a camper to be a taste tester.
  - b. See what happens! (MOST of the time people choose tap over bottled water.)
9. Think outside the bottle! Tap water is more heavily regulated, and healthier for you and the planet.

TIME: 15 minutes

GRADE LEVEL: 4-6

### OBJECTIVE:

Campers will learn facts about bottled water and how it compares to local tap water. They will learn about where to find out about the quality of local tap water. A taste-test will be conducted between bottled water and tap water.

### MATERIALS:

- 1-store bought bottle of water. It would be best if the bottle of water were Dasani, Nestle, or Aquafina as these are all just bottled tap water from the localities in which they are bottled.
- 2 cups that are exactly the same (for the taste-test). If you want to have more than one camper do the taste test you will need more cups.
- Tap water either straight from the tap or in a reusable container.
- Towel -- in case of a spill

### PRIOR TO ACTIVITY:

Purchase the cheapest bottled water you can find and note the price. This will be compared to the price and taste of tap water in your area. Familiarize yourself with the facts associated with bottled vs. tap water by visiting

# Bottle vs Tap - Who Will Win! (CONTINUED)

## 4-H Aggie Adventures for Kids

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### Reflect:

- Which water tastes better? Which one is cheaper? Which one is more heavily tested and regulated? Which one creates MOUNTAINS of waste in landfills and produces waste that is clogging up the ocean?
- Where can you find out what tap water quality is like in your area? (City dept. of water/environmental quality)
- The plastic used to make most single-use bottled water containers is made from oil. Oil is not an infinite resource, it is getting harder and harder to extract oil, thus more expensive. Isn't it kind of silly that we are just throwing all this oil (in the form of plastic) away after only one use?

### Apply:

- Do you have a reusable water bottle? What habits would you and your family need to establish in order to use reusable water bottles instead of single-use bottled water?
- Do you dare to be an example to your friends and family and stop using bottled water and begin drinking tap water to be more sustainable?
- Plastic makes up a HUGE proportion of pollution in our rivers, lakes streams, and ocean. Encourage the campers to research the "Great Pacific Garbage Patch" or the "Pacific Trash Vortex." An Internet search would yield a sufficient amount of material.

the following websites:

- Food & Water Watch (quick facts and a full report about bottled water): <http://bit.ly/PaDG62>
- The Water Project (quick facts about bottled water and its environmental impacts): [http://thewaterproject.org/bottled\\_water\\_wasteful.asp](http://thewaterproject.org/bottled_water_wasteful.asp)

# Water Treatment Plant Tour or Video

4-H Aggie Adventures for Kids (11:15 a.m. - 12:15 p.m.)

## What to Do:

1. Tell the campers that they will be touring a water treatment plant. They will learn where water goes after it goes down the drain.
2. Meet with the person giving the tour.
3. Take the tour together.
4. Ask the guide how much water this water treatment plant treats per day/month/year.
5. Ask about the quality of the water and what processes are used to clean the water.
6. Discuss how water is filtered in nature versus the chemical process necessary to clean it ourselves.
7. Which process costs more?
8. Continue on the tour and allow the campers to ask questions.
9. Finish up the tour and thank the guide.

## Reflect:

- Where does all the water in this treatment plant come from?
- Were you surprised to learn about how dirty water becomes clean again?
- Wetlands filter dirty water for free. Are there any wetlands where you live?

## Apply:

- Because wetlands filter water for free how can you protect wetlands?
- Visit a wetland area with your family/friends and find all the wildlife and plants that you can. These organisms all play a part in recycling nutrients and cleaning water.

TIME: 1 hour

GRADE LEVEL: 4-6

### OBJECTIVE:

Campers will learn about where local water goes when it is flushed down the toilet and goes down the drain. They will be able to attach “down the drain” with a location. Water use facts will also be shared for the state of Utah. Note, if you cannot visit a local treatment plant, find a good water treatment plant tour video, such as this one at <http://www.youtube.com/watch?v=r6ycWxw-nZI>, and secure a guest speaker from a local plant to come and talk with the campers.

### MATERIALS:

- Journals
- Writing utensils

### PRIOR TO ACTIVITY:

Contact the wastewater treatment plant for your area. This entity can be found by contacting your local environmental department. Once contacted, arrange a tour time and date. Make all necessary travel arrangements to get campers to and from treatment area.

# Filtration Station\*

4-H Aggie Adventures for Kids (11:15 - 11:45 a.m.)

\*Adapted from the Water Filtration Experiment by teachbesideme.com.

## What to Do:

1. Show a diagram or drawing of the water cycle and review how water moves through the earth (The campers should have learned this at the beginning of the day during the water cycle game). Water is evaporated from the oceans and lakes by heat, it condenses into clouds, the clouds are carried around by atmospheric currents, the water in the clouds falls back to earth being absorbed into the soil, the water travels into plants via their root systems, and the water moves up the xylem in the plants, eventually evaporating off the leaves. Water also runs into rivers and streams, it is stored as snow in the mountains, eventually melting and running down into lakes, rivers, and streams, and eventually back into the ocean.
2. Tell them that they are going to learn about how water moves through the Earth.
3. Begin by getting a jar full of dirty water. You can get this from a nearby pond or natural body of water.
4. Ask campers to give you examples of how the Earth can filter water. What are the benefits?
5. Next tell the campers that they are going to do an experiment to show the natural purification of water. Remind campers that this is a part of the water cycle.
6. Divide the campers into small groups (two to three per group).
7. Give each group an empty plastic cup with a hole in the bottom and their coffee filters. Have them line the bottom of the cup with the coffee filters
8. Each group can then put a layer of sand followed by a layer of gravel into the coffee filters.
9. Have each group place their plastic cup into the empty jar and have one camper pour the dirty water through the plastic cup.
10. Tell each camper to notice the water moving through the gravel, sand, and coffee filters.

TIME: 30 Minutes

GRADE LEVEL: 4-6

## OBJECTIVE:

After doing the activity, campers will be able to explain the major movements of water through the water cycle, how water is filtered naturally through the Earth, and describe the importance of soil in the water cycle.

## MATERIALS (Per Group):

- 2 Glass Jars
- Sand
- Gravel
- 3-4 Coffee Filters
- Dirty Water
- A Plastic Cup with a Hole Cut in the Bottom

## PRIOR TO ACTIVITY:

For more information on how nature makes clean water, check out this 4 minute video by The Nature Conservancy at <https://www.youtube.com/watch?v=7fqEuKXanBg>

# Filtration Station (CONTINUED)

## 4-H Aggie Adventures for Kids

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11. Next, have the groups compare the two water samples. Ask them what differences they notice.
12. Ask the campers again what benefits come from water moving through the Earth during the water cycle.
13. Explain how soils are the Earth's largest natural filter of water. The soil particles absorb contaminants and remove them from the water. Explain how soil can retain many organic chemicals, pesticides and some inorganic chemicals, making the water healthier for wildlife and other living organisms. ^4
14. Gather together in an area and ask all the groups to share their findings from the experiment.
15. Ask for a volunteer to try and summarize the process of natural water filtration one more time to the group.

### Reflect:

- How did the "soil" filter the water?
- What benefits come from this process?

### Apply:

- Teach your family about how water is filtered by the Earth. Share your findings with them from the experiment.
- Can you think of any water resources nearby where this process may be occurring?

# Clean Up and Journal Activity

4-H Aggie Adventures for Kids (11:45 - Noon)

## What to Do:

1. Have the campers help clean up from the day's activities.
2. Have the campers sit down in a space where they have enough room to write.
3. Show the campers the same journal questions from the morning and have them label a new journal page "Day 5: Water, Afternoon."
4. Have the campers answer the same questions from the morning in their journal. Remind them that there are no right or wrong answers. If their answer in the afternoon would be the exact same as their answer in the morning, they can simply write "same." However, encourage them to answer the questions with any new information they learned. If you are not going to use the journals for evaluation, you can simply discuss the journal questions with the campers as opposed to having them write the answers down again.

## Reflect:

- If time allows, have the campers share with the group how their answers changed as a result of what they learned that day.

## Apply:

- Send campers home with Home Gardening: Quick Tips to Efficient Watering fact sheets and/or Rural Connections: Water in the Western U.S. report. Available for free through USU Extension at: <http://extension.usu.edu/sustainability/htm/water>. Have them share at least one new water-wise behavior they will embark on with their families.

TIME: 15 minutes

GRADE LEVEL: 4-6

## OBJECTIVE:

Clean up after the day's activities and have campers answer the same questions from the morning in order to gauge their level of increased knowledge on the topic of water.

## MATERIALS:

- Journals
- Pencils
- Journal questions
- Home Gardening: Quick Tips to Efficient Watering fact sheets and/or Rural Connections: Water in the Western U.S. report. Available through USU Extension at: <http://extension.usu.edu/sustainability/htm/water>

## PRIOR TO ACTIVITY:

Prepare to guide campers if they have any questions by reviewing the background information for today.

# APPENDIX

## SUSTAINABLE YOU! SUMMER CAMP

- A: Utah Sustainability Websites
- B: Supplemental Activity Notes and Definitions for Each Thematic Day
- C: Camp Journals
- D: Wacky Waste Weight Chart
- E: Scavenger Hunt
- F: Pollution Detectives Tally
- G: Origin of Production for Common Grocery Items
- H: Practical Packaging Worksheet
- I: Food Commonly Grown in Utah
- J: Energy Sources with Associated Byproducts
- K: Pictures of Worm Compost Bins from Previous Sustainable You Camps
- L: Garden Box Pictures





# Appendix A

## Utah Sustainability Websites

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Although not all-encompassing, this list provides plenty of information to assist you as you prepare.

### Extension Experts

<http://extension.usu.edu/experts/>

### Sustainability

Extension Sustainability - Roslynn Brain - <http://extension.usu.edu/sustainability/>

Intermountain Sustainability Summit - Weber State - <http://www.intermountainsustainabilitysummit.com/>

SLC Green - Salt Lake - <http://www.slcgov.com/slcgreen>

Sonoran Institute - <http://www.sonoraninstitute.org/>

University of Utah Global Change & Sustainability Center - <http://environment.utah.edu/>

Western Rural Development Center - <http://wrdc.usu.edu/>

### Land

#### *Recycling*

Momentum Recycling - <http://www.momentumrecycling.com/>

Recycling Coalition of Utah - <https://utahrecycles.org/>

Rocky Mountain Recycling - <http://rockymountainrecycling.com/>

#### *Land Conservation*

The Nature Conservancy Utah - <http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/utah/>

Utah Ducks Unlimited - <https://www.ducks.org/utah>

Utah Open Lands - <http://www.utahopenlands.org/>

Utah State Parks Land and Water Conservation Fund - <http://stateparks.utah.gov/resources/grants/land-and-water-conservation-fund>

### Air

#### *Air Quality*

Northern Utah Clear the Air - <https://www.facebook.com/NorthernUtahClearTheAir>

Utah Department of Environmental Quality - <http://www.airquality.utah.gov/>

#### *Climate Change*

Utah Center for Climate and Weather - <http://utahweather.org/>

Utah State University Utah Climate Center - <http://climate.usurf.usu.edu/>

### Water

USU Extension Water Quality - <https://extension.usu.edu/waterquality/>

iUtah - <http://iutahepscor.org/>

Utah Water Watch - <http://extension.usu.edu/utahwaterwatch/>

# Appendix A (CONTINUED)

## Utah Sustainability Websites

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### Food

Utah's Own - <http://utahsown.utah.gov/>

Local First Utah - <http://www.localfirst.org/>

Slow Food Utah - <http://slowfoodutah.org/>

Edible Wasatch Magazine - <http://www.ediblewasatch.com/>

Utah Farm-Chef-Fork - <http://extension.usu.edu/sustainability/htm/programs/utah-farm-chef-fork/>

Western Sustainable Agriculture Research & Education - <http://www.westernsare.org/>

### Energy

Spanish Fork Wind Farm - <http://www.pacificpower.net/env/bsre/bses/sfwf.html>

U.S. Department of Energy - <http://energy.gov/>

Utah Office of Energy Development - [http://www.energy.utah.gov/renewable\\_energy/](http://www.energy.utah.gov/renewable_energy/)

# Appendix B

## Supplemental Activity Notes and Definitions for Each Thematic Day

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### Land

The average person generates 4.3 pounds of waste per day. This is 1.6 pounds more than most produced back in 1960. “Center for Sustainability & Commerce.” How Much Do We Waste Daily? N.p., n.d. Web. 08 Oct. 2013.

In 2011, Americans generated about 250 million tons of trash and recycled and composted almost 87 million tons of this material, equivalent to a 34.7 percent recycling rate. On average, we recycled and composted 1.53 pounds of our individual waste generation of 4.40 pounds per person per day (Figure 1 and Figure 2). “Municipal Solid Waste.” EPA. Environmental Protection Agency, n.d. Web. 08 Oct. 2013. <http://www.epa.gov/epawaste/nonhaz/municipal/index.htm>

#### *Informative links*

Municipal Solid Waste Facts and Figures <http://www.epa.gov/osw/nonhaz/municipal/msw99.htm>;  
<http://www.epa.gov/epawaste/nonhaz/municipal/index.htm>

#### *Information from EPA regarding your area*

<http://www.epa.gov/epahome/commsearch.htm> (Enter in your zip code and select “my environment,” then submit to see facts about your area)

### Air

#### *Air Quality*

Definition: A measurement of the pollutants in the air/measurement of the healthiness and safety of our atmosphere.

#### *Inversion*

Definition: A reversal of position. In Utah’s case, this is where cold air gets trapped below, and hot air ends up above, where normally the reverse is the case.

### Food

#### *Local Food*

Definition: Minimized distance between production and consumption. Generally within 400 miles of production, or within same state boundaries

#### *Food Mile*

Definition: associated fossil fuel use, air pollution, and greenhouse gas emission as a result of the long distance your food travels. Average grocery store item travels 1,800 miles. That’s equal to driving from Park City, Utah, to Atlanta, Georgia!

#### *What can be grown in Utah*

Honey, potatoes, onions, celery, sweet corn, cherries, apricots, peaches, eggs, raspberries, blackberries, strawberries, grapes, spinach, tomatoes, garlic, lettuce, squash, and cucumbers,

# Appendix B (CONTINUED)

## Supplemental Activity Notes and Definitions for Each Thematic Day

### Energy

#### *Sources for Electricity Generation*

There are various forms of energy that we harness to meet our needs. Some of these sources of energy have by-products that are less desirable and can be harmful to the environment. In order to meet our current needs and ensure the right of future generations to have the energy they need, careful consideration must be taken when choosing energy sources. The following information highlights individual energy sources, their accompanying by-products, and the percent of energy generated by them in Utah.

Energy Source	Generated in UT % (2018)	Byproduct(s)
Coal	66.0	<p>Principle emissions resulting from coal combustion:<sup>1</sup></p> <ul style="list-style-type: none"> <li>• Sulfur dioxide (SO<sub>2</sub>), which contributes to acid rain and respiratory illnesses.</li> <li>• Nitrogen oxides (NO<sub>x</sub>), which contributes to smog and respiratory illnesses.</li> <li>• Particulates, which contribute to smog, haze, and respiratory illnesses and lung disease.</li> <li>• Carbon dioxide (CO<sub>2</sub>), which is the primary greenhouse gas emission from the burning of fossil fuels (coal, oil, and natural gas).</li> <li>• Mercury and other heavy metals, which have been linked with both neurological and developmental damage in humans and other animals. Mercury concentrations in the air usually are low and of little direct concern. However, when mercury enters water — either directly or through deposition from the air — biological processes transform it into methylmercury, a highly toxic chemical that accumulates in fish and the animals (including humans) that eat fish.</li> <li>• Fly ash and bottom ash are residues created when coal is burned at power plants. In the past, fly ash was released into the air through the smokestack, but by law much of it now must be captured by pollution control devices, like scrubbers. In the United States, fly ash is generally stored at coal power plants or placed in landfills. Pollution leaching from ash storage and landfills into groundwater and the rupture of several large impoundments of ash have emerged as new environmental concerns.</li> </ul> <p><small>1. U.S. Energy Information Administration. (2013). Coal and the Environment. Retrieved from: <a href="http://www.eia.gov/energyexplained/index.cfm?page=coal_environment">http://www.eia.gov/energyexplained/index.cfm?page=coal_environment</a></small></p>

# Appendix B (CONTINUED)

## Supplemental Activity Notes and Definitions for Each Thematic Day

Energy Source	Generated in UT % (2018)	Byproduct(s)
Natural Gas	16.0	<ul style="list-style-type: none"> <li>• CO<sub>2</sub> - Carbon Dioxide - Greenhouse Gas</li> <li>• CH<sub>4</sub> - Methane - Greenhouse Gas</li> </ul>
Wind	18.0	<ul style="list-style-type: none"> <li>• No by-products from use -- by-products created in the manufacturing, transportation, and assemblage of wind turbines include CO<sub>2</sub>, and some chemical waste. Compared to burning fossil fuel, these amounts are very small.</li> </ul>
Hydroelectric	3.3	<ul style="list-style-type: none"> <li>• Damming rivers to create reservoirs for hydroelectric generation may obstruct migration of fish to their upstream migration areas.</li> <li>• Reservoirs can also change natural water temperature, chemistry, flow characteristics, and silt loads -- all of which can lead to changes in the ecology of the river upstream and downstream.</li> </ul> <p data-bbox="711 1125 1338 1192"><a href="http://www.eia.gov/energyexplained/index.cfm?page=hydropower_environment">http://www.eia.gov/energyexplained/index.cfm?page=hydropower_environment</a></p>
Geothermal	0.7	<ul style="list-style-type: none"> <li>• CO<sub>2</sub> - (less than 1% of the CO<sub>2</sub> emissions of a fossil fuel plant.</li> <li>• Natural hydrogen sulfide – scrubbers are used to capture this from entering the atmosphere, which results in 97% less acid rain - causing sulfur compounds that are emitted by fossil fuel plants.</li> </ul> <p data-bbox="711 1537 1279 1604"><a href="http://www.eia.gov/energyexplained/index.cfm?page=geothermal_environment">http://www.eia.gov/energyexplained/index.cfm?page=geothermal_environment</a></p>

# Appendix B (CONTINUED)

## Supplemental Activity Notes and Definitions for Each Thematic Day

<u>Energy Source</u>	<u>Generated in UT % (2018)</u>	<u>Byproduct(s)</u>
Petroleum	0.4	<p>Petroleum products give off the following emissions when they are burned as fuel:</p> <ul style="list-style-type: none"> <li>• Carbon dioxide (CO<sub>2</sub>)</li> <li>• Carbon monoxide (CO)</li> <li>• Sulfur dioxide (SO<sub>2</sub>)</li> <li>• Nitrogen oxides (NOX) and Volatile Organic Compounds (VOC)</li> <li>• Particulate matter (PM)</li> <li>• Lead and various air toxics such as benzene, formaldehyde, acetaldehyde, and 1,3-butadiene may be emitted when some types of petroleum are burned.</li> </ul> <p>Nearly all of these byproducts have negative impacts on the environment and human health:</p> <ul style="list-style-type: none"> <li>• Carbon dioxide is a greenhouse gas and a source of global warming.<sup>1</sup></li> <li>• SO<sub>2</sub> causes acid rain, which is harmful to plants and to animals that live in water, and it worsens or causes respiratory illnesses and heart diseases, particularly in children and the elderly.</li> <li>• NOX and VOCs contribute to ground-level ozone, which irritates and damages the lungs.</li> <li>• PM results in hazy conditions in cities and scenic areas, and, along with ozone, contributes to asthma and chronic bronchitis, especially in children and the elderly. Very small, or “fine PM” is also thought to cause emphysema and lung cancer.</li> <li>• Lead can have severe health impacts, especially for children, and air toxics are known or probable carcinogens.</li> </ul> <p><a href="http://www.eia.gov/energyexplained/index.cfm?page=oil_environment">http://www.eia.gov/energyexplained/index.cfm?page=oil_environment</a></p>
Other	0.4	
Biomass	0.1	<ul style="list-style-type: none"> <li>• CO<sub>2</sub> - Greenhouse gas</li> <li>• Potential chemical contaminants, depending on what is being burned.</li> </ul>

Below is a summarized list of energy sources used to generate electricity in all of Utah by Rocky Mountain Power and others.

# Appendix B

## Supplemental Activity Notes and Definitions for Each Thematic Day

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### Sources of Energy Reference Sheet

Renewable- naturally replenished energy. The sun is always shining, plants are always growing, the wind is often blowing, and rivers are always flowing.

- **Solar** (renewable)- from the sun
  - a. Heating
  - b. Electricity
  
- **Wind** (renewable)- from the wind
  - a. Electricity
  
- **Geothermal** (renewable)- from the heat inside the Earth
  - a. Heating
  - b. Electricity
  
- **Hydro** (renewable)- from flowing water
  - a. Electricity
  
- **Biomass** (renewable)- from plants
  - a. Heating
  - b. Electricity
  - c. Transportation

Nonrenewable- sources of energy that will eventually run out and cannot be replenished.

- **Nuclear** (nonrenewable) from
  - a. Uranium
  - b. Electricity
  
- **Coal** (nonrenewable)
  - a. Electricity
  - b. Manufacturing
  
- **Petroleum** (nonrenewable)
  - a. Electricity
  - b. Manufacturing
  - c. Transportation
  
- **Natural Gas** (nonrenewable)
  - d. Electricity
  - e. Manufacturing
  - f. Transportation
  - g. Heating

U.S. Energy Information Administration - EIA - Independent Statistics and Analysis. (2020, June 18). Retrieved from <https://www.eia.gov/energyexplained/what-is-energy/sources-of-energy.php>

National Geographic Society. (2013, February 14). Non-renewable energy. Retrieved from <https://www.nationalgeographic.org/encyclopedia/non-renewable-energy>

# Appendix B (CONTINUED)

## Supplemental Activity Notes and Definitions for Each Thematic Day

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### **Electricity Generated in Utah (2011)**

Coal	66%	Geothermal	0.7%	TOTAL	100%
Natural Gas	16%	Petroleum	0.4%		
Wind	18%	Other	0.4%		
Hydroelectric	3.3%	Biomass	0.1%		

Source: *Energy Information Administration* (<http://www.eia.gov/electricity/data.cfm>)

Rocky Mountain Power is a large electric utility company that services the majority of Utah. A larger company called PacifiCorp that services many additional states owns Rocky Mountain Power.

### **Renewable Energy: A Summit County, Utah Example**

There are approximately 90 solar installations in the Summit County area that are connected to the electric grid. These installations tie into the larger Rocky Mountain Power system and owners receive credit for the power they generate through something called net metering (<http://www.rockymountainpower.net/env/nmcg/nm.html>). Below are some summary statistics on the net-metered systems located in Summit County:

- 90 total solar panel systems (71 residential, 19 commercial)
  - 69 of the 90 systems are located in the Park City/Snyderville areas
- Total generating capacity of the solar panels is 494 kilowatts of power
  - This is enough energy to power 32,900 15-watt lamps or 27,444 Nintendo Wii Consoles
  - Producing this same amount of power from coal would require 602,000 pounds of coal every year (solar panels are typically warranted for 25-years and can last up to 40 years or more)
- The number of new solar installations in Summit County has increased every year since 2006

There is currently a local solar bulk-purchase program titled Summit Community Solar (<http://mycommunitysolar.org/summit/>) that is guiding homeowners through the process of evaluating and purchasing solar panels for their homes.

### **Blue Sky Renewable Energy Program**

In addition to installing solar panels on their homes and businesses, Park City residents support renewable energy by participating in Rocky Mountain Power's Blue Sky program (<http://www.rockymountainpower.net/env/bsre.html>). Residents pay a small additional charge on their monthly bill in order to support the development of large-scale wind projects plus small renewable projects (including the solar panels installed at Swaner EcoCenter). Park City currently ranks #27 in the country (<http://www.epa.gov/greenpower/communities/gpcrankings.htm>) with 8.2 percent of electricity customers signing up for clean energy through Blue Sky.

Additional Information can be found at:

<http://apps1.eere.energy.gov/states/maps.cfm/state=UT>

<http://www.energy.utah.gov/>



# Appendix B (CONTINUED)

## Supplemental Activity Notes and Definitions for Each Thematic Day

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### Water

See the following links for additional information regarding water in Utah.

- [http://www.water.utah.gov/brochures/uwf\\_broc.htm](http://www.water.utah.gov/brochures/uwf_broc.htm) - data regarding how much water is in Utah and how much it takes to do various things.
- <http://waterwiseutah.org/kids.htm> - interactive website with a lot of information about water use and water conservation.
- <http://le.utah.gov/interim/2012/pdf/00002706.pdf> - This pdf is filled with facts about water use in Utah.

# Appendix C

## Camp Journals

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### How To Make Camp Journals

#### MATERIALS NEEDED:

- Colored construction paper (8.5"x11") for front and back covers
- Per camper- copy of prewritten journaling questions template - found in Appendix B
- Per camper- 3 sheets of 8.5"x11" blank paper
- 3 hole punch/paper punch
- String/yarn
- Glue

#### WHAT TO DO:

1. (per journal) - Cut 3 blank 8.5"x11" pages in half horizontally (hamburger).
2. (per journal) - Cut 1 sheet of construction paper (used for cover) in half horizontally.
3. Next, take the formatted pages with prewritten questions on them (templates of pages with questions already written found in this section for copying) and cut them in half as well.
4. Assemble the journal in the following order (more blanks can be inserted if desired).
  - a. Front Cover Page (construction paper)
  - b. Land questions page
  - c. Blank page
  - d. Air questions page
  - e. Blank page
  - f. Food questions page
  - g. Blank page
  - h. Energy questions page
  - i. Blank page
  - j. Water questions page
  - k. Blank page
  - l. Back Cover Page (construction paper)
5. Take the hole punch and punch two to three holes in the side of covers and pages so that the journal can be bound together with string (alternate would be to staple along one side).
6. Tie string through and around these holes to keep the journal together.
7. Repeat process until desired number of journals are made.

# Appendix C (CONTINUED)

## Camp Journal Templates

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### LAND

1. If you put something in the trash can, what happens to it?
2. If you put something into the recycling bin, what happens to it?
3. If you put something into the compost bin, what happens to it?
4. What can you do to reduce waste?
5. Why is land/ open space important?

### AIR

1. Why is clean air important?
2. What pollutes our air?
3. How can you improve the air you breathe?
4. Draw a city on the back of this page with no air pollution; don't include anything in the city that creates air pollution.

# Appendix C (CONTINUED)

## Camp Journal Templates

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### FOOD

1. What did you learn about the air quality in the area you live in? What can you do to help keep the air healthy?

2. What is local food?

3. Why buy local food?

4. What is a food mile?

5. Draw a picture on the back of this page showing where the food in your lunch box comes from.

### ENERGY

1. Why is energy important?

2. What is renewable energy?

3. What is non-renewable energy?

4. Draw as many sources of energy as you can.  
(you may draw on the back of this page)

# Appendix C (CONTINUED)

## Camp Journal Templates

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### WATER

1. Why is water important?
2. Where does water go when it goes down the drain or when you flush the toilet?
3. What can you do to conserve water? (list)
4. Draw what water means to you on the back of this page.

# Appendix D

## Wacky Waste Weight Chart

<b>WACKY WASTE WEIGHT CHART</b>			
<b>DAY</b>	<b>x3 LANDFILL (worst)</b>	<b>x2 RECYCLING (better)</b>	<b>COMPOST (best)</b>
<b>LAND</b>			
<b>AIR</b>			
<b>FOOD</b>			
<b>ENERGY</b>			
<b>WATER</b>			
<b>INCREASED OR DECREASED</b>			

# Appendix E

## Scavenger Hunt

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Deciduous Tree	Rock Shaped Like a Cube	Open Field (Conserved Space>	Group of Houses	Car
Clouds	Running Water	Stick	Dandelion	Flower
Conferous Tree	Leaf	Cement	Bicycle	Sound of Wind
Something Green	Scat	Soil	Kids Laughing	Facorty/ Business
Sage Brush	Insect	Shadow	Bird	Something Yellow

# Appendix F

## Pollution Detectives Tally

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Number of Each Vehicle by Type

<b>TYPE</b>	<b>TALLY</b>	<b>TOTALS</b>
Motorcycles		
Cars		
Trucks		
Buses		
Bicycles		
Feet (walking)		

Number of People in each Vehicle (keep separate results for each individual vehicle)

<b>MOTORCYCLES</b>	<b>CARS</b>	<b>TRUCKS</b>	<b>BUSES (estimate)</b>	<b>BICYCLES</b>



# Appendix F (CONTINUED)

## Pollution Detectives Tally

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### Air Pollution Values

<b>VEHICLE TYPE</b>	<b>TOTAL # OF PEOPLE</b>	<b>AIR POLLUTION VALUE/PERSON</b>	<b>ESTIMATED AIR POLLUTION VALUE</b>
Trucks with 1-2 People		10	
Cars with 1-2 People		09	
Motorcycle with 1-2 People		03	
Cars and Trucks with 3 or more People (carpool)		03	
Bus		0.2	
Bicycle/Walking		00	

# Appendix G

## Origin of Production for Common Grocery Items

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\* The actual origins of the ingredients contained in the following items was not verified through the companies that made the product. The countries listed are the largest producers and/or exporters of each ingredient. For exact product origin, you may wish to contact the manufacturer of each product.

### **OSKRI COCONUT BAR**

Ingredients: coconut, rice syrup

#### ***Origin of ingredients:***

- Coconut – Indonesia
  - <http://top5ofanything.com/index.php?h=1cb15034>. FAOSTAT data, 2014.
- Rice syrup – China and India
  - [http://en.wikipedia.org/wiki/Rice#Production\\_and\\_commerce](http://en.wikipedia.org/wiki/Rice#Production_and_commerce)

### **STRETCH ISLAND FRUIT CO.** All-natural fruit strip (mango sunrise)

Ingredients: Apple puree concentrate, mango puree concentrate, Lemon juice concentrate

#### ***Origin of ingredients:***

- Apple puree – China and the United States
  - [http://en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_apple\\_production](http://en.wikipedia.org/wiki/List_of_countries_by_apple_production)
- Mango puree – India, China, Thailand, and Mexico
  - <http://www.mapsofworld.com/world-top-ten/mango-producing-countries.html>
- Lemon juice – China, Mexico, and India
  - <http://en.wikipedia.org/wiki/Lemon#Production>

### **CASCADIAN FARMS ORGANIC** – Oatmeal Raisin granola bar

Ingredients: Granola (rolled oats, brown rice syrup, sugar, sunflower oil, sea salt, baking soda, vanilla), tapioca syrup, raisins, inulin, crisp rice (rice flour, sugar, sea salt, malt extract, annatto color), oat fiber, glycerin, sunflower oil, rice maltodextrin, soy lecithin, cinnamon, sea salt

#### ***Origin of ingredients:***

- Granola
  - Oats – Russia and Canada
    - <http://top5ofanything.com/index.php?h=97b1e6d7>
  - Brown rice syrup – China and India
    - [http://en.wikipedia.org/wiki/Rice#Production\\_and\\_commerce](http://en.wikipedia.org/wiki/Rice#Production_and_commerce)
  - Sugar – Brazil
    - <http://en.wikipedia.org/wiki/Sugarcane>
  - Sunflower oil – Ukraine and Russia
    - <http://www.indexmundi.com/agriculture/?commodity=sunflowerseed-oil&graph=production>
  - Sea salt – China and the United States of America
    - <http://www.maldonsalt.co.uk/About-Salt-Where-does-Salt-come-from.html>
  - Baking soda – Green River Basin in the Central USA
    - <http://www.care2.com/greenliving/green-cleaning-basics-wait-what-is-baking-soda.html>
  - Vanilla – Indonesia and Madagascar
    - <http://en.wikipedia.org/wiki/Vanilla#Production>

# Appendix G (CONTINUED)

## Origin of Production for Common Grocery Items

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- o Tapioca syrup - Brazil
  - <http://www.fao.org/docrep/x5032e/x5032e08.htm>
- Raisins - Turkey and the United States
  - <http://www.jagranjosh.com/general-knowledge/top-10-countries-by-raisins-export-1317708191-1>
- Inulin (if made from chicory) - Belgium
  - <http://www.top5ofanything.com/index.php?h=308304ae>
- Crisp Rice
  - o Rice flour - India and China
    - [http://wiki.answers.com/Q/What\\_country\\_exports\\_the\\_most\\_rice\\_flour?#slide=2](http://wiki.answers.com/Q/What_country_exports_the_most_rice_flour?#slide=2)
  - o Sugar - Brazil
    - <http://en.wikipedia.org/wiki/Sugarcane>
  - o Sea salt - China and the United States
    - <http://www.maldonsalt.co.uk/About-Salt-Where-does-Salt-come-from.html>
  - o Malt extract (can be from fermented grains) - Various countries
  - o Annatto color (derived from the seeds of achiote tree) - South America
    - <http://en.wikipedia.org/wiki/Annatto>
  - o Oat fiber - Russia and Canada
    - <http://top5ofanything.com/index.php?h=97b1e6d7>
  - o Glycerin -
  - o Sunflower oil - Ukraine
    - <http://www.indexmundi.com/agriculture/?commodity=sunflowerseed-oil&graph=production>
  - o Rice maltodextrin - India and China
    - [http://wiki.answers.com/Q/What\\_country\\_exports\\_the\\_most\\_rice\\_flour?#slide=2](http://wiki.answers.com/Q/What_country_exports_the_most_rice_flour?#slide=2)
  - o Soy lecithin - United States and Brazil
    - [http://www.nationmaster.com/graph/agr\\_pro\\_soy-agriculture-production-soybean](http://www.nationmaster.com/graph/agr_pro_soy-agriculture-production-soybean)
  - o Cinnamon - Indonesia and China
    - <http://top5ofanything.com/index.php?h=bd227ac0>
  - o Sea salt - China and the United States
    - <http://www.maldonsalt.co.uk/About-Salt-Where-does-Salt-come-from.html>

### **ANNIE'S CHEDDAR BUNNIES** (similar to Pepperidge Farms goldfish)

Ingredients: organic wheat flour, expeller-pressed sunflower oil, salt, cheddar cheese (pasteurized milk, cheese culture, salt, enzymes), yeast, paprika, cultured whole milk, nonfat milk, annatto extract (for color), ground celery seed, onion powder, natural Vitamin E (to protect flavor).

#### ***Origin of ingredients:***

- Wheat flour - China, India, and the United States
  - o <http://www.mapsofworld.com/world-top-ten/world-map-countries-wheat-production.html>
- Sunflower oil - Ukraine
  - o <http://www.indexmundi.com/agriculture/?commodity=sunflowerseed-oil&graph=production>
- Salt - China and the United States
  - o <http://www.maldonsalt.co.uk/About-Salt-Where-does-Salt-come-from.html>
- Cheddar cheese - United States, Germany, and France
  - o <http://en.wikipedia.org/wiki/Cheese>

# Appendix G (CONTINUED)

## Origin of Production for Common Grocery Items

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- Yeast – originated in Egypt thousands of years ago
  - <http://www.breadworld.com/Science.aspx>
- Paprika – Hungary, Serbia, and Spain
  - <http://en.wikipedia.org/wiki/Paprika>
- Whole milk - United States and India
  - <http://www.jagranjosh.com/general-knowledge/top-10-countries-by-milk-production-1318490243-1>
- Nonfat milk - United States and India
  - <http://www.jagranjosh.com/general-knowledge/top-10-countries-by-milk-production-1318490243-1>
- Annatto extract – South America
  - <http://en.wikipedia.org/wiki/Annatto>
- Ground celery seed – France and India
  - [http://www.agmrc.org/commodities\\_products/vegetables/celery-profile/](http://www.agmrc.org/commodities_products/vegetables/celery-profile/)
- Onion powder – China and India
  - [http://en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_onion\\_production](http://en.wikipedia.org/wiki/List_of_countries_by_onion_production)

### **SNYDERS OF HANOVER** – Mini Pretzels

Ingredients: enriched flour (wheat flour, niacin, reduced iron, thiamine mononitrate, riboflavin, folic acid), water, salt, malt, dextrose, canola oil, yeast, soda.

#### ***Origin of Ingredients:***

- Enriched flour
  - Wheat flour – China, India, and the United States
    - <http://www.mapsofworld.com/world-top-ten/world-map-countries-wheat-production.html>
  - \* The following are vitamins and minerals and their country of origin could not be determined.
    - Niacin -
    - Reduced iron -
    - Thiamine mononitrate -
    - Riboflavin -
    - Folic acid -
- Water – probably originates from area of manufacture
- Salt – China and the United States
  - <http://www.maldonsalt.co.uk/About-Salt-Where-does-Salt-come-from.html>
- Malt (made from fermented grains –origin could not be determined)
- Dextrose (made from corn sugar) – United States
  - <http://www.ers.usda.gov/topics/crops/sugar-sweeteners/background.aspx>
- Canola oil – Europe, China and Canada
  - [https://www.soyatech.com/canola\\_facts.htm](https://www.soyatech.com/canola_facts.htm)
- Yeast – ambient in the environment, comes from fungus spores. Utilization of yeast for making bread is thought to have originated in Egypt.
  - <http://www.breadworld.com/Science.aspx>
- Soda – United States
  - <http://www.care2.com/greenliving/green-cleaning-basics-wait-what-is-baking-soda.html>

# Appendix G (CONTINUED)

## Origin of Production for Common Grocery Items

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### LAYS CLASSIC POTATO CHIPS

Ingredients: potatoes, vegetable oil (sunflower, corn and/or canola oil) and salt.

**Origin of ingredients:**

- Potatoes – China, India, and Russia (although it is likely they are sourced from the United States)
  - <http://top5ofanything.com/index.php?h=01880761>
- Sunflower oil – Ukraine
  - <http://www.indexmundi.com/agriculture/?commodity=sunflowerseed-oil&graph=production>
- Corn oil – United States and China
  - <http://www.indexmundi.com/agriculture/?commodity=corn>
- Canola oil – Europe, China and Canada
  - [https://www.soyatech.com/canola\\_facts.htm](https://www.soyatech.com/canola_facts.htm)
- Salt – China and the United States
  - <http://www.maldonsalt.co.uk/About-Salt-Where-does-Salt-come-from.html>

### HERSHEY'S Milk Chocolate Bar

Ingredients: milk chocolate (sugar, milk, chocolate, cocoa butter, lactose, milk fat, soy lecithin, PGPR, emulsifier, vanillin, artificial flavor)

**Origin of ingredients:**

- Milk Chocolate
  - Sugar – Brazil
    - <http://en.wikipedia.org/wiki/Sugarcane>
  - Whole milk – United States and India
    - <http://www.jagranjosh.com/general-knowledge/top-10-countries-by-milk-production-1318490243-1>
  - Chocolate (cacao bean) – Africa and Central/South America
    - <http://www.facts-about-chocolate.com/where-does-chocolate-come-from/>
  - Cocoa butter (cacao bean) – Africa and Central/South America
    - <http://www.facts-about-chocolate.com/where-does-chocolate-come-from/>
  - Lactose (sugar present in milk) and milk fat – United States and India
    - <http://www.jagranjosh.com/general-knowledge/top-10-countries-by-milk-production-1318490243-1>
  - Soy lecithin – United States, Western Europe, and Japan
    - <http://www.soyinfocenter.com/HSS/lecithin1.php>
  - PGPR (polyglycerol polyricinoleate) – used to make the thickness of chocolate and similar foods. Location of manufacture couldn't be determined.
- Vanillin (it is the fragrant compound in vanilla) – Indonesia and Madagascar
  - <http://en.wikipedia.org/wiki/Vanilla#Production>

# Appendix G (CONTINUED)

## Origin of Production for Common Grocery Items

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### POPCORN

Ingredients: corn, butter, salt

**Origin of ingredients:**

- Corn – United States and China
  - <http://www.indexmundi.com/agriculture/?commodity=corn>
- Coconut oil - Phillipines and Indonesia
  - <http://www.whichcountry.co/which-country-produces-most-coconuts-2/>
- Salt – China and the United States
  - <http://www.maldonsalt.co.uk/About-Salt-Where-does-Salt-come-from.html>

### COFFEE

Ingredient: coffee beans

**Origin of ingredient:**

- Coffee beans – Brazil, Vietnam, and Columbia
  - [http://en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_coffee\\_production](http://en.wikipedia.org/wiki/List_of_countries_by_coffee_production)

### SWISS MISS MILK CHOCOLATE FLAVOR HOT COCOA MIX

Ingredients: Sugar, modified whey, cocoa, hydrogenated coconut oil, nonfat milk, calcium carbonate, salt, dipotassium phosphate, mono-and diglycerides, artificial flavor, carrageenan.

**Origin of ingredients:**

- Sugar – Brazil
  - <http://en.wikipedia.org/wiki/Sugarcane>
- Modified whey (made from milk) - United States and India
  - <http://www.usdec.org/Products/content.cfm?ItemNumber=82497&navItemNumber=82256>
- Cocoa (cacao bean) – Africa and Central/South America
  - <http://www.facts-about-chocolate.com/where-does-chocolate-come-from/>
- Hydrogenated coconut oil – Phillipines and Indonesia
  - <http://www.whichcountry.co/which-country-produces-most-coconuts-2/>
- Nonfat milk – United States and India
  - <http://www.usdec.org/Products/content.cfm?ItemNumber=82497&navItemNumber=82256>
- Calcium carbonate – found worldwide
- Salt – United States and China
  - <http://www.maldonsalt.co.uk/About-Salt-Where-does-Salt-come-from.html>
- The origin of dipotassium phosphate, mono and diglycerides, carrageenan and artificial flavor could not be determined.

# Appendix H

## Practical Packaging Worksheet

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Look at your products' packaging closely, and talk with your teammates about the following questions. You must be prepared to present the answers to these questions to the rest of the group.

1. Describe the products' packaging.
  - a. What shape is it?
  - b. Is it the same shape as the item inside?
  - c. Why do you think the packaging is shaped this way?
  - d. Does the shape have a purpose?
  - e. Is it to better protect the product or simply to provide space for advertising and information?
  - f. Does there seem to be a lot of "extra" material in the packaging that is not necessary to keep the product safe and secure?
  - g. Could the product be put in a package that was smaller and used less material without causing damage to the product?
2. What materials are used in the packaging? (Paper? Plastic? Glass? Metal? Other?)
3. Which material makes up the majority of the packaging?
4. What natural resources are used to make the materials used in the packaging? (What resource makes paper? What resource makes plastic? What resource makes glass?)
5. Look at your product closely. Is the packaging made of recycled materials?
  - a. How can you tell?
6. Is the packaging recyclable?
  - a. How can you tell?
  - b. Can it be recycled in your community?
  - c. Can all of the packaging be recycled or only parts of it?
7. What parts of the packaging are thrown away after the product is used?
8. Do the individual parts of the products packaging serve a purpose?
  - a. What are the purposes?
9. Could you make this product's packaging more sustainable?
  - a. What would you change about it to do so?

# Appendix I

## Food Commonly Grown in Utah

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<b><u>Vegetables</u></b>	<b><u>Fruit</u></b>	<b><u>Nuts</u></b>	<b><u>Herbs</u></b>	<b><u>Other</u></b>	<b><u>Meat</u></b>
Asparagus	Apples	Pine nuts	Basil	Butter	Antelope
Beans	Apricots	Sunflower Nuts	Fennel	Cheese	Buffalo
Beets	Blackberries	Walnuts	Garlic	Eggs	Chicken
Broccoli	Blueberries		Mint	Honey	Cow
Brussels	Cantaloupe		Oregano	Maple syrup	Deer
Sprouts	Cherries		Parsley	Milk	Duck
Cabbage	Chokecherries		Thyme	Mushrooms	Elk
Carrots	Grapes				Goat
Cauliflower	Honeydew				Goose
Celery	Nectarines				Grouse
Corn	Peaches				Moose
Cucumbers	Pears				Pheasant
Dandelion	Plums				Pig
Greens	Raspberries				Turkey
Eggplant	Rose Hips				
Green Beans	Strawberries				
Kale	Thimbleberries				
Leeks	Tomatoes				
Lettuce	Watermelon				
Onions	Wolfberries				
Peas					
Peppers					
Potatoes					
Pumpkins					
Radish					
Rhubarb					
Scallions					
Shallots					
Spinach					
Sprouts					
Squash					
Swiss Chard					
Zucchini					



# Appendix J

## Energy Sources with Associated By-products

<u>Energy Source</u>	<u>Generated in UT % (2011)</u>	<u>Byproduct(s)</u>
Coal	63.2	<p>The principal emissions resulting from coal combustion are:<sup>1</sup></p> <ul style="list-style-type: none"> <li>• Sulfur dioxide (SO<sub>2</sub>), which contributes to acid rain and respiratory illnesses.</li> <li>• Nitrogen oxides (NO<sub>x</sub>), which contributes to smog and respiratory illnesses.</li> <li>• Particulates, which contribute to smog, haze, and respiratory illnesses and lung disease.</li> <li>• Carbon dioxide (CO<sub>2</sub>), which is the primary greenhouse gas emission from the burning of fossil fuels (coal, oil, and natural gas).</li> <li>• Mercury and other heavy metals, which have been linked with both neurological and developmental damage in humans and other animals. Mercury concentrations in the air usually are low and of little direct concern. However, when mercury enters water – either directly or through deposition from the air – biological processes transform it into methylmercury, a highly toxic chemical that accumulates in fish and the animals (including humans) that eat fish.</li> <li>• Fly ash and bottom ash are residues created when coal is burned at power plants. In the past, fly ash was released into the air through the smokestack, but by law much of it now must be captured by pollution control devices, like scrubbers. In the United States, fly ash is generally stored at coal power plants or placed in landfills. Pollution leaching from ash storage and landfills into groundwater and the rupture of several large impoundments of ash have emerged as new environmental concerns.</li> </ul> <p><small>1. <a href="http://www.eia.gov/energyexplained/index.cfm?page=coal_environment">http://www.eia.gov/energyexplained/index.cfm?page=coal_environment</a></small></p>
Natural Gas	27.9	<ul style="list-style-type: none"> <li>• CO<sub>2</sub> - Carbon Dioxide - Greenhouse Gas</li> <li>• CH<sub>4</sub> - Methane - Greenhouse Gas</li> </ul>

# Appendix J (Continued)

## Energy Sources with Associated By-products

<u>Energy Source</u>	<u>Generated in UT % (2011)</u>	<u>Byproduct(s)</u>
Wind	4.1	<ul style="list-style-type: none"> <li>No by-products from use -- by-products created in the manufacturing, transportation, and assemblage of wind turbines include CO<sub>2</sub>, and some chemical waste. Compared to burning fossil fuel, these amounts are very small.</li> </ul>
Hydroelectric	3.3	<ul style="list-style-type: none"> <li>Damming rivers to create reservoirs for hydroelectric generation may obstruct migration of fish to their upstream migration areas.</li> <li>Reservoirs can also change natural water temperature, chemistry, flow characteristics, and silt loads -- all of which can lead to changes in the ecology of the river upstream and downstream.</li> </ul> <p><a href="http://www.eia.gov/energyexplained/index.cfm?page=hydropower_environment">http://www.eia.gov/energyexplained/index.cfm?page=hydropower_environment</a></p>
Geothermal	0.7	<ul style="list-style-type: none"> <li>CO<sub>2</sub> - (less than 1% of the CO<sub>2</sub> emissions of a fossil fuel plant.</li> <li>Natural hydrogen sulfide -- scrubbers are used to capture this from entering the atmosphere, which results in 97% less acid rain-causing sulfur compounds than are emitted by fossil fuel plants.</li> </ul> <p><a href="http://www.eia.gov/energyexplained/index.cfm?page=geothermal_environment">http://www.eia.gov/energyexplained/index.cfm?page=geothermal_environment</a></p>

# Appendix J (CONTINUED)

## Energy Sources with Associated By-products

Energy Source	Generated in UT % (2011)	Byproduct(s)
Petroleum	0.4	<p>Petroleum products give off the following emissions when they are burned as fuel:</p> <ul style="list-style-type: none"> <li>• Carbon dioxide (CO<sub>2</sub>)</li> <li>• Carbon monoxide (CO)</li> <li>• Sulfur dioxide (SO<sub>2</sub>)</li> <li>• Nitrogen oxides (NOX) and Volatile Organic Compounds (VOC)</li> <li>• Particulate matter (PM)</li> <li>• Lead and various air toxics such as benzene, formaldehyde, acetaldehyde, and 1,3-butadiene may be emitted when some types of petroleum are burned.</li> </ul> <p>Nearly all of these byproducts have negative impacts on the environment and human health:</p> <ul style="list-style-type: none"> <li>• Carbon dioxide is a greenhouse gas and a source of global warming.<sup>1</sup></li> <li>• SO<sub>2</sub> causes acid rain, which is harmful to plants and to animals that live in water, and it worsens or causes respiratory illnesses and heart diseases, particularly in children and the elderly.</li> <li>• NOX and VOCs contribute to ground-level ozone, which irritates and damages the lungs.</li> <li>• PM results in hazy conditions in cities and scenic areas, and, along with ozone, contributes to asthma and chronic bronchitis, especially in children and the elderly. Very small, or “fine PM” is also thought to cause emphysema and lung cancer.</li> <li>• Lead can have severe health impacts, especially for children, and air toxics are known or probable carcinogens.</li> </ul> <p><small><a href="http://www.eia.gov/energyexplained/index.cfm?page=oil_environment">http://www.eia.gov/energyexplained/index.cfm?page=oil_environment</a></small></p>
Other	0.4	
Biomass	0.1	<ul style="list-style-type: none"> <li>• CO<sub>2</sub> - Greenhouse gas</li> <li>• Potential chemical contaminants, depending on what is being burned.</li> </ul>

# Appendix K

Pictures of Worm Compost Bins from Previous Sustainable You Camps

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# Appendix K (CONTINUED)

Pictures of Worm Compost Bins from Previous Sustainable You Camps

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# Appendix K (CONTINUED)

Pictures of Worm Compost Bins from Previous Sustainable You Camps

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# Appendix K (CONTINUED)

Pictures of Worm Compost Bins from Previous Sustainable You Camps

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# Appendix L

## Garden Box Pictures

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# Appendix L (CONTINUED)

## Garden Box Pictures

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# CERTIFICATES



# PRESENTATIONS

