

Creating an Environmental Education Program for Camp Fire USA

A Senior Project

presented to

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by

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## **Abstract**

The topic area for this Senior Project is Environmental Education. There were four environmental hands-on lesson plans that were created for the non-profit organization Camp Fire USA, Central Coast Council. These lessons will be implemented at Camp Natoma, the resident camp the Central Coast Council owns in Paso Robles, California. The lesson plans take up hour-long increments and have been created for youth ages eight through fifteen. The topics covered in the lessons include: composting; reduce, reuse, and recycle; solar energy; and wetlands. These lesson plans will be implemented as a new “Nature Class” that campers can choose to take this summer at camp and will be available for other staff members to facilitate with their camp groups throughout the week. This project will have many potential impacts including enhancing camper’s critical thinking, problem-solving, and effective decision-making skills. It can help to teach campers to make informed and responsible decisions by weighing different sides of an environmental issue and it can help to increase camper’s interest and motivation in preserving the environment for future generations.

## **Acknowledgements**

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Sincerely,

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# **SECTION 1: SENIOR PROJECT DOCUMENT**

## Introduction

The increasing human population of the world has caused an increased need for natural resources to be utilized in our world. This has led to a decline in overall quality of our natural environment. The best way to counter this problem is prevention, which can be achieved through public education and outreach. By educating our youth, we can directly influence their future decisions and can positively impact the environment. The topic area for this project is Environmental Education. This has been defined by the U.S.

Environmental Protection Agency (USA EPA) as “helping people gain an understanding of how individual actions affect the environment, acquire skills to weigh various sides of issues, and become better equipped to make informed decisions” (USEPA 2011).

However in recent years, there has been a decrease in the amount of time youth spend outside in nature.

Child advocacy expert Richard Louv, author of *Last Child in the Woods* (2005), discusses this phenomenon he calls “nature-deficit” which directly links the lack of nature in the lives of today’s generation and is linked to the rises in obesity, attention disorders, and depression in children. Louv shows that direct exposure to nature is essential for healthy childhood development and for the physical and emotional health of children and adults.

There have also been studies conducted from the USEPA on the impact of environmental education, which have shown that environmental education programs increase the overall environmental quality, specifically air quality of an area.

In order to help create a solution to the decreasing quality of our environment, four hands-on environmental lesson plans have been created for the non-profit organization Camp Fire USA, Central Coast Council. Camp Fire USA is a 100-year-old inclusive non-profit organization. They welcome youth and adults regardless of age, race, religion, socioeconomic status, disability, sexual orientation or other aspects of diversity. I have been involved with Camp Fire USA organization as a member of the Long Beach Council since I was four years old and I have been involved with the Central Coast Council since March 2010. I worked last summer as a counselor at Camp Fire USA Central Coast Council's resident summer camp, Camp Natoma, and am very familiar with their program.

Camp Natoma is located at 617 Cypress Mountain Road in Paso Robles, California 93446, near the Adaleida Hills. The average high temperature for the summer is around 94 degrees Fahrenheit and the average low temperature is 54 degrees Fahrenheit. The summer months get an average of .01-.06 inches of rain. The area has grassy vegetation and chaparral.

The purpose of this project is two fold: 1) to educate youth about what they can do to preserve the environment for future generations, and 2) to create a sense of empowerment in youth that their actions can make a difference. There is a definite need for this program at Camp Natoma. One of Camp Fire USA's mission statements is that they "believe in the power of nature to awaken a child's senses, curiosity and desire to learn" (Camp Fire USA 2011). However, the camp currently does not have a strong nature

program. Creating an environmental education program will help fulfill Camp Fire USA's mission statement and therefore benefit their organization. In particular, Camp Natoma also has certain goals for camper development. One of their objectives for staff is "to help each camper gain knowledge and appreciation of the natural environment and develop an ethic of stewardship" (Camp Natoma 2011). This project will help to fulfill Camp Natoma's objective for staff by providing more opportunities for campers to experience different aspects of the natural environment.

This project is important to educate youth about how they can help to protect the environment for future generations. In order to address Camp Natoma's objectives, an environmental education program has been created for implementation this summer. Four lesson plans were made on topics including: composting; reducing, reusing, and recycling; utilizing solar energy; and learning about wetlands (Appendices A-D).

This project has great potential to have a positive impact on campers. A study done by the State Education and Environment Roundtable found that most students' performance improved after being exposed to environmental education programs. Students received grades and scores better in reading, math, and writing, and their interest and motivation were also enhanced. This was because environmental education is interdisciplinary, collaborative, student-centered, and hands-on (Lieberman 1998). The new nature class created for Camp Natoma has all of these components integrated within the lesson plans and therefore has the potential to attain all of these impacts on youth involved in the class.

## **Objectives**

1. To create four lesson plans spanning an hour in length to be implemented this summer at Camp Natoma.
2. To create an interest in campers to learn about the natural environment.
3. To fulfill Camp Natoma's goals for camper development by creating a program to help each camper gain knowledge and appreciation of the natural environment and develop an ethic of stewardship.
4. To encourage youth to weigh various sides of environmental issues and enhance their problem-solving and decision-making skills in regards to the environment.
5. To implement the new "Nature Class" at camp Natoma this summer 2011 season.

## Literature Review

These lessons have been created from comparing various agencies and non-profits environmental education lesson plans that have been successfully used in the past. This curriculum was used as a guide for the format and content of my lesson plans and then adapted to better fit into a camp setting. Several different environmental education lesson plans from organizations were looked at, including the USEPA, The Arbor Day Foundation, The American Camp Association (ACA), Catalina Island Marine Institute (CIMI) Camps, and the American Forest Foundation (AFF). These sources were selected due to the amount of available information, and the accessibility of staff that were able to provide knowledge and support to this project.

In particular, the AFF's Project Learning Tree (PLT) was the most utilized curriculum in creating the lesson plans. This was from several factors, including them having a wide variety and quantity of information. This is due to the program, which has been around since the early 1970s. PLT is very activity-based, interdisciplinary, and helps youth learn how to think and not what to think, which is beneficial to a camp setting. PLT has many different topics available and curriculum and activity guides for youth in Pre-K – 8<sup>th</sup> grade. Also, Emily Starkie, the camp director of Camp Natoma was familiar with the PLT program and wanted the curriculum for camp to be similar. Other environmental education lesson plans were considered and similar elements from multiple sources were

used in the lesson plans (such as the California Regional Environmental Education Community: CREEC).

The USEPA's environmental education program consists of several components including awareness and sensitivity, knowledge and understanding, attitudes, skills, and participation. These main concepts were used and adapted for use into the lesson plans created for Camp Natoma. The USEPA was also utilized in the majority of the background information that was incorporated into the lesson plans. They were used as a resource because they have a numerous amounts of information on every topic of the lesson plans. Also, PLT's background information came from several sources including the USEPA, so the majority of the research put into the background section of the lesson plans have been from information from the USEPA.

CIMI's (2011) environmental education program was also analyzed and adapted to fit some of Camp Natoma's needs. CIMI's program is based upon performing environmental projects to educate youth on how to lessen their carbon footprint. Their program consists of reducing their waste and composting. One of their most prominent projects is composting at their camps on Catalina Island. Information from CIMI was used for integrating a composting program to work at Camp Natoma. Upon attending the 2011 American Camp Association (ACA) Southern California Spring Leadership Conference this April, I was able to listen to a seminar featuring CIMI. Danny Sudman (2011), one of the camp directors and Catalina Island Camps, discussed how they have implemented several projects to make their camp more "green." They went over several techniques that worked for camps including creating a composting program for their

camp and they handed out information on how to implement similar projects at summer camps. This information was used and put into the background section of the composting lesson plan. Another ACA seminar titled, “Outdoor Cooking” (2011), discussed how to utilize solar energy into outdoor cooking. I used this information to create the activity portion of my solar energy lesson plan.

## **Procedures and Methodology**

Four lesson plans were created lasting an hour in length on topics including composting; reduce, reuse, and recycle; solar energy; and wetlands (Appendices A-D). These topics were selected after many discussions with Camp Natoma director Emily Starkie to fit the needs most necessary to their programming and their available resources. In order to accomplish creating the lesson plans, each topic was researched to gain an understanding in the background information necessary to complete the activities. The Project Learning Tree Environmental Education Activity Guide was used as a guide to the formatting used in the lesson plans created. The information that was used in the lesson plans came from several resources including the USEPA, The Arbor Day Foundation, The American Camp Association (ACA), Catalina Island Marine Institute (CIMI) Camps, the American Forest Foundation (AFF), Solar Now, U.S. Energy Information Administration, San Luis Obispo County Integrated Waste Management Authority, Environmental Concern, California Regional Environmental Education Community, Compostables Materials Management, and the California Department of Resources Recycling and Recovery. The lesson plans were read and approved by Emily Starkie for implementation over the summer.

## **Implementation and Impact**

These four lesson plans created for use for Camp Fire USA will be used over the summer 2011 camp season at Camp Natoma. The lessons will be utilized as a new “Nature Class” that campers in grades 2<sup>nd</sup>-10<sup>th</sup> grade can choose to take as an activity. “Classes” at camp are program areas that counselors and staff members teach to campers for an hour twice daily for four days. On the first day of camp, campers get to choose three classes that they enroll in and attend every full day of camp. Different classes are offered for various age groups and the campers in classes tend to be around the same age. The created lesson plans will be used in a nature class period that will be taught to campers. A staff member will be teaching the new nature class, and they will be trained on how to lead the lesson plans and activities. The created lesson plans will be used to guide campers and staff through each environmental education activity. This class will be offered from July 3<sup>rd</sup> – July 30<sup>th</sup>, 2011. Lessons will also be available during “camp time” for staff members to teach to their campers. Camp time is an hour-long period everyday and counselors collaborate with campers to select activities during this time. Emily Starkie is considering making it mandatory that each camp group does at least one environmental lesson each week, with the direction of making camp more of a nature and environmental learning experience for all campers.

This nature class may have many potential impacts on campers. The USEPA has found many impacts of environmental education on youth, including “enhancing their critical

thinking, problem-solving, and effective decision-making skills, and teaches individuals to weigh various sides of an environmental issue to make informed and responsible decisions” (USEPA 2011b). The USEPA also mentions that environmental education can help create “awareness and sensitivity to the environment and environmental challenges, knowledge and understanding of the environment and environmental challenges, attitudes of concern for the environment and motivation to improve or maintain environmental quality, skills to identify and help resolve environmental challenges and encourage participation in activities that lead to the resolution of environmental challenges” (USEPA 2011b). This nature class will have the potential of all of these impacts found by the USEPA as well as increase camper’s interest and motivation.

## **Conclusion**

Four Environmental Education hands-on lesson plans have been created for the non-profit organization Camp Fire USA, Central Coast Council. These lessons will be implemented at Camp Natoma in the summer 2011 season as a new nature class for campers to take and available for other staff members to lead with their camp group. The lesson plans will take up hour-long increments and have been created for campers in 3<sup>rd</sup>-10<sup>th</sup> grades. The topics that are covered in the lessons include: composting; reduce, reuse, and recycle; solar energy; and wetlands (Appendices A-D). This project will have many potential impacts on campers including: enhancing critical thinking, problem-solving, and effective decision-making skills. This project will potentially help increase camper's interests and motivation in preserving the environment for future generations.

There are some recommendations for future follow up. Since these lesson plans will be implemented for the first time this summer at camp, it would be useful to conduct a follow up of how effective the implemented program was over summer. This could be implemented by surveys of campers who enroll in the class and from feedback from observers on the camp staff such as Emily Starkie. These lesson plans will need to be managed and maintained by staff in order for the program to continue on. They also may need to be adjusted and adapted depending on campers' interest and overall feedback from the class.

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## **SECTION 2: APPENDICES**

## Appendix A: Composting

**Overview:** Campers will learn about composting. They will learn the benefits of composting compared to throwing food into the garbage. They will get to use their knowledge by participating in a new composting project at camp.

**Objectives:** Campers will understand what composting is, and how it is done. They will know the benefits of composting compared to throwing food into the garbage. They will know which items can be composted and which items cannot be composted. Campers will help sort out food waste at the end of each meal and help add ingredients to the compost pile.

**Levels:** 3<sup>rd</sup>-10<sup>th</sup> grade

**Materials:** Food scraps from kitchen to be sorted by campers, labeled buckets, poster paper, markers

**Time Considerations:** Preparation: 15 minutes; Activity: 1 hour

### Background:

#### What is compost?

Compost is organic material that can be used as a soil amendment or as a medium to grow plants. Mature compost is a stable material with a content called humus that is dark brown or black and has a soil-like, earthy smell. It is created by combining organic wastes in proper ratios into piles, rows, or vessels; adding bulking agents (e.g., wood chips) as necessary to accelerate the breakdown of organic materials; and allowing the finished material to fully stabilize and mature through a curing process.

As vegetation falls to the ground, it slowly decays, and breaks down. This provides minerals and nutrients needed for plants, animals, and microorganisms. Mature compost includes the production of high temperatures to destroy pathogens and weed seeds that natural decomposition does not destroy.

#### What are the benefits of composting?

Yard trimmings and food residuals together constitute 26% of the U.S. municipal solid waste stream. Composting offers the benefits of resource efficiency and creating a useful product from organic waste that would otherwise have been sent to a landfill.

Composting has many benefits including suppressing plant diseases and pests; reduces the need for chemical fertilizers, promotes higher yields of agricultural crops; facilitates reforestation, wetlands restoration, and habitat revitalization efforts by amending contaminated, compacted, and marginal soils; can remediate soils contaminated by hazardous waste; removes solids, oil, grease, and heavy metals from stormwater runoff; captures and destroy 99.6 percent of industrial volatile organic chemicals (VOCs) in

contaminated air; and can have a cost savings of at least 50 percent over conventional soil, water, and air pollution remediation technologies (USEPA 2011a).

### **What can be composted?**

Common household items that can be composted include animal manure, cardboard rolls, clean paper, coffee grounds and filters, cotton rags, dryer and vacuum cleaner lint, eggshells, fireplace ashes, fruits and vegetables, grass clippings, hair and fur, hay and straw, houseplants, leaves, nut shells, sawdust, shredded newspaper, tea bags, wood chips, wool rags, and yard trimmings.

### **What can't be composted?**

Items that should not be composted include black walnut tree leaves or twigs because they release substances that might be harmful to plants; coal or charcoal ash because it might contain substances harmful to plants. Diseased or insect-ridden plants could cause the diseases or insects to survive and transfer to other plants and therefore should not be composted. Pet wastes should also not be used since it might contain parasites, bacteria, germs, pathogens, and viruses harmful to humans. Yard trimmings that have been treated with chemical pesticides might kill beneficial composting organisms, and should not be included in composting. Also, there are several items that can create odor problems and attract pests such as rodents and flies and therefore should not be composted. These include dairy products such as butter, milk, sour cream, yogurt and eggs, fats, grease, lard, or oils, meat or fish bones and scraps.

### **How do you successfully compost?**

It is important to keep track of the different ingredients that are put into a compost pile. Different ingredients contain different ratio of carbon to nitrogen (C:N). The ratio of carbon to nitrogen (C:N) in a compost pile should be around 25 parts carbon to 1 part nitrogen, (25:1). If there is too much carbon in the pile, then decomposition will slow down in the pile. If there is too much nitrogen, it will create a very odorous pile.

Table 1. Estimated carbon to nitrogen ratios of items from composting 101.

<b>Browns = High Carbon C:N</b>	<b>Greens = High Nitrogen C:N</b>
Ashes, wood 25:1	Alfalfa 12:1
Cardboard, shredded 350:1	Clover 23:1
Corn stalks 75:1	Coffee grounds 20:1
Fruit waste 35:1	Food waste 20:1
Leaves 60:1	Garden waste 30:1
Newspaper, shredded 175:1	Grass clippings 20:1
Peanut shells 35:1	Hay 25:1
Pine needles 80:1	Manures 15:1
Sawdust 325:1	Seaweed 19:1
Straw 75:1	Vegetable scraps 25:1
Wood chips 400:1	Weeds 30:1

**Getting Ready:** Materials will be gathered for the activity. In order to gauge prior knowledge of campers, counselors will ask questions about what they already know. These could include: Do you know what composting is? Have you ever seen a compost bin or pile? What kinds of things do you think can be composted? What can't be composted? These questions will help establish where campers are coming from and will help to guide the lesson further.

### **Doing the Activity:**

#### **Part A: Composting**

Counselors will go over background knowledge with campers so they can learn about composting. They will understand composting, and how it can successfully be done. Counselors will make sure that they can answer the questions: what is compost; what are the benefits of composting; what can be composted; what can't be composted; and how do you successfully compost?

After campers are able to answer these questions, they will create a poster with things that can and cannot be composted. They will display the poster up in the dining hall for other campers and counselors to use when sorting and throwing away food. Campers will help sort out food waste at the end of each meal and help add ingredients to the compost pile.

#### **Part B: Work on the compost pile**

Campers will get to use their knowledge of what can and cannot be composted on the compost pile created at camp. They will get to help sort out food after every meal and be in charge of the buckets where other campers will deposit food waste. They will check the buckets to make sure that every item placed in the bucket is acceptable to go into the compost pile. Campers will get to go out to the compost pile and add correct portions of "greens" and "browns" (carbon and nitrogen) into the pile and mix it accordingly.

The steps that campers and supervising counselors will go through are as follows:

1. In a rodent resistant bin (already at camp), create a base of 3 - 4 inches of woody, brushy material to promote aeration (do not mix into pile).
2. Alternate the layers of green and brown materials; keep the layers 2 – 4 inches deep. See table 1 for list of greens and browns. Larger materials should be chopped up for faster decomposition.
3. Whenever a food scrap layer is added, sprinkle it with soil and then cap off with a brown layer to prevent smells and flies.
4. Mix bin contents often (minimum once every two weeks). This introduces air and gets bin heating up again. Mix older materials with newer materials for faster decomposition.
5. Moisture content of bin should be like a wrung out dishrag. Only add water if pile is very dry after mixing.
6. Pile will shrink. Continue to add and mix until bin is almost full. Place cover (such as carpet or wooden lid) on surface of pile to retain heat and moisture.
7. Compost is generally ready to use when it looks like humus.

**Additional Resources:**

- Compostables Materials Management. 2011. California Department of Resources Recycling and Recovery. (30, April 2011;  
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## **Appendix B: Reduce, Reuse, and Recycle Lesson Plan**

**Overview:** Campers will learn about reducing, reusing, and recycling materials. They will learn about how things are thrown away and where waste goes. After learning about the “Three R’s” campers will learn about commonly used materials that are recyclable and will create a poster of ideas of what can and cannot be recycled. They will make a poster and will reuse materials to make a craft out of recyclable materials.

**Objectives:** Campers will be able to understand what happens to waste when it is thrown away. They will understand what recycling is, and the benefits of it. They will learn why some materials are considered to be recycled and others are not. They will make a poster of all items that are recyclable in the San Luis Obispo County area and will also make a craft from recyclable materials.

**Levels:** 3<sup>rd</sup>-10<sup>th</sup> grade

**Materials:** Poster board, markers, berry baskets, cardboard tubes (toilet paper and paper towel rolls), colored construction paper, paint, glue, walnuts

**Time Considerations:** Preparation: 15 minutes; Activity: 1 hour

### **Background:**

#### **How can you produce less waste?**

Overall, there are many ways for people to produce less waste including reducing, reusing, recycling, and composting.

#### **What is reducing?**

Reducing is using less of something, for example using fewer materials will reduce the amount of waste. The most effective way to reduce waste is to not create it to begin with. Reducing and reusing can save natural resources and reduce costs of waste management. In the United States the amount of waste generated has been increasing. In the year 2009 the amount of waste each person creates was 4.3 pounds per day. This has caused about 243 million tons of waste generated in the United States in 2009 (USEPA 2011d).

#### **What are the benefits of reducing?**

There are many benefits of reduction including saving resources, reducing toxicity of waste, and reduces costs. Reducing items can save resources by decreasing waste. It can cause fewer materials that need to be recycled, combusted for energy, or sent to a landfill. Reducing waste can cause less hazardous materials to be used (such as cleaning products and pesticides), which can reduce waste toxicity. Reducing waste also can mean economic savings for many people including communities, businesses, organizations, and individuals. In communities who “pay as they go” for trash end up reducing their waste, they dispose of less trash and end up paying lower trash bills. Businesses can also save

money by reducing. When they manufacture their products with less packaging, they are buying fewer raw materials and saving money. Individuals and consumers can also get economic benefits by reducing waste. If they buy products in bulk that have less packaging, or that are reusable can help save money.

### **What is reusing?**

Reusing is taking materials that have already been used and using them again for the same or another purpose. This can range from several items such as reusing Tupperware, a water bottle, or even buying a used car.

### **What are the benefits of reusing?**

Reusing materials can also be beneficial because it helps to reduce waste by reusing materials instead of having to buy or make objects from new materials. It can reduce the amount of items being put in landfills if they are continuously used over again. Also, some reusable items can be recycled once they cannot be used again.

### **How can I reuse materials?**

Materials can be reused in several ways. Water bottles can be used over again by washing them and refilling it. Glass containers can be washed out and used to hold other food or liquids. Clothes, furniture and other products can be reused at “second-hand stores” such as Salvation Army, Goodwill, and other Thrift Stores. Once materials are “unwanted” they can be donated to second-hand stores for other people to use.

### **What is recycling?**

Recycling turns materials that would otherwise become waste into valuable resources. Collecting used bottles, cans, and newspapers and taking them to the curb or to a collection facility can generate a host of financial, environmental, and social returns. The majority of materials can be recycled, but most things aren’t recycled because it’s not economically feasible to recycle them. If a material is difficult to recycle, it will be more expensive than new materials, and people won’t want to use it.

### **What are the benefits of recycling?**

Recycling also has many benefits. It reduces the need for putting materials into landfills and incinerating them. Recycling can also prevent pollution that is created from manufacturing products from new materials. It saves energy, decreases greenhouse gas emissions, conserves natural resources (such as timber, water, and minerals), and helps sustain the environment for future generations.

### **How can recycling be successful?**

Recycling includes collecting recyclable materials that would otherwise be considered waste, sorting and processing recyclables into raw materials such as fibers, manufacturing raw materials into new products, and purchasing recycled products. Collecting and processing secondary materials, manufacturing recycled-content products, and then buying recycled products creates a circle or loop that ensures the overall success and value of recycling.

### **What can be recycled?**

Different cities and counties have varying items that they recycle. Here is a list of items that are commonly recycled in San Luis Obispo County through San Luis Garbage Company: aluminum (cans, bread tins, pie tins and clean foil), cardboard (clean and dry), chipboard (clean cereal boxes, cracker boxes, pasta boxes, rice boxes), glass bottles and jars, greeting cards, grocery bags (plastic and paper bags), junk mail (unless it's coated with metal, plastic and/or vinyl), magazines, mixed paper (including wrapping paper and shredded paper), newspaper (wet or dry) office paper, plant containers, plastic bottles (numbers 1, 2, 3, 4, 5, & 7), PETE, HDPE, PVC (PVC used in piping materials is not recyclable), LDPE, PP, PS (only rigid clear bottles with a number 6 on them are recyclable; no Styrofoam), steel cans, tin cans, and telephone books. You can recycle yard and lawn clippings only if you have a special bin for "greenwaste." Greenwaste should not be put in the regular recycle bin with cans and bottles.

**Getting Ready:** All materials for the activities will be gathered. Before activities begin, counselors will ask questions about what they already know. This will be used to gauge the prior knowledge of campers and allow for more focused discussions on topics they don't know. These questions could include: Do you know what the "Three R's" are? Do you know what some benefits to reducing, reusing, and recycling are? Do you know what items can be recycled? How do you think you can use the "Three R's" in your everyday life? These questions will help establish where campers are coming from and will help to guide the lesson further.

### **Doing the Activity:**

#### **Part A: Reduce, Reuse, Recycle**

Counselors will go over background knowledge with campers so they can learn about the "Three R's": reducing, reusing, and recycling. They will learn what each of the Three R's are, and they can successfully be implemented. Campers will be able to answer the questions: how can you produce less waste, what is reducing, what are the benefits of reducing, what is reusing, what are the benefits of reusing, how can I reuse materials, what is recycling, what are the benefits of recycling, how can recycling be successful, and what can be recycled?

After campers are able to correctly answer these questions, they will create a poster showing all materials that can be recycled at camp. The poster will be hung in the dining hall for counselors and campers to use for correctly sorting items into recyclables and garbage.

#### **Part B: Crafts from Recyclables**

Campers will make a craft from recyclable items. Using cardboard tubes from both paper towels and toilet paper rolls, campers will create a cardboard-tube castle.

1. Paint the cardboard tubes with paints and let dry.
2. Draw windows on the tubes with a marker
3. Using scissors, notch the tops of several tubes to make them look like turrets. Set aside two tubes for the outside of the castle.

4. Glue the tubes together to make the castle. Slits can be made to interlock the castle.
5. Several half circles from construction paper can be cut to make roofs for the tubes.
6. One side of a long strip of construction can be notched to create a wall. A door can be cut out in front of the wall, which can be attached to the castle with glue.

Campers will also have an opportunity to make a strawberry mobile recyclable craft. The steps used to make this craft are as follows:

1. Paint walnuts red and let dry.
2. Glue a long piece of green yarn to the top of each strawberry for a hanger.
3. Cut five star shapes from green felt. Clip a small hole in the center of each one. String one down the yarn hanger of each strawberry and glue in place.
4. Tie one strawberry to the center and one to each corner of the inside of the berry basket. Make sure to leave four inches of yarn above each knot. Turn the berry basket upside down so the berries hang down. Gather all the top ends of yarn together and tie them in a knot to hang the mobile by.

**Additional Resources:**

- San Luis Obispo County Integrated Waste Management Authority. 2011. Residential Curbside Recycling. (15, May 2011; [www.iwma.com/helpdesk/resrecycle.html](http://www.iwma.com/helpdesk/resrecycle.html))
- [USEPA] U.S. Environmental Protection Agency. 2011d. Reduce, Reuse, Recycle. (10, April 2011; [www.epa.gov/epawaste/conservation/rrr/index.htm](http://www.epa.gov/epawaste/conservation/rrr/index.htm))
- Van Blaricom, Colleen. 1992. Crafts from Recyclables, Great Ideas from Throwaways. Boyds Mills Press.

## Appendix C: Solar Energy Lesson Plan

**Overview:** Campers will learn about how the sun can be utilized as a renewable energy resource. They will learn about the advantages and disadvantages to using solar energy. They will learn how to make two different types of solar ovens and use them to cook food.

**Objectives:** Campers will understand how solar energy works. They will learn about the advantages and disadvantages of this renewable energy resource. Campers will learn ways to utilize solar energy by creating solar ovens and cooking food by the sun.

**Levels:** 3<sup>rd</sup>-10<sup>th</sup> grade

**Materials:** Pizza boxes, aluminum foil, black construction paper, clear plastic, non-toxic glue, markers, tape, scissors, ruler, wooden dowel or straw, s'mores ingredients (marshmallows, graham crackers, and chocolate), hot dogs, Pringles cans with lids, bamboo skewers, sharpie, plastic wrap

**Time:** Preparation: 15 minutes; Activity: 1 hour

### Background:

#### What is solar energy?

Solar energy is the sun's rays (solar radiation) that reach the Earth. This energy can be converted into other forms of energy, such as heat and electricity. Solar energy is a renewable resource because it is continuously supplied to the earth by the sun.

#### What can it be used for?

Solar energy can be used for heat and electricity. It can heat water for use in homes, buildings, or swimming pools; heat spaces inside of homes, greenhouses, or other buildings; and heat liquids to high temperatures to operate a turbine to generate electricity.

#### How does it work?

Solar energy can be converted to electricity by photovoltaic cells, or concentrating solar power plants. Photovoltaic cells (also known as "solar cells") can change sunlight directly into electricity. Their cells are made of conductive materials and when sunlight hits them a chemical reaction occurs and causes the release of electricity. These cells can be grouped into panels and that can be used in a wide range of applications ranging from single small cells that charge calculator and watch batteries, to systems that power single homes, to large power plants covering many acres.

Concentrating Solar Power Plants generate electricity by using the heat from solar thermal collectors by concentrating the sun's rays with mirrors or other reflective devices. This is used to heat a fluid, which produces steam that powers generators.

### **What are the advantages?**

There are not very many negative environmental impacts of solar energy. This is because solar energy systems do not produce air pollutants or carbon dioxide in order to produce electricity. Also, photovoltaic systems do not need to use water in order in the process of creating electricity. Both types of solar energy does not release water and concentrating solar power do not produce any substantial amount of solid waste while creating electricity. When both types of the solar energy are located on buildings, they have minimal impact on the environment and solar energy installations do not usually damage the land they occupy. Also, solar resources are available everywhere in the United States, although some areas receive less sunlight than others (it depends on climate and season).

### **What are the disadvantages?**

Photovoltaic cells create small amounts of hazardous materials that must be handled properly to prevent risk to the environment or to people handling them. Solar-thermal technologies may use water resources if the liquid that is being heated to create steam is water. Concentrating solar power plants may require a significant amount of land for production if they are not located on buildings and they prevent the land from being used for other purposes, which can negatively impact wildlife habitat. Also, the amount of sunlight that arrives at the Earth's surface is not constant. It varies depending on location, time of day, time of year, and weather conditions. Because the sun does not deliver that much energy to any one place at any one time, a large surface area is required to collect the energy at a useful rate. Also, there is a high cost to build the solar cells, which is a disadvantage.

**Getting Ready:** Materials will be gathered together to prepare for the activity. Questions will be asked to campers in order to gauge their prior knowledge of the subject matter. These could include: Have you ever heard of solar energy? Do you know what solar energy is? Do you know where the energy comes from? Do you know how solar energy works? Have you ever seen solar panels before? These questions will help establish where campers are coming from and will help to guide the lesson further.

### **Doing the Activity:**

#### **Part A: Solar Ovens**

Campers will make two different types of solar ovens as a group and use them to cook food in them. They will make solar ovens out of pizza boxes and also out of Pringle's cans and cook s'mores and hot dogs within the solar ovens.

#### **How to Make A Pizza Box Oven**

1. Using markers and a ruler, campers will draw a one-inch border on all four sides of the top of the pizza box. They will cut along three sides, leaving the line along the back of the box uncut (Figure 1).

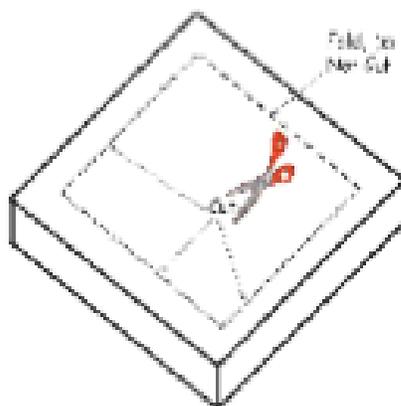


Figure 1. Pizza box with one-inch borders.

2. Campers will form a flap by gently folding back along the uncut line to form a crease (Figure 2). They will cut a piece of aluminum foil to fit on the inside of the flap (counselors can assist if needed). Wrinkles should be smoothed out and then foil can be glued into place.
3. Measure a piece of plastic to fit over the opening of the flap of the pizza box (Figure 2). The plastic should be cut larger than the opening so it can be taped to the underside of the box top and it should become a tightly sealed window so air cannot escape from the oven interior.

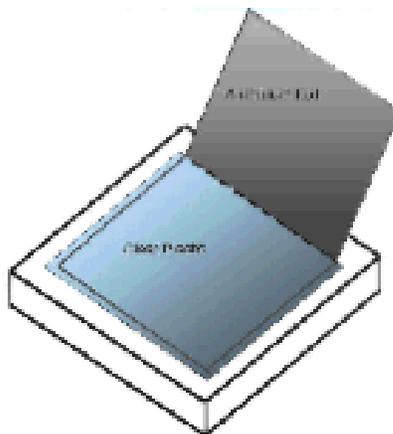


Figure 2. Pizza box with aluminum foil flap and plastic over opening.

4. Cut another piece of aluminum foil to line the bottom of the pizza box and carefully glue into place. Cover the aluminum foil with a piece of black construction paper and tape into place. (Figure 3).

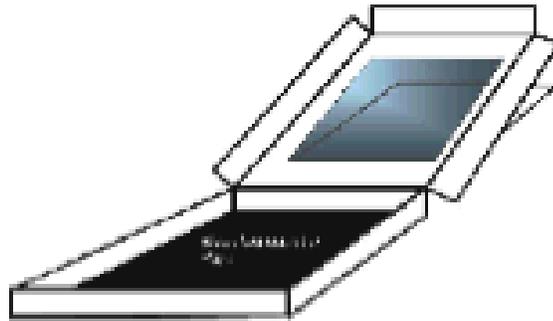


Figure 3. Pizza box with aluminum foil and black construction paper lining the bottom.

5. Close the pizza box top with the window, and prop open the flap with a wooden dowel, straw, or other device and face towards the sun (Figure 4). Adjust until the aluminum reflects the maximum sunlight through the window into the oven interior.

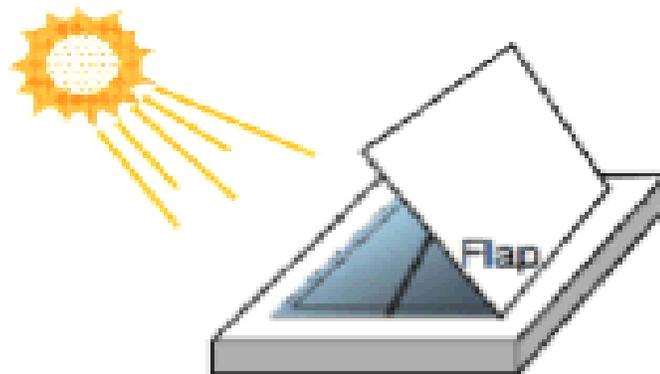


Figure 4. Pizza box closed and the top with window is propped open and facing towards the sun.

## Pringles Can Solar Cooker

1. Using scissors, campers will cut a line lengthwise down the Pringles can, about 1 inch from the top to 1 inch to the bottom.
2. Cut a vertical line across the top and bottom of the first slice about 1-2 inches on the ends of both sides of the first horizontal cut line.
3. Open both sides of the Pringles can out, making a window to the interior of the can.
4. Use scissors to create a hole in the center of the bottom of the can and the lid to create a hole for the bamboo skewer.
5. Insert the skewer into the holes at the top and bottom of the can and close the lid.
6. Write campers name on the lid
7. Place hotdog in center of the can. Pull out the skewer at one end and use it to pierce the hotdog (or marshmallow) and insert the other end into the can.
8. Cover Pringles Solar Cooker with plastic wrap.
9. Adjust the cooker to that the sun is directly on the reflectors and there is no shadow.
10. Cook hotdog (or marshmallow) in solar oven until it is cooked (around 30-45 minutes).

### Part B: Solar Renewable Energy

While food is cooking in the solar oven, campers will learn about solar energy. Counselors will go over the background information listed in the lesson plan with campers. Counselors will make sure that campers understand how solar energy works. They will be able to answer the questions: what is solar energy; what can it be used for; how does it work; what are the advantages and the disadvantages?

Once they understand everything about solar energy, counselors will check on the status of the solar cooked food in the pizza box and Pringles can solar ovens. When food is ready, campers and counselors can eat it.

### Additional Resources:

Moore, Cindy. 2011. American Camp Association volunteer. Outdoor Cooking. Lectured at ACA conference on 4/14/11.

Solar Now: Make a Solar Box Solar Oven 2011. (11, May 2011; [www.solarnow.org](http://www.solarnow.org))

U.S. Energy Information Administration. 2011. Energy Kids: Solar. (17, May 2011; [www.eia.doe.gov/kids/energy.cfm?page=solar\\_home-basics](http://www.eia.doe.gov/kids/energy.cfm?page=solar_home-basics))

[USEPA] U.S. Environmental Protection Agency. 2011b. Non-Hydroelectric Renewable Energy (9, May 2011; <http://www.epa.gov/cleanenergy/energy-and-you/affect/non-hydro.html#solar>)

## Appendix D: Wetlands Lesson Plan

**Overview:** Campers will learn about wetlands. They will understand what a wetland is, the different components that comprise them, and the many different functions they can serve in a community. They will learn about how to delineate wetlands and will dig soil pits.

**Objectives:** Campers will know what a wetland is, and the three components that are present in wetlands. They will know the functions and benefits of wetlands. They will get to use their new knowledge by digging two soil pits. They will be able to identify different soil textures and colors of the soil and determine if they are hydric soils. They will be able to determine if nearby plants are hydrophytic and whether the area is considered a wetland.

**Levels:** 3<sup>rd</sup>-10<sup>th</sup> grade

**Materials:** Shovel, yardstick, plant guide, local tree identification poster, soil texture guide, print out about soil colors

**Time Considerations:** Preparation: 15 minutes; Activity: 1 hour

### Background:

#### What is a wetland?

There are as many different definitions for wetlands used by wetlands scientists, managers, regulatory agencies, and landowners. Wetlands definitions generally consist of the following three components: hydric soils (soils that form in a wet environment), hydrophytic vegetation (water plants), and hydrology (water), which are defined more below. Wetlands are a place where water meets land and special plants grow in unique soil conditions.

#### Where are they found, and what types are there?

Wetlands are found worldwide on all continents except Antarctica. There are numerous types of wetlands, which can include both freshwater and saltwater. Some types of wetlands are freshwater and saltwater marshes, swamps, bogs, vernal pool, and mangroves. Marshes are usually in a low-lying area and have plants such as grasses, cattails, and rushes. Saltwater marshes are also known as estuaries and have salt adapted plants like pickleweed, salt grass, and eelgrass. Swamps are dominated by woody plants such as shrubs and trees, and are located near streams and rivers. A bog is a made of spongy ground with soil that has a lot of decayed material. Vernal pools are seasonal wetlands that only have water during parts of the year. Mangroves have mostly low trees that are growing in marshes or tidal shores, and have above ground roots.

#### Where does the water come from?

The water, or hydrology, of a wetland can come from rain, groundwater, the ocean, a river, or a lake. There are both primary and secondary indicators of water in a wetland.

Some primary indicators are visible surface water, and saturated soils (soil that is filled with water). Some secondary indicators are water stained leaves, plant adaptations and hydric soils.

### **What are hydric soils and how are they formed?**

For hydric soils to be formed, there need to be certain conditions, bacteria, and environment present. The hydric soils in wetlands are formed from anaerobic conditions (no oxygen exists). This creates a reducing environment, which helps to create hydric soils. There also needs to be anaerobic bacteria present in hydric soils. These bacteria need low or no oxygen for metabolic processes. A reducing environment is also needed for hydric soils. This occurs when no oxygen is present for chemical and biological processes. This causes elements (such as iron and magnesium) to release oxygen and gain a hydrogen ion.

Some identification of Hydric Soils are the color, permeability, texture, and smell. The color of hydric soils is usually gleyed (a grayish blue color). The soil permeability depends if it is an organic, or mineral soil. Organic hydric soils have high permeability with an impermeable or poorly permeable layer. Mineral hydric soils have poor permeability and can hold water at the surface. The texture of soil often consists of fine particles, silts and clays. The smell of hydric soil can be like a rotten egg (sulfurous).

### **What are hydrophytic plants?**

Wetlands also contain hydrophytic (water loving) plants. Hydrophytic plants need to adapt to anoxia (long periods of little or no oxygen), erosive conditions (exposure to moving water), and be able to withstand varying salinity levels in order to survive in a wet environment. In order to adapt to wetlands, plants have many strategies they use to survive. This includes adventitious roots (roots that develop above the water and helps transfer oxygen to the roots), pneumatophores, knees, oxidized rhizosphere, and aerenchyma. Plants can also adapt by having floating seeds, vivipary (seeds can germinate while attached to tree), having buttresses (thickening of a tree trunk to add stability), or rigid stems.

### **How do you determine if a place is a wetland?**

Wetland delineation is how the boundaries of a wetland are determined. This is done through digging a soil pit and analyzing the soils, plants, and hydrology of the area. There are several species of vegetation that can help to indicate wetlands. These include obligate wetland plants that are found >99% of the time in wetlands. Some of these plants include cattails, bulrush, and water sedge.

### **What are the functions and benefits of a wetland?**

Wetlands have many beneficial functions. They can help with flood control, coastal protection, groundwater recharge, sediment traps, filter pollutants, serve as nurseries, habitat, recreation, aesthetics, and have socioeconomic benefits such as producing food. Wetlands act as protective natural sponges by capturing, storing and slowly releasing water over a long period of time, thereby reducing the impact of floods.

Certain wetlands such as coastal marshes, mangrove swamps and other estuarine wetlands act as effective storm buffers. Wetland plants help to decrease erosion because their roots hold soil in place. Wetlands often contribute to ground water and can be important in recharging aquifers and are effective at trapping sediments in slow moving water. Wetland vegetation slows water velocity and particles settle out. The water that enters a wetland is filtered through substrate and wetland plants. They remove nutrients (such as Nitrogen and Phosphorous) and toxins. Wetlands provide nurseries for aquatic life like fish by providing a place for them to grow and a supply of food. Wetlands provide habitat for upland mammals such as deer and raccoons, wetland dependent species such as the salamander, waterfowl and habitat for endangered species. Around one third of all endangered species are dependent on wetlands and they provide sites for migratory birds. Wetlands also produce food (such as rice, shrimp, and cranberries) that is beneficial to humans.

### **Why should we care?**

Even though wetlands have many benefits, they are diminishing in numbers rapidly. Preliminary estimates suggest that throughout human history, about half of the world's wetlands have been lost. Wetland loss is the loss of wetland area as a result of human activity and occurs from the conversion of wetland to non-wetland habitats. The United States alone has lost more than half of its original wetlands, and we continue to lose over 100,000 wetland acres a year.

**Getting Ready:** Materials will be gathered together to prepare for the activity. In order to gauge prior knowledge of campers, counselors will ask questions about what they already know. These could include: Do you know what a wetland is? Have you ever been to one? What did it look like? What did you notice about it? What kinds of plants or animals did you see there? These questions will help establish where campers are coming from and will help to guide the lesson further.

### **Doing the Activity:**

#### **Part A: All About Wetlands**

Counselors will go through background knowledge of wetlands. They will make sure that campers understand what a wetland is, the different components that make up wetlands (soils, hydrology, and hydrophytic vegetation), and the many different functions they can serve in a community. They will learn what delineation is, and how wetlands are usually delineated. Counselors will make sure that they can answer the following questions: what is a wetland; where are they found, and what types are there; where does the water come from; what are hydric soils and how are they formed; how do you determine if a place is a wetland; what are the functions and benefits of a wetland; and why should we care?

**Part B: Dig a Soil Pit**

Campers will dig a soil pit along the creek in camp to learn about how wetlands are delineated. They will dig an upland pit and a wetland pit, and look at the difference in soil, hydrology, and vegetation.

Using a shovel, campers and supervising counselor will dig a soil pit 18-24 inches deep (or until water is reached in the soil) near the creek located on the camp property. They will look at the plants located nearby and identify them (to the best of their ability) with a plant identification book, and a local tree identification poster. Using a soil texture guide and print out of soil colors, campers will learn how to texture soil and figure out which type is present near the creek. They will learn about different horizons of soil and get to determine them in the pit. Campers will also dig a soil pit 18-24 inches deep (or until water is reached in the soil) upland of the creek. They will also look at the plants located nearby and identify them (to the best of their ability) with a plant identification book, and a local tree identification poster. They will texture the soil, figure out its color, and establish the different horizons inside of the pit. They will discover which soil texture is present upland of the creek, and compare the differences and similarities of the pits to one another.

**Additional Resources:**

Environmental Concern. 2011. Wetlands 101.

(14, May 2011; [www.wetland.org/education\\_kids101.htm](http://www.wetland.org/education_kids101.htm))

Keith, Trevor. 2011 Wetlands Ecology and Management. Spoke at Cal Poly State University on May 12, 2011.