An Environmental GPS Activity Developed for Earth Day 2009

Activity materials available at http://sciencespot.net/Pages/classgpslsn.html

Overview:

The Earth Quest activity challenges students to use GPS receivers to search the schoolyard to find a series of microcaches and complete challenges with an environmental theme. I have set up a total of 8 quests, each with a different theme. The goal of each quest is to raise student awareness of environment issues and provide ideas they can incorporate into their daily lives to help the environment. Each team starts with a different quest route and rotates through the quests until they have completed all eight.

Challenge Titles
#1 - Weighty Matter
#2 - Bottle Blast
#3- Water Wasteland
#4 - Energy Zone
#5 - Metals Madness
#6 - Globs of Glass
#7 - News Flash
#8 - Habitat Helpers

Materials Needed:
- GPS receivers (At least 1 for every group of 3-4 students)
- Copies of the Quest Challenge cards - Need one set for each team
- Copies of the Cache Cards - One set
- Film canisters to use as microcaches (22 total)
- 2 copies of the Earth Quest: Overview of Quests & Challenges - one for you; other to put inside the challenge containers for each coordinator
- Recycling bins (or large plastic totes) - Need 1 for each of the 8 challenges
- Signs for the challenge stations - Use to identify the location of the individual challenges
- Materials for each challenge - Refer to the "Overview of Microcaches & Challenges" on pages 4-17
- Large envelopes for each team - To hold completed Quest Cards - must be turned in at the end of the event.
- Calculators, pencils, and clipboards (optional) for each team

Preparation:

1 - Determine the boundaries of your search area (schoolyard, local park, or nature area) and then sketch a map of the location. Be sure to set specific boundaries and share these with your students, such as "Don't cross the highway" or "Stay in the schoolyard!" Use a GPS receiver to set up 30 waypoints in the search area and mark each location on the map you created.

> NOTES:
> 1- I set up the waypoints in advance and then load them onto the GPS receivers. This saves time for the students as they only need to calculate which waypoint they need and do not have to enter the coordinates. They only have to learn how to use the Find or GoTo feature and master navigating with the unit to find the caches.

Waypoints for Routes
Q1: 005 → 026 → 030 - Weighty Matter
Q2: 017 → 002 → 025 - Bottle Blast
Q3: 006 → 013 → 022 - Water Wasteland
Q4: 004 → 021 → 018 - Energy Concentration
Q5: 001 → 010 → 027 - Metal Madness
Q6: 008 → 019 → 028 - Globs of Glass
Q7: 012 → 014 → 024 - News Flash
Q8: 016 → 009 → 020 - Habitat Helpers

2 - Be sure to set up the waypoints #018, 020, 022, 024, 025, 027, 028, and 030 in areas where you will have plenty of room for the associated challenges. I set the other waypoints around the schoolyard in areas that I can see from one location to make it easy to keep an eye on the students and spot "lost" teams that need help getting back on the right track. Refer to my Earth Quest map to see how I set up the waypoints. It is available in the Earth Quest section at http://sciencespot.net/Pages/classgpslsn.html.

3- If you do not have GPS receivers, you can provide copies of a schoolyard   map that lists the locations of each microcache. They will need to use their   mapping skills to locate the caches to find the information they need to complete the quest.

2 - Print the Earth Quest Cache Cards and cut apart. Place each card in a film canister and then label the lids. I write the waypoint number on the top of the lid and then label the inside of the lid with the code (part 1-1, 3-2, etc.). This helps the students determine if they have found the correct cache or not and limits the time they spend searching endlessly for a cache.

Tips:
1 - Tape a clothespin to the side of the film canister to make it easy to clip it onto branches, signs, or other objects. You can also tie string around the canisters and secure with tape. I've also straighten out the bottom half of a paper clip, poked it through the lid, and then bent the inside end to keep it from coming out easily. Use the   other end as a hook to hang the cache in a tree, on a fence, or on the metal pole on a sign.

2 - Don't get too tricky with where you hide the caches - they should be visible at close range. I find that my students struggle with understanding that the GPS units will get you close - not right on top of it!

3 - Take a GPS unit along with you as you hide the caches. If you find that a waypoint is off by a good distance, you may want to remark that location or hide the cache in a spot that better matches the original waypoint.

3 - Gather the materials for each challenge as they are listed on pages 4-17. I put each set of materials into a recycling bin (or large plastic tote) along with the challenge information page and label each with a sign that tells the name of the challenge and its waypoint. Signs are available in the Earth Quest section at http://sciencespot.net/Pages/classgpslsn.html.

4 - Recruit 8 teachers, parents, or older students to coordinate each challenge. You may want to have them come 30 minutes before the event to go over the plans for the event, answer any questions they may have, and allow time for them to set up the challenge. Each coordinator needs to set up in the area where their waypoint is located. You may want to place the bins in the correct locations before they arrive to make sure they are in the right spot.

Note: Be sure to emphasize that the coordinator needs to check each team's Quest Card when the arrive for the challenge to be sure they are in the right location. If not, the team needs to backtrack and find their mistake.

5 - The chart below outlines the Quest Cards that need to be passed out after each challenge. Provide 7 copies of the correct Quest Card for each coordinator using the list in the table below to ensure that they will provide the correct Quest Card to each team after they have completed the challenge. For example, the coordinator of the Metal Madness challenge needs 7 copies of the Quest Card #6, since all but one team will be going to that one next. Team 6 started at Quest #6, so they will be finished as soon as they complete this challenge and turn in their worksheet.

Team	Weighty Matter	Bottle Blast	Water Wasteland	Energy Concentration	Metal Madness	Globs of Glass	News Flash	Habitat Helpers
1	Next → Q2	Next → Q3	Next → Q4	Next → Q5	Next → Q6	Next → Q7	Next → Q8	Final
2	Final	Next → Q3	Next → Q4	Next → Q5	Next → Q6	Next → Q7	Next → Q8	Next → Q1
3	Next → Q2	Final	Next → Q4	Next → Q5	Next → Q6	Next → Q7	Next → Q8	Next → Q1
4	Next → Q2	Next → Q3	Final	Next → Q5	Next → Q6	Next → Q7	Next → Q8	Next → Q1
5	Next → Q2	Next → Q3	Next → Q4	Final	Next → Q6	Next → Q7	Next → Q8	Next → Q1
6	Next → Q2	Next → Q3	Next → Q4	Next → Q5	Final	Next → Q7	Next → Q8	Next → Q1
7	Next → Q2	Next → Q3	Next → Q4	Next → Q5	Next → Q6	Final	Next → Q8	Next → Q1
8	Next → Q2	Next → Q3	Next → Q4	Next → Q5	Next → Q6	Next → Q7	Final	Next → Q1

6 - Prepare envelopes for each team labeled with their team number that contains a pencil, calculator, and a copy of the team worksheet along with the Quest Card that matches their team number. For example, Team 1 should receive Quest Card #1, Team 2 receives Quest Card #2, and so on. Teams should also keep all the Quest Cards in the envelope to turn in at the end of the event.

The list below shows the order in which each team should complete the quests and related challenges.

Team 1 → 1, 2, 3, 4, 5, 6, 7, 8	Team 5 → 5, 6, 7, 8, 1, 2, 3, 4
Team 2 → 2, 3, 4, 5, 6, 7, 8, 1	Team 6 → 6, 7, 8, 1, 2, 3, 4, 5
Team 3 → 3, 4, 5, 6, 7, 8, 1, 2	Team 7 →- 7, 8, 1, 2, 3, 4, 5, 6
Team 4 → 4, 5, 6, 7, 8, 1, 2, 3	Team 8 → 8, 1, 2, 3, 4, 5, 6, 7

7 - At the start of the event, I divide students into teams of 3-4 students (no more than 8 teams). Since I have 16 GPS eTex Legend units, I am able to provide two units for each team. I use the "Earth Quest" PowerPoint presentation - available at http://sciencespot.net/Pages/classgpslsn.html - to introduce the event, introduce students to common geocaching terms, and go over the rules.

Note: Be sure students understand that they must leave the microcaches exactly where they found them with the cache cards hidden inside. They also need to write answers on their worksheets and not on the Quest Cards.

8 - Plan at least 3 hours for your event. You'll spend 20-30 minutes going over the information and reviewing how to use the GPS units before the kids start their quests. Each quest (microcaches and the related challenge) is designed to take approximately 10-15 minutes to complete.

9 - If you want to award prizes, you will need to rank the teams based on their scores for each challenge as well as their overall time. I assign each team a rank from 1 point for 1st place to 8 points for last place on each challenge. If a team did not complete the challenge, they earn a rank of 9 points. I add their ranks for all 8 challenges to their overall time in minutes (rounded to the nearest minute) and then sort the teams from the lowest score to the highest. The team with the lowest score earns 1st place, second lowest earns 2nd place, and so on. In the case of a tie, I use the fastest overall time.

Note: An excel file for organizing your team scores is available in the Earth Quest section on my "Learning with GPS" page located at http://sciencespot.net/Pages/classgpslsn.html.

Overview of Quests & Challenges

#1-1 **Earth starts with the letter "E". If "A" is 1 and "Z" is 26, which number is "E" in the alphabet? Use this number as your first waypoint!**

Waypoint #005

Question: What percentage of our trash is recycled?

Answer: 31%

#1-2 **Subtract 5 from your answer for #1 to determine your next waypoint.**

Waypoint #026

Question: The average person discards 7.5 pounds of garbage every day. How much trash does one of you throw away in two days?

Answer: 15

Challenge: Double your answer from #2 and use it as your final waypoint to find the challenge you need to complete.

Waypoint #030

Challenge A: A Weighty Matter   **Need Quest #1 completed to compete**

Goal: Fill a cloth grocery bag with enough materials to equal the amount of trash each person generates in 2 days, which should be close to 15 pounds (the answer for #1-2.)

Materials:
Cloth grocery bag
Cans of food, boxes of cereal, water bottles, soda cans, box of rice, spices, etc. (Need at least 20 pounds worth)
Scale (such as those used to weigh fish)

Directions:
(1) If the team is at the correct station, have the group members sit down on a bench and then give the team a cloth grocery bag. Tell the team that they need to fill the bag with enough food item to equal the amount of trash one person generates in two days. (15 pounds)

(2) When they think they have enough, the bag will be weighed and you will tell them if they are over or under the required amount. They will not be allowed to see the scale!

(3) Allow time for the group to add or remove items and then weigh the bag again. Teams should be able to get the weight between 14-16 pounds. Keep track of the number of attempts they made!

(4) Once they have successfully completed the challenge, have them return their food items to the bin and return the grocery bag to you.

(5) Ask the team how they could reduce the amount of trash they generate. After they give you a good answer (see below), record the number of attempts it took to get the correct weight, initial their card, and give them the next card.
  Possible Answers: *Buy in bulk to reduce packaging, recycle what you can, or reuse containers for other things*

#2-1   **The first Earth Day was held on April 22, 1970. Add the digits in the year for your first waypoint.**

Waypoint #017 (1 + 9 + 7 + 0)

Question: Plastic bottles come in many forms. Use the chart provided to identify the type of plastic used to make the water bottles. How many <u>vowels</u> are in the <u>abbreviation</u> for this type of plastic?

Answer: 2 (P<u>E</u>T<u>E</u> - 2 vowels)

#2-2   **Use your answer from #1 as your next waypoint.**

Waypoint #002

Question: The energy saved by recycling one plastic bottle rather than make a new one from scratch is enough to power a single 60-watt bulb for six hours. How many hours could we light a the bulb if we recycled 100 bottles?

Answer: 600 hours (100 x 6)

Challenge: How many <u>days</u> would your answer to #2 equal? Use your answer for your final waypoint to find the challenge you need to complete.

Waypoint #025 (600 ÷ 24)

Challenge B: Bottle Blast   <mark>Need Quest #2 completed to compete</mark>

Goal: Teams must "recycle" or toss five bottles of water - one from each location - into the recycling bin in order to complete this challenge.
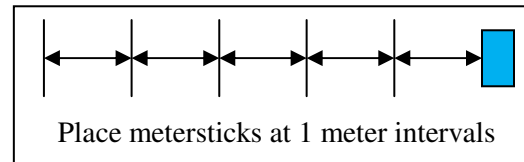
Materials:
Recycling bin
Water bottles (Have spares on hand in case some break open)
Meter sticks - Placed 1 meter apart as shown in diagram at right
        (Or you could also use chalk to mark lines on a sidewalk)
Timer

Place metersticks at 1 meter intervals

Directions:
(1) If the team is at the correct station, tell the group that they will need to "recycle" or toss five bottles of water - one from each location - into the recycling bin in order to complete this challenge. They may have one person do the challenge or they can all take turns. Bottles must remain in the bin to count as "recycled".

(2) Have one person from the group stand behind the meterstick (feet must remain behind the stick) closest to the recycling bin and toss the bottle until they get it to stay in the bin.   If it misses or bounces out, the person must retrieve it and return to the line for another try.

 (3) For the second bottle, another person must attempt to "recycle" a bottle from behind the second meterstick. Once they are successful, the person needs to move to the third and so on until the group has recycled all 5 bottles.   Every team member must recycle at least one bottle!

 (4) Ask the team, "How long could we light an incandescent light-bulb with these energy saved by recycling 5 plastic bottles?"   ***Answer: 30 hours (5 x 6 hours)***

 (5) Stop the timer once they have successfully answered the question and then record their time, initial their worksheet, and give them the next card.

#3-1   **How many DAYS are in April, the month in which Earth Day is celebrated each year? Divide this number by 5 and use the result as your first waypoint.**

Waypoint #006 (30 ÷ 5)

Question: #3-1- The average person in America uses up to 170 gallons of water each day. If we were able to reduce our water usage by 50%, how much water would a person save in 1 day?

Answer: 85 gallons

#3-2   **Add the digits in your answer to #1 and use the sum as your next waypoint.**

Waypoint #013 (8 + 5)

Question: It takes approximately 6 gallons of water to flush a regular toilet. If each family were to flush one time less each day, how much water would the family save in a week?

Answer: 42 gallons

Challenge: Subtract 20 from your answer to #2. Use this number as your final waypoint to find the challenge you need to complete.

Waypoint # 022 (42 -20)

Challenge C: Water Wasteland   <mark>Need Quest #3 completed to compete</mark>

Goal: Teams must fill a gallon milk jug to represent the amount of water that is wasted when we leave the water running when we brush our teeth one time.

Materials:
Bucket of water (rainwater preferably)
Milk jug (1 gallon size)
Plastic cups (8 - 12 ounces)
Timer

> Water Tip: If you have kid pools available or large tubs, place them under the bucket and the jug. After each team completes the challenge, pour the water back into the bucket.   When everyone is done, pour the water on nearby plants or a tree that you have just planted for Earth Day!

Directions:
(1) If the team is at the correct station, tell the group that they will need fill a gallon milk jug with water to represent the amount of water we waste when we leave the water running while we brush our teeth one time.

(2) Give each group member a plastic cup and then say "Go" to start the race. Team members must run to the water bucket, bring water back to pour into the jug, and pour it into the jug.

(3) Once they have filled the jug to the line, ask them the question below.
      If we brush our teeth <u>three times per day</u>, how many gallons of water could we save in <u>one week</u> if we turn
      off the water every time we brush our teeth?   *Answer: 21 gallons*

(4) Stop the timer once they have successfully answered the question and then record their time, initial their worksheet, and give them the next card.

#4-1 **If you were to write the date of Earth Day in numerical form, what NUMBER would you use for the MONTH of April? Use this number as your first waypoint.**

Waypoint #004

Question: Renewable energy comes in many forms. Use the diagram to answer the question. What type of renewable energy comes from <u>trees</u> and other <u>plants</u>?

Answer: Biomass

**#4-2** **Triple the number of letters in your answer to #1 and use the answer as your next waypoint.**

Waypoint #021

Question: A compact fluorescent light bulb (CFL) will save about $30 over its lifetime and pay for itself in about 6 months. It uses 75 percent less energy and lasts about 10 times longer than an incandescent bulb. How much money could you save by replacing <u>6 regular light bulbs</u> in your home with CFLs?

Answer: $180

Challenge: **Use the first two digits of your answer to #2 as your final waypoint to find the challenge you need to complete.**

Waypoint #018

http://www.eia.doe.gov/kids/energyfacts/sources/whatsenergy.html

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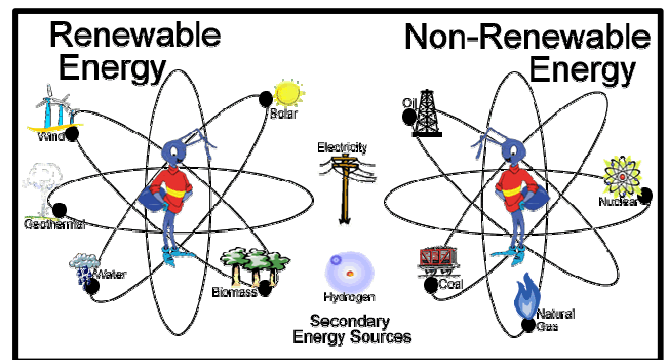
Challenge D: Energy Concentration   <mark>Need Quest #4 completed to compete</mark>

Goal: Team must search through plastic eggs to successfully match five pictures of renewable energy sources with their name.

Materials:
Plastic Eggs - Total of 18 eggs
Pictures of energy sources (next page)
Timer

Preparation:
(1) Cut apart and place one card in each egg . You may want to use tape to secure the card inside one half of the egg.
(2) Scatter the eggs in a small area.

Directions:
(1) If the team is at the correct station, tell the group that they will need find matching pictures of <u>five renewable</u> energy sources, similar to a game of "Concentration."
> Note: Let them know that some of the pictures show nonrenewable resources and those will not count! However, they may want to remove them from the playing area when they find a match to make it easier to find the ones they need.

 (2) Group members can only have <u>two eggs open at one time</u>. If the pictures match, they get to keep those eggs. If not, the eggs must be put back together and placed <u>back in the same spots</u> before they attempt another match.
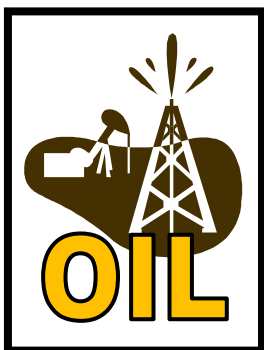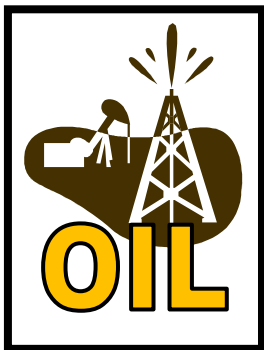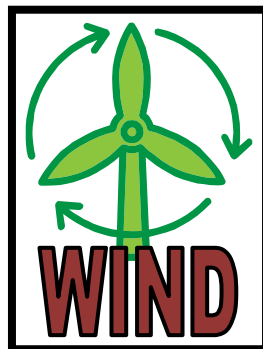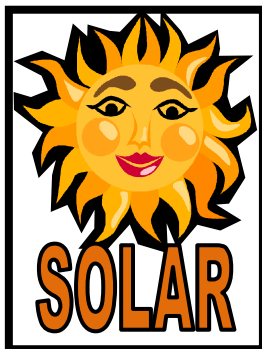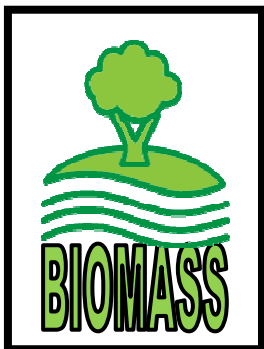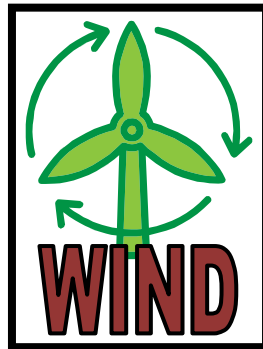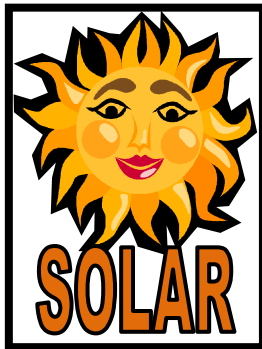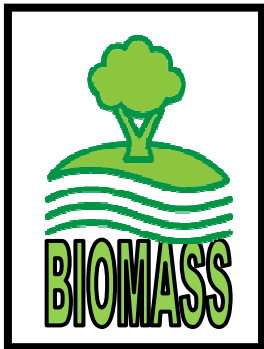
 (3) Once the groups have matched all 5 of the renewable energy pictures, ask them to list the five types of renewable energy alphabetically.   ***Answer: Biomass, Geothermal, Solar (Sun), Water, and Wind***

 (4) Stop the timer once they have successfully answered the question. Have the team replace the eggs in the correct area, record their time, initial their worksheet, and give them the next card.

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Cut apart the cards and place in plastic eggs. Spread the eggs out in an area of the yard or floor.

BIOMASS	WATER	SOLAR	WIND	GEOTHERMAL
BIOMASS	WATER	SOLAR	WIND	GEOTHERMAL
OIL	COAL	GAS	NUCLEAR	
OIL	COAL	GAS	NUCLEAR	

#5-1 **How many YEARS are equal to 12 months? Use the answer as your first waypoint.**

Waypoint # 001

Question: Recycling one aluminum can saves enough energy to run a 100-watt bulb for 20 hours, a computer for 3 hours, or a TV for 2 hours. How many cans would you need to recycle to watch 20 hours of SpongeBob cartoons?

Answer: 10 cans

#5-2 **Use your answer to #1 as your next waypoint.**

Waypoint #010

Question: On average a little more than 9,000 steel cans are removed from landfills with a magnet every minute. Based on this rate, how many steel cans are removed in one hour (60 min)?

Answer: 540,000 cans

Challenge: Divide the first two digits in your answer to #2 by 2 and use the result as your final waypoint to find the challenge you need to complete.

Waypoint # 027

Challenge E: Metal Madness   <mark>**Need Quest #5 completed to compete**</mark>

Goal: Team must search through trash bags to find 10 cans (equal to their answer in #5-1) and place them in the recycling bin.

Materials:
Aluminum cans (Empty)
Newspaper & other "trash"
Trash bags - 2 + extras to replace torn bags
Blindfolds - 2 total
Recycling bin
Timer

Preparation:
(1) Wad up newspaper and stuff into 2 garbage bags. You may also want to include empty cereal boxes or other containers that could be used to hide the cans.
(2) Hide 10 empty aluminum cans inside the two bags.

Directions:
(1) If the team is at the correct station, tell the group that two team members will put on blindfolds and then search through the two trash bags to find a total of 10 aluminum cans. The other team members will be the "recyclers' and take the found cans to the recycling bin. Teams must leave the trash in the bags and cannot dump it out to speed up the searching. Recyclers are not allowed to help in any way other than to tell the blindfolded person where to find a can.

 (2) Once the team has recycled all 10 cans, ask them the question below.

   If teens spend an average of 40 hours watching TV per week, how many cans would need to be recycled to provide the energy for the TV for this amount of time?   *Answer: 20 cans (40 ÷ 2)*
   Hint: They needed 10 cans to watch 20 hours of SpongeBob!

(3) Stop the timer once they have successfully answered the question. Have the team replace the cans in the trash bags, record their time, initial their worksheet, and give them the next card.

#6-1 **How many letters are in the phrase "Earth Day"? Use this number as your first waypoint.**

Waypoint #008

Question: Glass containers are 100% recyclable and can be recycled endlessly. By recycling just 10 glass containers, we can save enough energy to operate a computer for 200 minutes or a TV for 130 minutes.   Based on this rate, how long could we power a computer by recycling just one glass jar?

Answer: 20 minutes (200 ÷ 10)

#6-2 **Subtract one from your answer to #1 and use the result as your next waypoint.**

Waypoint #019

Question: Every ton of glass that is recycled results in one ton of raw materials saved to process new glass, including: **1,300 pounds of sand, 410 pounds of soda ash and 380 pounds of limestone. Silicon is an element in sand. What is it's atomic number?**

Answer: 14

Challenge: Multiply your answer to #2 by two and use the result as your final waypoint to find the challenge you need to complete.

Waypoint #028 (14 x 2)

Challenge F: Globs of Glass   **Need Quest #6 completed to compete**

Goal: Team must use a plastic spoon to transport marbles to a glass container without touching the marbles with their fingers, feet, or other body part!

Materials:
Glass marbles on a cookie sheet - Enough to fill the glass jar + extras
2 small beakers or glass jars (8-12 ounce size)
Plastic spoons - Enough for each team member and extras for replacements
Timer

> TIP: Place the marbles and glass jar at least 4 meters apart.

Directions:
(1) If the team is at the correct station, tell the group that each person will use one spoon to transport glass marbles from the container to the glass jar. They will need to fill the jar with enough marbles to fill the container (at least one marble sitting above the rim of the jar).

> NOTE: They are not allowed to touch the marbles with their fingers, feet, or other body part and cannot cover the spoon with their hand when they are transporting marbles.

(2) Ask the team the following question, "What is the chemical symbol for Silicon?". If they answer correctly, they will need to fill only one of the beakers. If they are incorrect, they must fill both beakers.

(3) Stop the timer once they have successfully completed the challenge. Have the team return the marbles to the cookie sheet, record their time, initial their worksheet, and give them the next card.

#7-1   How many MONTHS are in one YEAR? Use this number as your first waypoint.

Waypoint #012

Question: Recycling approximately 1 ton of newspaper saves 17 trees. How many tons of newspaper would need to be recycled to save 200 trees? (Round to nearest whole number.)

Answer: 12 (200 ÷ 17 = 11.8 or 12)

#7-2   Add 2 to your answer to #1 and use it as your next waypoint.

Waypoint #014

Question: The average American uses 7 trees a year in paper, wood, and other products made from trees. How many trees will you have used from the time you were born to the age of 16?

Answer: 112 trees

Challenge: Multiply the <u>sum of the digits</u> in your answer to #2 by <u>6</u>. Use this number as your final waypoint to find the challenge you need to complete.

Waypoint #024 (1+1+ 2 = 4 →4 x 6)

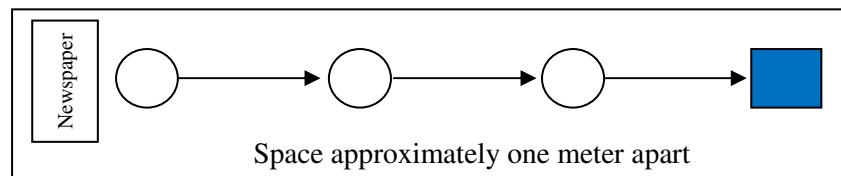| **Challenge G: News Flash** | <mark>**Need Quest #7 completed to compete**</mark> |

Goal: Team must "recycle" 17 wads of newspaper to represent the number of trees we save by recycling 1 ton of newspaper.

Materials:
Newspaper
Recycling bin
Hula hoops (or rope)
Clear trash bag
Timer

Space approximately one meter apart

Directions:
(1) If the team is at the correct station, tell the group that must "recycle" 17 wads of newspaper to represent the number of trees we save by recycling 1 ton of newspaper.

Rules:
1. Team members must stand in separate hula hoops (or ropes created by circles) and cannot leave the area to retrieve a wad of paper. They may reach for a wad of paper as long as both feet stay inside the circle. If a wad is too thrown too far away, they will have to start over.
2. The person closest to the newspaper pile will wad up one sheet and toss it to the second person. The second person   tosses it to the third person, who must toss it into the recycling bin.
Note: If there are 4 people on the team, have the extra person rotate in after every 3 points.

 (2) Stop the time once they have successfully completed the challenge, have them pick up the newspaper wads and put them in a clear trash bag or other container so it can be recycled. Record their time, initial their worksheet, and give them the next card.

#8-1   Subtract 6 from the <u>DAY of the MONTH</u> on which Earth Day is held to find your first waypoint.

Waypoint #016

Question: One in four mammals, one in eight birds, and one-third of all amphibians appear on the Red List of endangered species and may become extinct in the next 50 years. If there are an estimated 4500 species of mammals, how many face extinction in the next 50 years?

Answer: 1125

#8-2   Add the digits in your answer to #1 and use the sum as your next waypoint.

Waypoint #009

Question: Bald eagles and other raptors have made a great comeback after the banning of DDT in the early 1970s and efforts to protect them and their habitats. Use the chart to answer the question. How much has the number of breeding pairs of bald eagles increased in the US from 1986 to 2006?

Answer: 7914 (9789 - 1875)

Challenge: How many YEARS are between the DATES you compared in #2? Use this number as your final waypoint to find the challenge you need to complete.

Waypoint #020 (2006 - 1986)

Challenge H: Habitat Helpers   **Need Quest #8 completed to compete**

Goal: Team must ensure that their frogs stay safe in a habitat area and not encounter any dangers that could kill them.

Materials:
Frogs - Set of 10 plastic frogs
Habitat area* - Created on a twin-sized sheet or area of sidewalk
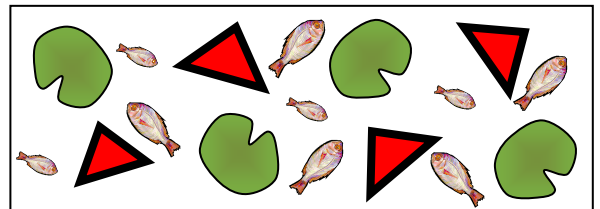Timer

Directions:
(1) If the team is at the correct station, tell the group that must help their frogs stay safe in the habitat area and avoid dangers. For the frog to survive, it must land at least halfway on a lily pad.

Rules:
1. Frogs must land on a lily pad to count as safe. At least half of the frog must be on the lily pad - touching the edge does not count as safe!
2. Frogs that do not land on a lily pad are considered "dead" and teams must try again.
3. Students must stay outside of boundary areas when they toss the frogs.
4. Team members must take turns tossing the frogs. <u>Each team member must keep a frog alive before the next person can try</u>.
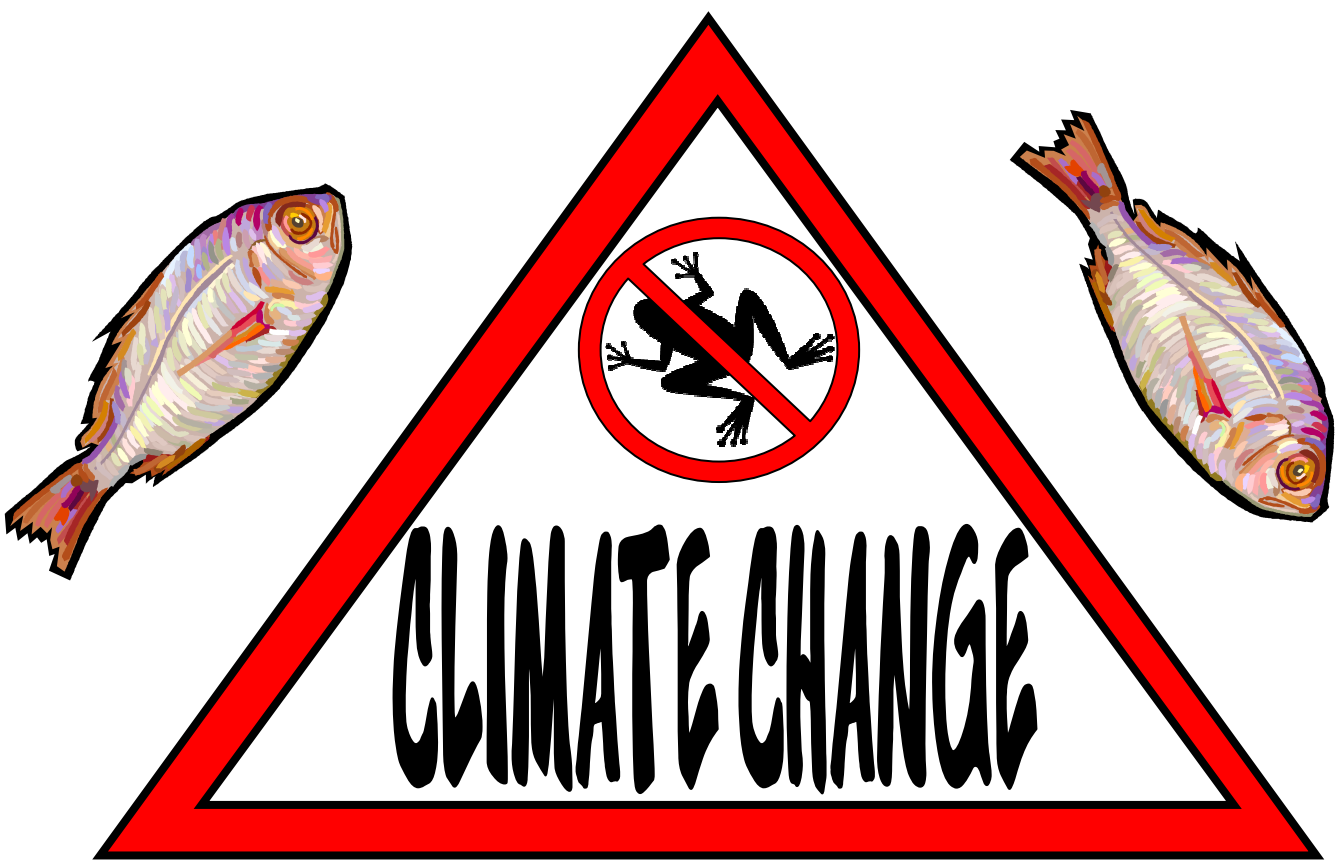
(2) Stop the timer once they have successfully completed the challenge, discuss the various dangers in the habitat area and ask for examples of each. Have them return the frogs to you, record their time, initial their worksheet, and give them the next card.

*Habitat Area: Print the danger signs, fish, and lily pads (on the following pages) on t-shirt transfer paper and iron onto a twin-sized sheet to create a "pond" habitat. You may also use paint to decorate the sheet or use chalk to make a habitat area in a parking lot or on a sidewalk. You will also need establish a one meter boundary around the area that students need to stay behind when they are tossing frogs..

POLLUTION

DISEASE

PREDATORS

HUMANS

INVASIVE SPECIES

CLIMATE CHANGE