

# Lesson Plan: Where the Waste Goes Part 1

Understanding Trash on Guam (Part 1 of 2)

**Subjects:** Earth Science, Ecology, Biology,  
Environmental Science, Marine Biology

**Grade-level:** Elementary [3-5], Middle [6-8], High [9-12]

**Time required:** 50 minute for 3 or more days\*

**Materials required:** Paper, pencil, internet, household trash

\*(Additional time is required for homework assignments and assessment tools.)

## Description

In this lesson students will conduct an investigation of their own trash consumption and become aware of how improperly handled trash impacts the environment.

## Emphasis

Building conceptual knowledge regarding where our waste goes once it is disposed of. In addition, students will comprehend the difference between types of trash (biodegradable vs. non-biodegradable) and their affect the environment.

## Objectives/Skills

- Students will be able to define biodegradable and non-biodegradable waste.
- Students will be able to identify types of biodegradable and non-biodegradable trash.
- Students will understand the basic chemistry/biology of how materials biodegrade (or don't!).
- Students will understand how recycling may off set the overall trash production in their household, community, island, and the world.
- Students will comprehend the process of trash disposal, from your house to the landfill.
- Students will discuss how they will change their current practices to ameliorate their own 'trash' situation.
- Students will develop a mini-PR campaign promoting the advantages of recycling in our communities.

## Questions or Assessment

- The "Good Litter Survey" – functions like a pre- and post-test. (Example provided below)
- Take Home Assignments – in response to videos shown in class.

## Day 1: Assessing Prior 'Trash' Knowledge

### Teacher Notes

Resist any urges you have to tell them where the items belong! This is a pre-activity that will be revisited after the students have gained instructional knowledge regarding proper waste disposal.

### *Pre-activity*

Hand out the "Good Litter Survey" (GLS). Ask students to cut out all the potential sources of debris we generate in our daily lives. Students can fill in any they think of that aren't listed. Once the 'debris items' are cut out, ask the students to organize them in the table according to where they think they belong. Tape or staple the items in the 'appropriate' category.

Make sure students put their names on their table (somewhere, anywhere, doesn't have to be on the front) and save them for later discussion. You can even display them around the room.

### *Background Information*

As we all know, there is a significant 'trash problem' here on Guam, whether one is referring to the fact that our dump is overflowing and costing the government millions of dollars to remedy, or that our roadways, beaches, oceans, public and private property trash are littered with trash.

## Goals

- Educate our youth that we can address this problem and clean up our island for good.
- Develop a scientific understanding of the processes surrounding the disposal of our trash.
- Develop comprehension that improperly disposed of trash negatively affects our livelihood (the watersheds, our reefs and fishing industries, and the tourism industry).

### **Biodegradable vs. non-biodegradable**

Refer to websites listed below for more information about biodegradable vs. non-biodegradable resources.

In the simplest terms “**biodegradable**” means a material that is able to degrade or break down. Examples of biodegradable materials are apple cores, bones, paper, flowers, serving utensils and plates made of corn products.

“**Non-biodegradable**” refers to materials that are not broken down by organisms. Examples of non-biodegradable materials are plastic, glass, polyester clothing items, and aluminum cans.

Something is biodegradable when little tiny microorganisms in the earth can break the object apart and turn it into soil. It looks like the thing disappears, but it just becomes part of the soil.

Things that are biodegradable are often made of organic materials, or things naturally occurring in our environment, not those synthetically produced in a lab. For instance, a banana peel is biodegradable and will take approximately 3 days to degrade, but a plastic bottle will take hundreds of years!

Take a disposable diaper for example... how many years do you think it takes for a disposable diaper to biodegrade?

Answer: 500-600 YEARS!

## Day 2 (or homework): Investigating Decomposition Rates

### **Activity**

Have students guess how long it takes for the following items to degrade in the environment (days, weeks, months, years). The class can investigate how long it ACTUALLY takes for things to degrade or it can be assigned as a homework assignment. (*Some helpful links provided below*). It may be difficult to find the exact time for certain items, like a folding chair. In this instance, estimate the actual time based on the parts of the item, the cloth and the metal frame.

### **Examples of How Fast/Slow Materials Biodegrade:**

- Green Eco Services: [How Long Does It Take For Trash To Biodegrade](#)
- [Biodegradable And Non-biodegradable Materials](#)

Below is a discussion of scientific experiment that attempts detailing how decomposing plastics have a negative affect the ocean environments. Previously thought to just be an unsightly source of pollution, a Japanese group has demonstrated that the plastics in plastic shopping bags release harmful chemicals into the water. Its direct effect on marine organisms is currently unknown:

Scientists are trying to come up with biodegradability formulas that can tell us how long it will take a material to biodegrade using the known chemical composition, and the impact on the environment of those chemicals.

### Challenge Questions

1. Were your estimates close to the actual time taken for some items to degrade?
2. What most surprised you about the results?

## Day 3: Learning About the Great Pacific Garbage Patch

How did we get here? At some point in our history, we used only things that we could find in our natural environment. As we have evolved, our needs have demanded the production of materials that are durable and weather-resistant. This leaves us with many products that take hundreds or thousands (!) of years to biodegrade. The following assignment aims to help students realize how much trash they are producing and the ratio of biodegradable to non-biodegradable materials that are consumed in their daily lives. This is a good opportunity for the teacher to model this assignment to see if their consumption differs from their student body.

### **Background Information**

Just to the north of Guam, there is a region of the world known as [The Great Pacific Garbage Patch](#), or the North Pacific Gyre, an area of the ocean where marine debris has conjugated due to the ocean's currents. This area located at 135° to 155° W and 35 ° to 42°N contains a high density of plastics and other debris, estimated to be TWICE THE SIZE OF TEXAS!

## Videos on The Great Pacific Garbage Patch:

- YouTube: [The Garbage Patch](#)
- Metacafe video for kids: [The Great Pacific Garbage Patch](#)

How plentiful is plankton in our world's oceans? VERY. It is the primary source of food for the organisms living in the ocean. In these videos, the scientists report that in some samples of water from The Patch, there were 6X more plastics than plankton!

## Challenge Questions

1. If there are 6,384 pieces of plastic debris in one liter of sea water collected from The Garbage Patch, how many plankton were in the sample?
2. Do scientists believe that the volume of plastics in The Garbage Patch can be reduced?
3. Do you believe that Guam's waters contribute plastic to The Garbage Patch? What about the trash on our roadsides and rivers? Why?
4. Given the following statement: The debris that ends up in the oceans surrounding Guam contributes to volume of debris found in The Garbage Patch. As a scientist, how would solve this problem locally, here on Guam?

## Day 4-6: Assessing My Trash Production

### Assignment

#### *In class*

Fold a piece of 8.5 x 11 paper in half, label one column Biodegradable, the other Non-Biodegradable.

#### *Take Home*

Have students record the items that they use in their daily lives over a give period of time (day, week, etc) and return to class with the following questions answered. As an added bonus, and for use in future experiments (The Dump, part 2 of 4) have students collect all their consumables and bring them to class.

Answer the following questions based on your assessment of the items you use in your daily lives. For questions that ask for your opinion (do you feel?), detailed complete sentences are required:

1. What do you consume more of biodegradable or non-biodegradable items?
2. Estimate how many pounds of trash do you produce in one day (weigh the bag of trash or each item, finger scales used for fishing can be helpful in this exercise). What about one week? A month? A year?
3. Look at the non-biodegradable items you consumed in a day. How many of those items can you reuse? How many of those items do you actually reuse? How many items do you 'throw away'?
4. If you went back in time on Guam to 1925, and did the same project with a young student your age, what do you think the answers to questions would be? How would their 'trash' differ from yours?
5. What percentage of the materials are you able to recycle? What percentage of the materials consumed did or will you recycle?
6. What does it mean to be sustainable? You can use the internet to formulate your own answer, consult this website:
  - J500 Media And The Environment: [What Does Sustainable Mean? Does It Mean Anything Or Everything?](#)
  - You may also use the definition your teacher gave you. Do you think that they way you live is sustainable? Could your lifestyle be more sustainable? How?
7. Do you feel recycling is important? State why or why not.
8. Do you think recycling could be improved on Guam? State why or why not.
9. Create a media project displaying how people in your community can become more sustainable. This could include making a pamphlet for distribution to patrons at the grocery store, a poster for display in the mall or Agana Shopping Center, a letter to the editor of the PDN, or a letter to Tammy Jo Anderson (tammyjo.anderson@gmail.com) for inclusion in her weekly insert in the PDN.

## Challenge Questions

1. What are the advantages and disadvantages of biodegradable materials?
2. What are the advantages and disadvantages of non-biodegradable materials?
3. What non-biodegradable items could you live without in your life?
4. What non-biodegradable items that you use could be replaced with biodegradable ones?

***Activity***

Considering what has been taught so far have students organize the following items in ascending order according to the time it will take them biodegrade.

Apple core, soy sauce bottle, picture frame, chicken bone, water bottle, soda can, tree branch, lamp shade, cracker tin, Doritos bag, diaper, sewing machine, rotten fruit.

***Post-activity***

Hand out a new copy of Good Litter Survey (GLS). Ask students to cut out all the potential sources of debris we generate in our daily lives. Students can fill in any they think of that aren't listed. Once the 'debris items' are cut out, ask the students to organize them in the table according to where they think they belong. Make sure the students put their name on their table (somewhere, anywhere, doesn't have to be on the front). Have the students compare their post-GLS to their pre-GLS.

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Item	Time <u>Thought</u> to Degrade	Time <u>Actually</u> Taken To Degrade
Bones		
Styrofoam plate		
Apple		
Plastic Cup		
Newspaper		
CDs		
Sky Cracker Tin		
Doritos Bag		
Dead Animal		
Aluminum Can		
Diaper		
Plastic Shopping Bag		
Tomato		
Folding Chair		
Plastic Bottle Cap		
Cigarette Butt		
Battery		

GLASS  
BOTTLES

CIGARETTE  
BUTTS

PLASTIC  
UTENSIL

CANS

FRUIT

FISHING  
LINE

DIAPERS

STYROFOAM

PAPER

BONES &  
MEAT

FOOD  
WRAPPER

BROKEN  
GLASS

CHIP  
BAGS

DOGGY  
POO

**UNACCEPTABLE TYPES OF LITTER**  
(THINGS YOU DO NOT WANT TO  
THROW ON THE GROUND)

**ACCEPTABLE TYPES OF LITTER**  
(THINGS YOU THINK ARE OK TO  
THROW ON THE GROUND)

**TYPES OF TRASH**