

## *Lesson 1:* **Trash: It Lasts a Long Time!**

### **At a Glance:**

Students complete a worksheet while participating in a class discussion about Tucson's Los Reales landfill and the practices of municipal solid waste management utilized in town. In the activity section of this lesson, students work in small groups to estimate and come to consensus agreement on the length of time it takes specific materials to decompose in a landfill. After considering the alternatives to current waste disposal methods such as reducing, reusing and recycling, students describe their concluding thoughts about waste management practices in our community.

### **Arizona Department of Education Academic Standards:**

Please refer to the Arizona Department of Education Academic Standards section for the ADE standards addressed by this lesson.

### **Learning Objectives:**

Students will be able to:

- ☛ understand the limitations of sending municipal waste to a landfill
- ☛ formulate their best estimate of how long some trash items might last in a landfill
- ☛ work together in a group to come to consensus
- ☛ understand some of the processes and environmental consequences of waste disposal
- ☛ draw conclusions that will direct their personal choices about consumption and waste disposal
- ☛ develop and express an opinion on solid waste management

### **Trash Talk: Key Words**

solid waste management, landfill, decomposition, biodegrade, longevity, trash, garbage, compost, reduce, reuse, recycle

### **Materials:**

- Student Worksheet: *How Long Does Trash Last?* – photocopy one per student
- Overhead Transparency: *Los Reales Landfill, Tucson, Arizona*
- Overhead Transparency: *Trash Decomposition Times*
- Overhead Transparency: *Garbage Longevity*
- Display Materials (Prior to class, collect the items listed below which are sometimes thrown away. The boot and sock can be still 'useful' items from your home. Write this list of items on the board or chart paper.)
 

<ul style="list-style-type: none"> <li>■ aluminum can (soda pop can)</li> <li>■ banana</li> <li>■ cigarette butt</li> <li>■ cotton rag</li> <li>■ glass bottle</li> </ul>	<ul style="list-style-type: none"> <li>■ leather boot</li> <li>■ paper bag</li> <li>■ plastic 6-pack rings</li> <li>■ plastic jug</li> <li>■ rubber sole of a leather boot</li> </ul>	<ul style="list-style-type: none"> <li>■ Styrofoam cup</li> <li>■ steel-tin can (soup or vegetable can)</li> <li>■ wool sock</li> </ul>
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## Lesson 1: Trash: It Lasts a Long Time! (continued)

### Procedure:

#### Part 1: Landfills as a Solid Waste Management Option

1. Direct the students' attention to the display of "trash" items, as noted in the Display Materials list.  
Tell students that these items are examples of what is termed "solid waste". Explain that every town or city must have procedures to handle solid waste. In Tucson, solid waste is managed by the City of Tucson's Environmental Services. Ask students to name other items from home or school that may "flow" into the Tucson "solid waste stream". Their suggestions may include any item that is thrown away or recycled.
2. Hand out the student worksheet, *How Long Does Trash Last?* Have students complete the student and class information at the top of the page and write responses for question 1: *List some procedures that your community uses for management of solid waste.* When this has been completed, ask students to share some of their comments. Lead the students to understand that the City of Tucson Environmental Services provides city-wide recycling collection and operates the Los Reales Landfill.
3. Display the overhead transparency, *Los Reales Landfill, Tucson, AZ*, a page of images and information about the Los Reales Landfill site in the southern part of Tucson. Ask students if any of them have ever been to this landfill. Read aloud the text shown on the overhead. Encourage students to express their opinions about landfills, trash and waste management by responding to question 2 on their worksheet: *Describe your impressions of a landfill site.* Ask and discuss the question, *How can we help make landfill space last longer?*
4. Tell students that the materials you have collected are samples of items which are sometimes tossed away and end up in a landfill such as Los Reales. Have students respond to the worksheet questions numbers 3-7:
  3. *What do all the items in the class "trash" collection have in common?*
  4. *What will happen to these items if they end up in the landfill?*
  5. *Which item do you think will take the shortest time to decompose?*
  6. *Will all the items disappear/disintegrate/degrade immediately or will they continue to take up space in the landfill?*
  7. *Which items, if any, will never decompose?*
5. You may wish to let students quietly discuss those questions with each other. After students have all completed their responses to the questions, discuss them as a class.
6. Next, draw students' attention to question 8 on their worksheet, a table including the list of "trash" items in the collection of materials. Instruct students to:
  - Think *on their own* about how long each of the items on the list might last when buried in a landfill.
  - Write in the first column their own "best guess", as a range, for how long each item might take to completely decompose.
7. Point out to students that there is not necessarily a "right answer" because various conditions could result in some items degrading more or less quickly. If time permits, ask students to name some things that could effect decomposition time, such as weather or the amount of moisture or heat inside the landfill.

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## Lesson 1: Trash: It Lasts a Long Time! (continued)

### Procedure: (continued)

8. When all students have recorded their own "best guesses", arrange students into small groups of 3 to 4 students. Display the overhead transparency, Trash Decomposition Times. Tell each group to use the times displayed on the overhead and come to a consensus agreement about their "best guess" of the decomposition time of each of the items. Students should record these times in column 3. In the fourth column, have students record the numbers 1-13 to correctly sequence the list in order from shortest to longest decomposition time. As groups finish this task, have them talk among themselves about the process of consensus and how best to present their group's list.
9. Ask the groups to share their lists in the sequence they agreed upon. Call on a member of the group to provide the item and the decomposition sequential number. Record this number next to the appropriate word on the board or chart in front of the class. For example, if they call out "sheet of paper -- number 1," write the number "1" after that phrase. Do the same for the other groups. When that activity is completed, draw students' attention to the discrepancies in the list. For example, Why did some groups choose to list the sheet of paper before the banana? At the conclusion of the discussion, reveal to students the best estimates of scientists, who say the following is the most probable sequence:

- |                          |                                    |
|--------------------------|------------------------------------|
| 1. banana                | 8. tin can (soup or vegetable can) |
| 2. paper bag             | 9. aluminum can (soda pop can)     |
| 3. cotton rag            | 10. plastic 6-pack rings           |
| 4. wool sock             | 11. plastic jug                    |
| 5. cigarette butt        | 12. Styrofoam cup                  |
| 6. leather boot          | 13. glass bottle                   |
| 7. rubber sole of a boot |                                    |

10. Next, display the overhead of the scientists' approximations listed below:

- banana -- 3 to 4 weeks
- paper bag -- 1 month
- cotton rag -- 5 months
- wool sock -- 1 year
- cigarette butt -- 2 to 5 years
- leather boot -- 40 to 50 years
- rubber sole (of a boot) -- 50 to 80 years
- tin can (soup or vegetable can) -- 80 to 100 years
- aluminum can (soda pop can) -- 200 to 500 years
- plastic 6-pack rings -- 450 years
- plastic jug -- 1 million years
- Styrofoam cup -- unknown? forever?
- glass bottle -- unknown? forever?

Sources: <http://www.blm.gov/education/int/background/packing.htm>  
and <http://www.deq.state.or.us/wmc/solwaste/rethinkrecyc/K-3/RRK-308.pdf>

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## Lesson 1: Trash: It Lasts a Long Time! (continued)

### Procedure: (continued)

11. After you have provided students with data about the longevity of the “trash” items on display, refer students to the last column of the chart for question 8 on their worksheet. Instruct students to record the scientists' estimations in this column.
12. Ask students to share their thoughts as to why they feel their sequence may not agree with the scientists' list. Point out that it is acceptable for scientists to have different conclusions if these are supported by good evidence. Read aloud from the overhead transparency, *Garbage Longevity*, the short summary regarding the research of William Rathje.

### Part 2: Options for Waste Management – Reduce, Reuse, Recycle

1. Review the ideas generated in the previous activity regarding trash decomposition time.

Discuss the following questions:

- What does the data (the scientists' approximations of decomposition time) tell you about landfills?
  - Do items continue to degrade and make room for new garbage or will landfills eventually fill up?
  - Do the trash “life spans” say anything to you about the importance of limiting the production of solid waste by a community?
  - What do you know about the solid waste management practices of reducing, reusing and recycling?
  - How are these practices used in your family or community?
2. Refer to the list of “trash” items in Part One of this activity. Ask students to share ideas of how they could use the practices of reducing, reusing or recycling to keep each item from going into a landfill.
  3. Ask students to take out their worksheets from part one of this activity. Have the students record responses to question number 9 on the worksheet:  
*How would you apply each of these practices in reference to solid waste management?*  
*Give an example of each application.*
    - *Reduce:*
    - *Reuse:*
    - *Recycle:*
  4. Instruct students to continue onto number 10 on the worksheet, the “Opinion Essay about a Problem Situation”. Instruct them to describe, in a “letter to the editor”, their opinion about community waste management. Have them use as many facts as they know to support their statements. Students should include the “Trash Talk” key words. If time permits, students could read aloud their essays when completed or during the following class period.

### Extension Activities:

- Have students create graphs illustrating the life span of trash items discussed in the activity, either by hand or using a graphing software program.
- Have students create posters to encourage reducing, reusing or recycling. Display those posters where students in the school will see them or in prominent public places, such as the library or a grocery store.

## Student Worksheet: *How Long Does Trash Last?*

Name: \_\_\_\_\_ Class/Period \_\_\_\_\_ Date \_\_\_\_\_

**Instructions:** Read and record a response for each question below as directed by your teacher.

1. List some procedures that your community uses for managing its solid waste.

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2. Describe your impressions of a landfill site.

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3. What do all the items in the class "trash" collection have in common?

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4. What will happen to these items if they end up in the landfill?

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5. Which item do you think will take the shortest time to decompose?

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6. Will all the items disappear/disintegrate/degrade immediately or will they continue to take up space in the landfill?

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7. Which items, if any, may never decompose?

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## Student Worksheet: *How Long Does Trash Last?* (continued)

8. Complete this chart. In the first column, list your estimate for the time that each item of trash might take to break down in a landfill. Use a range, for example, 3-5 weeks. Then work with your group to agree upon an estimate of time based on time ranges provided by your teacher. Next, number the items in order as agreed upon. Complete the final column at the direction of your teacher.

Your Own "Best Guess" Decomposition Times	Item of Trash	Group Consensus Decomposition Times	Decomposition Order (Shortest to Longest, 1-13)	Decomposition Times as Estimated by "Garbologists"
	aluminum can			
	banana			
	cigarette butt			
	cotton rag			
	glass bottle			
	leather boot			
	paper bag			
	plastic 6-pack rings			
	plastic jug			
	rubber sole of boot			
	Styrofoam cup			
	tin can			
	wool sock			

9. *How would you apply each of these practices in reference to solid waste management? Give an example of each application?*

a. Reduce:

b. Reuse:

c. Recycle:

### 10. Opinion Essay about a Problem Situation:

Your community will soon fill up the current landfill. Community leaders are searching for another site to develop as a sanitary landfill. The local newspaper is encouraging readers to write a letter to the editor with thoughts and facts about this issue. Describe, in an essay, your opinion about community solid waste management. Use as many facts as you know to support your statements. Include the following "Trash Talk" vocabulary words.

### Trash Talk: Key Words

*solid waste management, landfill, decomposition, biodegrade, longevity, trash, garbage, compost, reduce, reuse, recycle*

Overhead Transparency: *Los Reales Landfill, Tucson, AZ*

## Landfills are one option for solid waste management.



The Los Reales Landfill in Tucson, Arizona covers approximately 370 acres. It is located south of Los Reales Road between Craycroft and Swan Roads. This landfill has been managed by the City of Tucson since 1967. About 2000 tons of refuse per day are dumped, compacted and buried in the landfill. It is expected to remain open for at least another 20 years.

A growing city does need a place to dispose of its trash. When the Los Reales landfill is full the city of Tucson will either need to locate another site for waste disposal or pay to have the garbage transported somewhere else. Both of these are expensive options. How can we help make landfill space last longer?



Overhead Transparency: *Trash Decomposition Times*

**Instructions:** Certain items on your list will take longer to decompose than others. Use times from the following list and write them after the items where your group has decided they fit best.

- **3 to 4 weeks**
- **1 month**
- **5 months**
- **1 year**
- **2 to 5 years**
- **40 to 50 years**
- **50 to 80 years**
- **80 to 100 years**
- **200 to 500 years**
- **450 years**
- **1 million years**
- **unknown? forever?**
- **unknown? forever?**



Overhead Transparency: *Garbage Longevity*

# How long will trash last?

**Scientists' approximations of how long certain items remain in a recognizable condition in a landfill:** (These times will vary depending on soil and moisture conditions.)

- **banana – 3 to 4 weeks**
- **paper bag – 1 month**
- **cotton rag – 5 months**
- **wool sock – 1 year**
- **cigarette butt – 2 to 5 years**
- **leather boot – 40 to 50 years**
- **rubber sole** (of a boot) – **50 to 80 years**
- **tin can** (soup or vegetable can) – **80 to 100 years**
- **aluminum can** (soda pop can) – **200 to 500 years**
- **plastic 6-pack rings – 450 years**
- **plastic jug – 1 million years**
- **Styrofoam cup – unknown? forever?**
- **glass bottle – unknown? forever?**

Sources: <http://www.blm.gov/education/lnt/background/packing.htm>  
and <http://www.deq.state.or.us/wmc/solwaste/rethinkrecyc/K-3/RRK-308.pdf>

*Read what another researcher discovered:*

William Rathje is a "garbologist". He is the founder and Director of the Garbage Project, which conducts archaeological studies of modern trash. This University of Arizona professor and his students have been collecting data about solid waste since 1973. Rathje and his team found newspapers from the late 1970s that were still readable. Rathje's research also shows that for some kinds of organic garbage biodegradation (the rotting process) works for a while and then slows down or stops. For other kinds, it never starts to break down at all. Rathje and his team of garbologists plan to conduct more digs to find out why paper and other organic waste degrade slowly in landfills. "It's not a pleasant task," Rathje says, "but someone has to do it."

Source: <http://www.eia.doe.gov/kids/energyfacts/saving/recycling/solidwaste/landfiller.html>