



Lesson: Look At A Landfill

Grade: K-3

Subject: Science, Social Sciences

Objective:

Student will:

- identify landfills as the most common method of disposing solid waste
- describe the form and function of a sanitary landfill by observing a model
- understand that waste does not “go away” or decompose when it is placed in a landfill in comparison to a natural cycle
- discuss how landfills take up space and are located in areas that are, or were, habitats for people and wildlife

Teaching Time: 45-60 minutes

Materials: a prepared one-gallon milk jug (or more if you would like students to work in small groups to construct their own); six cups of garden soil (not potting soil); grass, leaves, sticks, small plastic animals; a few Ziploc bags for plastic lining; blue construction paper; transparency Landfill in a Jug Diagram; A Simple Diagram of A Landfill and When Will These Things

Background:

(Prerequisite: Cycles in Nature). Almost all garbage is eventually disposed of in a landfill. (See “Where Is Away?” Background for more detail). As of 2001, there are 36 active municipal solid waste landfills in Oregon. Some, but not all, of these landfills have upgraded modern systems that maximize environmental protection. “Modern” landfills (all landfills or sections (called cells) of landfills built after 1991) are called sanitary landfills because they are lined with a thick plastic and clay layers and have leak monitoring systems in order to protect our groundwater. Older unlined landfills continue to be a source of environmental pollution that we must pay to clean up until they no longer exist.

According to federal law, all closed landfills must be monitored for 30 years. Landfills are monitored for two reasons. First, to control methane buildup which can cause fires and explosions and second, to control “leachate” which can leak out. With regard to the first issue, the technology has now developed so that we can “harvest” the excess methane from large landfills and actually use it as a source of energy. However, this is still not a very efficient process and is still not being widely used, but it may be important for future energy conservation efforts.

The second issue, controlling leachate, is difficult and complex. Leachate is any liquid that comes into contact with garbage and commonly contains undesirable components such as volatile organic compounds (VOCs), nitrates, trace metals, and other salt compounds. Additionally, the pH of leachate is usually corrosive, so when it migrates through the soil it can remove naturally occurring iron and manganese which can pollute surface and groundwater.

Leachate is dealt with by two primary approaches. The first approach to dealing with the problem of leachate is to keep the landfill as protected and dry as possible so that excess leachate is not formed. In Oregon this is how it is handled. This means that garbage is not receiving much air or water and will not break down for an unknown period of time. Modern landfills with leachate monitoring systems will test the leachate for presence of hazardous constituents. If the leachate is not hazardous, it is removed and sent to the waste water treatment facility. Hazardous leachate is processed the same as any other hazardous waste.

The second method for dealing with leachate is being tried in other parts of the U.S. This method involves the “recirculation” of the leachate and air through the landfill in order to speed up the decomposition of garbage. This method tries to deal with any problems stemming from the decomposition such as toxins or methane right away while the landfill is still open and being actively monitored. There are critics of both methods for dealing with landfilled waste and the “best” method has not been agreed upon.

REDUCE
REUSE
RECYCLE

Procedure:

- **Where does trash go when we throw it away?** Most trash (92%) in Oregon goes to landfills, a small amount gets burned by incinerators.
- **Today we are going to build a model of a landfill much like those used in Oregon for storing solid waste.**
- Using the needed materials and the diagram of a landfill in a jug, follow these steps:

(Option: Have groups construct models along with you.)

1. See instruction sheet for making a landfill in a jug. **What does the blue paper (or other material you picked) on the bottom represent? Water under the ground. People pump this water through wells and use it to drink and farmers use it to water their crops. Garbage should not touch or leak onto the blue paper.**
2. Dig a hole for a landfill in the soil of the gallon jug. **What could be done with the soil that is dug up? It will be used later to cover up the disposed trash.**
3. Show the transparency, "A Simple Diagram of a Landfill." Point out the lining of the landfill. **Thick plastic liners are used on the bottom of landfills in order to prevent garbage from leaking in the ground water.** (Use a piece from a Ziploc bag, plastic film or a grocery bag).
4. After placing the plastic liner in the landfill, add about six or seven pieces (about one-half to one inch in size) of garbage and/or allow students to find something in the classroom that they could put in their landfills. Examples are: a piece of crayon, part of a snack/lunch, a leaf, a piece of paper, or a tissue.
5. Pack down the garbage, as compactors do at a real landfill. Cover the garbage layer with soil. This simulates how the garbage at a landfill is covered daily with soil to eliminate odor and to keep animals, such as rats, out of the landfill.
6. Have students record a description of a landfill and draw a picture of the classroom model. Do some reflection and response on what will happen to the garbage in their model landfill. Discuss the ways in which the classroom model is similar to and different from a real landfill.

Reflection/Response:

- **What can be done with our garbage now that our landfill is full?**
Students might recommend using another landfill or digging a new one.
- **Will digging a new landfill cause any problems? Yes, it will impact the land and the plant and animal life in the area. And remember, landfills could possibly leak into groundwater.**
- **What could we do to keep the landfill from filling up so quickly?**
Lead class to a discussion of reduction, reusing, and recycling. Teach students Oregon's "waste hierarchy" (The 3R's) Reduce, Reuse and Recycle! (See Overhead in Lesson: Where is Away?)
- **Are there any objects in the landfill that could be recycled or reused?**
- Create a list of the pros and cons of placing trash in the landfill. Write it on the board or have students make their own lists. Pros include: we need a place to put our trash; landfills are constructed to help protect the environment. Cons include: the plastic liner might eventually break and let pollution get into the groundwater; when the landfill gets full it is hard to find a good place to build a new one; things

(Continued)

Decompose?; pieces of daily garbage

(Optional:) Build a larger classroom landfill model from an old aquarium.



that are buried in the landfill are no longer able to be used by nature or by people.

- Show the transparency, “When Will These Things Decompose?”
Note: the number of years refers to garbage decomposition when exposed to open air and sunlight, not when buried in a landfill!
(Remind students about natural cycles).

Extensions:

- Ask students to write or illustrate their ideas for keeping garbage out of a landfill. Examples are to: give away my toys to others, compost food and yard debris at home, reduce the amount of disposable items that I use, repair things when I can, never take more than I need, etc.
- Ask students to illustrate garbage leaving their home and the route it passes as it goes to the landfill.
- Take students on a field trip to see their local landfill or transfer station (or incinerator if you are in Marion and Coos County). (See the Field Trip guide for your area).
- Ask the local waste hauler or solid waste coordinator to visit your class and explain where waste goes and what can be recycled.

Common Curriculum Goal:

Science: Unifying Concepts and Processes

- Apply explanatory concepts of model, system, theory, probability, and replication.

Social Science: Analysis

- Identify, analyze, and select a course of action to resolve an issue.

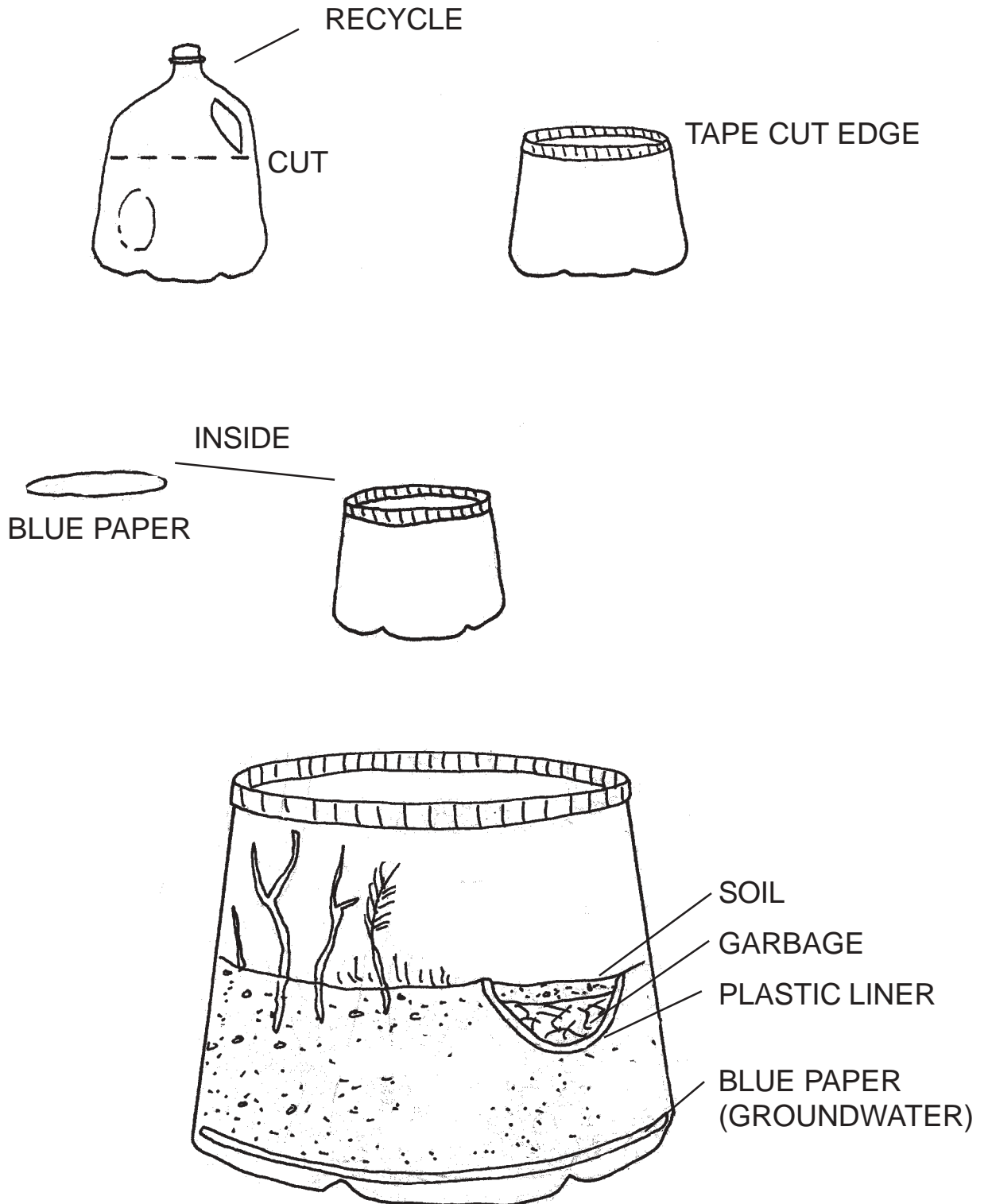
Grade 3 Benchmark:

- Compare objects, drawings, and constructions to the real things they represent
- Identify how people or other living things might be affected by an event, issue, or problem.

REDUCE
REUSE
RECYCLE

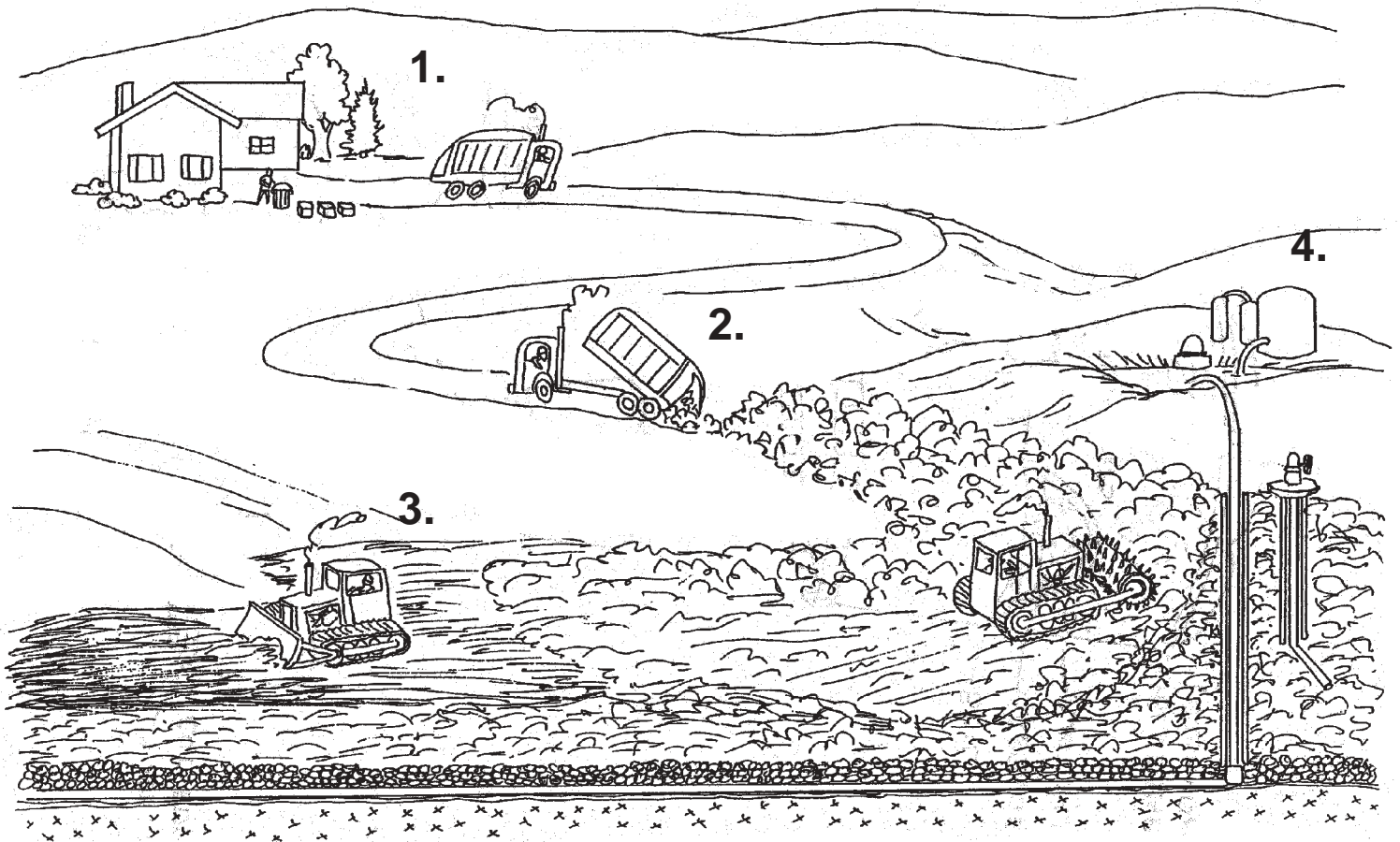


Overhead: Landfill In A Jug Diagram





Overhead: A Simple Diagram of a Landfill



- 1. Garbage is taken from your house.**
- 2. Garbage is delivered to the landfill.**
- 3. Garbage is compacted and buried in a landfill.**
- 4. Equipment checks the water to make sure it is clean and safe.**



Overhead: When Will These Things Decompose?

