Lesson 4: Building a Landfill Model

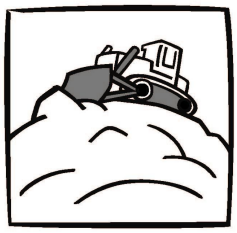
Grade Level:
3-5

Concepts Taught:
conservation of resources; human impact on natural resources

Activity Time(s):
1 hour (prep)
20 minutes (lesson)
20 minutes (follow-up)

Essential Questions:
- What is a landfill?
- What types of items can be disposed in a landfill?
- How is a landfill designed?

NC CORE/Essential Standards:
Grade 3: Soc Std 3.G.1.2, 3.G.1.3; Science 3.L.2.4
Grade 4: Soc Std 4.G.1.2, 4.G.1.3; Science 4.L.1.3
Grade 5: Soc Std 5.G.1.2



Objectives:

Students will demonstrate understanding of the landfill layers concept by building a landfill model.

Materials:
Clean, empty 2-liter bottles (one for each group of 4 students)
craft foam sheets in blue and brown
scrap materials such as cardboard, plastic grocery bags, polystyrene packing peanuts, construction paper, straws
(see diagram for alternative materials list)

Lesson:
1. Review the Teacher Background Section. Landfills are necessary because we all create trash everyday.
2. Ask students why it is important to build landfills a special way. Answers may include: to keep the environment safe, to keep the trash contained in an area, to make it easy for trucks to dump trash at the landfill.
3. Using the diagram below, arrange students in groups of four or five (or use as an independent center activity).
4. They will then construct the landfill.
5. Explain each layer's function as you go along:

- Groundwater: this is water running beneath the earth's surface that feeds wells and springs. Landfills are constructed to keep groundwater safe and protected.
- Compacted Clay: a thick layer of clay is a barrier to prevent liquids in the landfill from coming in contact with the groundwater. Clay is a soil type that is resistant to water moving through it. (You may want to discuss the three main soil types here and why they would or would not make a good landfill layer: sand is not appropriate because it would allow water to move through it very easily, as would humus.)
- Liner: this thick plastic liner is impermeable and serves as an excellent barrier to keep trash and liquids from coming in contact with soil and groundwater below.

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- Leachate Collection Pipes: often called "garbage coffee," leachate is any liquid produced as trash settles. It must be collected and treated to remove any hazardous chemicals
- Geo-Textile Mat and Drainage Layer: combining gravel and another synthetic liner, these layers help drain liquids from the landfill.
- Soil: soil is placed on top of all these layers before the first layer of garbage.
- **Garbage**: placed and compacted daily on the landfill.
- Soil: placed and compacted on top of the garbage each night to prevent smells, wind-blown litter, and environmental hazards. If you have enough materials, students may repeat the garbage layer and soil layer several times to show how garbage is continually placed on top of other garbage layers.
- Liner: another liner is placed on top of the soil and garbage layers when the landfill closes.
- Soil: more soil is placed on top of the liner to prepare for vegetation planting.
- Vegetation: planted on top of the landfill. Grasses are planted rather than trees or other plants that have major root structures.

Extension:

Ask students to keep a log of each piece of trash they throw away in the class garbage can for a week using the following categories: paper, plastic, food waste, wood, and metals.

Keep a chart hung near the trashcan where students can mark their trash.

At the end of the week, use the student data to create a bar graph showing how much trash is composed of each of the categories.

Discuss why some bars on the graph are higher or lower than others and discuss how the graph might look different if students kept a record of what they throw away in their garbage can at home.

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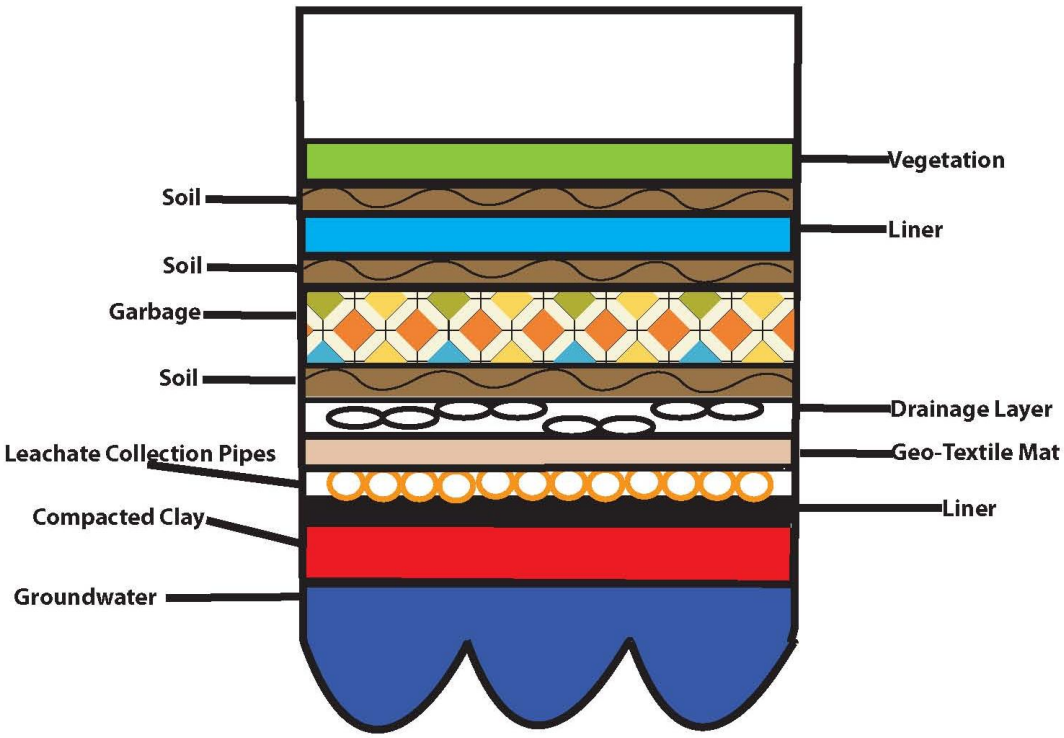
Simplified Wake County Landfill



Edible Landfill	Other Landfill Options
This can be made in a large baking or serving dish for a classroom of students. Making individual servings in small cups generates a great deal of waste. Please be mindful of food allergies. If you use ice cream, have students examine the bottom of the container to see if the "liner" is functioning properly. If so, the cookies will remain dry.	Two-liter bottles can also be used to construct a landfill model. Cut the top off the bottle and use scraps of paper, plastic, or other items to make the layers as shown above.
Groundwater.....blue tablecloth Clay.....Oreo half with filling Liner.....fruit roll-up Leachate Pipes.....licorice pieces Drainage Layer and GeoText. Mat.....graham crackers Soil.....Oreo half without filling Garbage.....candy pieces or ice cream Vegetation.....Cool Whip or green sprinkles You can also use birthday candles to represent the methane flare.	Groundwater .....blue foam or construction paper Clay.....brown foam circles Liner.....black trash bag circles Leachate Pipes.....straws Drainage layer and GeoText.Mat....packing peanuts Soil.....cardboard circles Garbage.....candy wrappers, napkins, etc. Vegetation.....green construction paper, potpourri