

The Abandoned Mine

Grade

7

Topic: Waste
Grade: 7
Duration: 4-5 x 45 minutes

Students will investigate the possibility of using abandoned mines as landfills for large centres where there is no longer room for landfill sites in the area. They will design and construct models of systems that could move the garbage into these mines. They will investigate the environmental impact of such a decision.

Curriculum Expectations

- 7s1: Demonstrate an understanding of the interactions of plants, animals, fungi, and micro-organisms in an ecosystem
- 7s2: Investigate the interactions in an ecosystem, and identify factors that affect the balance among the components of a ecosystem
- 7s3: Demonstrate an understanding of the effects of human activities and technological innovations, as well as the effects of changes that take place naturally, on the sustainability of ecosystems
- 7s4: Identify living (biotic) and non-living (abiotic) elements in an ecosystem
- 7s7: Explain the importance of micro-organisms in recycling organic matter
- 7s15: Use appropriate vocabulary, including correct science and technology terminology, to communicate ideas, procedures, and results
- 7s17: Communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, oral presentations, written notes and descriptions, charts, graphs, and drawings
- 7s18: Investigate the impact of the use of technology on the environment
- 7s19: Investigate the bio-economical costs and benefits of the recycling and waste-disposal industries
- 7s106: Identify the factors that must be considered in making informed decisions about land use and explain their importance
- 7s122: Communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, written notes and descriptions, charts, graphs, drawings, and oral presentations
- 7e1: Communicate ideas and information for a variety of purposes (to outline an argument, to report on observations) and to specific audiences, using forms appropriate for their purpose and topic
- 7e3: Organize information to develop a central idea, using well-linked and well-developed paragraphs
- 7e5: Produce pieces of writing using a variety of forms (e.g., descriptive, narrative, and expository compositions), techniques and resources appropriate to the form and purpose, and materials from other media (e.g., diagrams, illustrations)
- 7e37: Plan a research project and carry out the research
- 7e48: Ask questions and discuss different aspects of ideas in order to clarify their thinking
- 7e50: Express and respond to a range of ideas and opinions concisely, clearly, and appropriately
- 7e52: Demonstrate the ability to concentrate by identifying main points and staying on topic

- 7e58: Use words and phrases to signal that a new or important point is about to be made (e.g., My central point is. . ., Note that. . ., First. . . Second. . . Third. . .)
- 7e61: Rehearse and revise their material before making a presentation (e.g., reorder ideas, change the conclusion)
- 7e62: Identify some of the ways in which non-verbal communication techniques (e.g., tone of voice and body language) can affect audiences, and use these techniques in their own speech to arouse and maintain interest, and convince and persuade their listeners
- 7e63: Use eye contact, variations in pace, appropriate gestures, and such devices as the “pause for effect” in presentations
- 7m53: Recognize the front, side, and back views of three-dimensional figures
- 7m54: Sketch front, top, and side views of three-dimensional figures with or without the use of a computer application
- 7m55: Sketch three-dimensional objects from models and drawings
- 7m85: Construct graphic organizers using computer applications

Background Information

Most of our garbage is either buried or burned. Places where it is buried are called dumps or landfills. Dumping garbage is quick, easy and not too expensive if the site is near the city or town. But it takes up a lot of space. Towns and cities are running out of space and are looking at alternatives. Toronto now takes the majority of its garbage by truck to landfills in Michigan.

Landfills have become more complex since new technologies have been created to help sustain the life of the landfill and ensure that it is safe for the community. In the past, landfills were open dumps that contained everything. Now most communities have recycling depots or curb-side pick up systems. In the past, these sites were not regulated or monitored. Waste materials in open dumps leaked toxic contaminants into the environment and became a source of pollution in the water and soil. Today precautions are taken to design landfills that are safe and efficient.

Garbage dumps can be dangerous. When rain falls on a landfill, water seeps into the piles of trash. If the water trickles over dirty tissues, it picks up germs. If it flows through spilled paint, motor oil or household cleaners, it picks up dangerous chemicals. All this is called “leachate” and it flows out the bottom of the dump into the ground beneath. The polluted water soaks into the land, finding places where it can trickle through soil or porous rock. This keeps on flowing into underground streams. This is the water that is found in wells and our rivers and lakes. Fish swim in it and people drink it. Once the groundwater has been contaminated, it is almost impossible to clean because there is no way to get at it.

New garbage dumps are lined with plastic or a special kind of clay to seal the ground so that this water cannot seep away. Pipes are installed to collect the polluted water so it can be cleaned and ditches are dug around the landfill to catch spills. But the liner in a landfill soon gets buried under mountains of trash and could develop a leak.

Accountability

Students will appreciate the need to examine issues related to landfill sites and the future of waste management.

Teacher Notes

1. Present the scenario to the students:

The amount of garbage produced in large cities, like Toronto and Ottawa, has become a real problem. The problem is two-fold. As the population increases, there is more and more need for residential land. No one wants to live next to a landfill site and the property value itself drives the city to look for landfill sites

elsewhere. Moreover, as the population increases, so does the amount of garbage produced.

One of the proposed solutions is to use abandoned underground mines as new landfill sites. The garbage would need to be trucked there and then processed for storage underground. Use of these mines has safety and environmental concerns, like the possible contamination of the underground water supply and the further disruption of natural ecosystems. This is a controversial issue. Your team has been asked to study the feasibility use of abandoned mines, from an engineering point of view as well as an environmental one.

2. Before you start the activity, research landfills and discover the current method of creating a landfill. Part of this research should include the Toronto proposal to use the abandoned mine in Adams Mine site near Kirkland Lake, Ontario, about 600 kilometres (375 miles) north of Toronto.
3. This activity can be done as a debate or as a design and technology challenge. If you do it as a debate, divide the class into groups – a pro and a con side and have them research the topic. Invite speakers to the class to help with the research and to observe the final debate. Record the debate and use it for promotional material for EarthCARE Activities.
4. If you use a design challenge, it will be a more extensive activity! Divide the class into teams. Within each team, there will be different responsibilities. One part of the team will design a device that can move the garbage into the abandoned mine and the other part of the team will conduct an environmental impact study and present their findings.
5. Challenge One: Design Team – (the use of LEGO is well suited to this activity and is available in many schools). These three components can be done by three different groups and then brought together to form one system at the end of the activity. Design and build a prototype system that includes:
 - A vehicle that can move the garbage (500g) forward at least 60cm, dump the garbage onto the conveyor belt, then move back 30cm.
 - A double-conveyor belt to transfer the garbage from one location to another, but also to sort waste from recyclable material. HINT: Your double-conveyor belt will look like a “T”. The first conveyor belt takes the garbage to a second conveyor belt that is placed perpendicular to the first. The second conveyor belt will move to the right or left depending on the feedback received about the type of material present.
 - An elevator to move the garbage to at least 3 different levels of the mineshaft depending on the type of materials.
6. Challenge Two: Environmental Team - present using graphic organizers which:
 - Show the specific abiotic and biotic component of the ecosystem;
 - Present the information in a way that is easy to understand, using arrows, small pictures, symbols and colour;
 - Include labels that explain the connections between the components;
 - Show an environmental, economic and social effect of waste disposal; and
 - Include short and long term effects.
7. At the conclusion of the activity, each team will be required to prepare a five-minute presentation to be delivered to a steering committee on the subject of garbage re-location. They will need to demonstrate the effectiveness of their system and discuss potential environmental concerns. The design team presentation must also include the following:
 - sketches of their designs, including dimensions and specifications;
 - mechanical advantage calculations with explanations;
 - an evaluation of the strengths and limitations of the system, with possible ideas for improvement;
 - a report on the potential environmental impact.
8. Discuss how this kind of future thinking will be required as landfills are no longer available in larger cities.

Home Extension

Discuss the issue at home to find out what the family thinks about the topic.

Lesson Comments

Teachers, feel free to add in your own comments for this lesson.