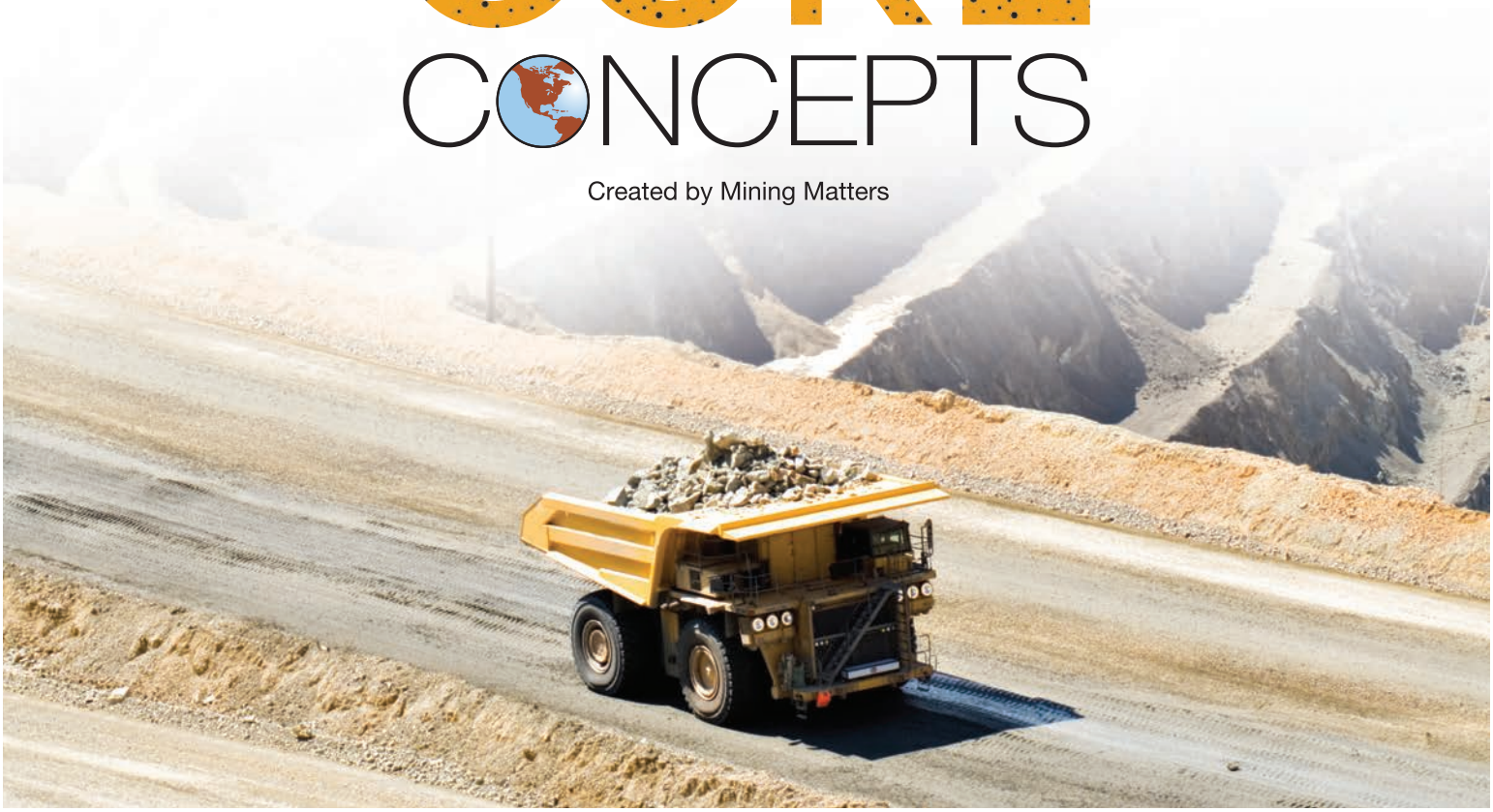
CORE CONCEPTS

Created by Mining Matters



Mining Cycle

Did you know that there are complementary and additional resources that will facilitate with the delivery of this topic? Please contact Mining Matters and we'd be happy to assist. Be sure to state, "Core Concepts order request" in the subject line of the email and/or the fax cover sheet.

Mining Matters:
T: (416) 863-6463
F: (416) 863-9900
E: schoolprograms@miningmatters.ca

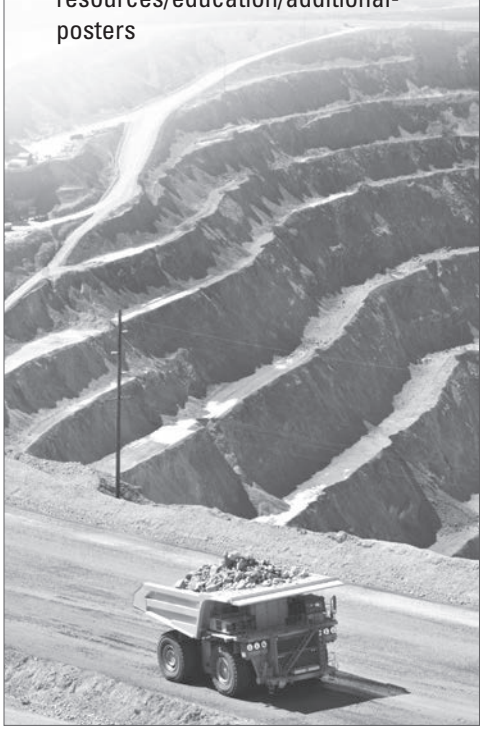
TABLE OF CONTENTS

1 MINE TYPES AND TECHNOLOGY

MATERIALS

- Handout: *Mine Types and Technology Information Bulletin*
- *Command for Underground* https://www.youtube.com/watch?v=8c9IGP1SmSs By Cat Mining
- Caterpillar's *"Ground Rules: Mining Right For a Sustainable Future"* https://mining.cat.com/groundrules
- NRCan Posters: Underground Mine and Surface Mine

  The mining posters: *Surface Mine, Underground Mine, Smelter, and Concentrator,* can be downloaded from the Mining Matters website at http://www.pdac.ca/mining-matters/resources/education/additional-posters



Key Words:

Basic Terms: mining, orebodies, surface mining, excavated, open pit, quarry, aggregate, pit, underground mining, shaft, smelter

Secondary Terms: front-end loaders, cage, skip, ventilation shaft, drift, scoop, reclamation, rehabilitation

SUMMARY OF TASK

Students will:

- Analyze modern mining techniques, and compare underground and surface resource extraction.

EARTH SCIENCE LITERACY PRINCIPLE(S)

BIG IDEA 7 Humans depend on Earth for resources.

BIG IDEA 9 Humans significantly alter the Earth.

OBJECTIVES

1. Be familiar with the basic stages in the discovery and development of a mine.
2. Use terminology associated with the mining process.
3. Understand that exploration is dependent on technology.

INSTRUCTIONS

Engage

1. Have students examine the posters: Underground Mine and Surface Mine.
2. Review the facts indicating that mining is a large industry.

Explore

3. Give students handout: *Mine Types and Technology Information Bulletin*. Read the information with the class. Students should use highlighters to denote important points, terms and definitions. As you read the information, stop and elaborate on the material when you feel it necessary or a good opportunity to reinforce content.
4. Use the NRCan Posters: *Surface Mine and Underground Mine* to provide visual examples of how each mine is constructed or perhaps draw a simplified version on the board.

Explain

5. Identify the differences between the two types of surface mines – open pits for minerals such as copper which have kilometre-scale dimensions and are usually in remote areas; and open quarries used for crushed stone that are usually smaller and close to local populations. Contrast underground mining with surface mining and ask the students which they think is easier to develop and run and why.

Elaborate

6. View the You Tube video, *Command for Underground*. It is a short video showing one example of technology that is making underground mining easier and safer. *Command for Underground* allows operators to load, move and dump material via remote control. Using computers, cameras, lasers and software, the loading truck can even steer itself to avoid obstacles.
7. View video, *"Ground Rules: Mining Right For a Sustainable Future"* by Caterpillar, specifically the segments related to 'Mining'. This theme teaches students about open pit and underground mining, including safety and environmental considerations. It also introduces students to a wide range of mining careers.

Evaluate

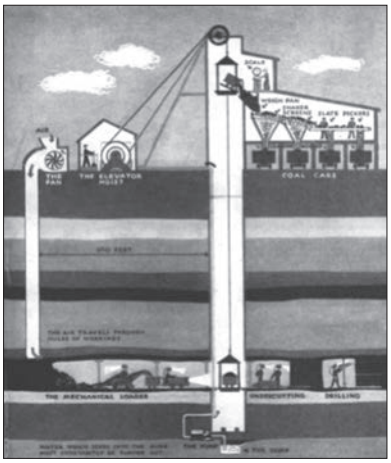
8. Have each student complete a grid with point-form statements for the positive and negative aspects of surface and underground mining. Allow students to include their personal opinions, so long as the factual content is from the material presented in this activity.

MINE TYPES AND TECHNOLOGY

Mining is the process of removing (extracting) valuable rock from the earth. Rocks that contain concentrations of valuable metals or minerals are called **ore bodies**. In some cases, the rock's value is its direct use as building material.

Surface mining is used when the orebody is close to the surface of the earth and can be **excavated** (dug out) forming a hole called an **open pit** mine. Explosives are used to break up the rock. The broken rock is loaded onto very large trucks, using *front-end loaders*, and taken away for additional processing. A **quarry** is an open pit mine where bedrock is extracted and crushed into **aggregate**, used to make buildings, bridges, monuments and roads. It is called aggregate because it is often mixed with cement to make concrete and tar to make asphalt. Other sources of aggregate are deposits of sand and gravel. These sediments can be extracted without blasting. Machines simply remove the material directly from the ground. When the source of aggregate is sand and gravel the operation is called a **pit**.

After mining, the hole can be filled with water to make a new lake or landscaped with rock and soil. Grass and trees may be planted to make a park or recreational area. If the surface mine was in an agricultural area, the land can be returned to agricultural use. These processes are called *reclamation and rehabilitation*.



Underground mining is used when the orebody is buried deep in the earth and miners must dig tunnels to reach it. The vertical tunnel that is used to reach the area of the orebody is called a shaft. Inside the **shaft**, an elevator, or **cage**, is used to transport the miners and equipment from the surface to the underground workings and a bucket or **skip** is used to lift the broken rock and ore from underground. Other vertical tunnels called **ventilation shafts** bring fresh air to the mine. Horizontal tunnels, called *drifts*, provide access from the shaft to the orebody. Once again, explosive is used to break up the rock. Broken rock is loaded into a *scoop* which is a combination *front-end loader* and truck. It is driven back to the shaft where the ore is dumped and lifted to the surface in the skip.

Once the rock is broken from the orebody it must be processed to extract the valuable minerals or metals (copper, zinc, gold, silver, nickel, etc.). First the rock is crushed into a fine powder then combined with water and various chemicals to "free" the valuable minerals from the waste rock. The valuable minerals have to be collected and concentrated before being processed further at a **smelter** or refinery to obtain the final metal product.

After underground mining is completed, the reclamation process includes filling all the opened areas with sand, concrete or waste rock. The shafts are capped (plugged) and the buildings on the surface are removed. The small areas used for the buildings are replanted with grass and trees so that very little evidence of the mine remains.

2 RECLAMATION AND REHABILITATION

MATERIALS

- Figure: *Reclamation and Rehabilitation* (Displayed on available classroom projection technology)
- Handout: *Reclamation and Rehabilitation Information Bulletin*
- Handout: *Reclamation and Rehabilitation Activity*
- Aggregate Producers Association of Ontario Brochures

  The hole story
  https://www.ossga.com/primer/

  https://www.mineralseducationcoalition.org/store/aggregates-poster

SUMMARY OF TASK

Students will:

- Identify environmental impacts of geological resource extraction, and describe techniques used to address these.
- Identify environmental, social, and economic factors that should be considered in making informed decisions about land use.

EARTH SCIENCE LITERACY PRINCIPLE(S)

BIG IDEA 7 Humans depend on Earth for resources.

BIG IDEA 9 Humans significantly alter the Earth.

OBJECTIVES

1. Examine the environmental concerns that can accompany mining.
2. Discuss the importance of aggregates and the concept of quarry rehabilitation.
3. Work in pairs to construct a realistic reclamation/rehabilitation plan for a site.
4. Display their plan in a creative fashion.

INSTRUCTIONS

Engage

1. Have students brainstorm the following questions:
   - Name the ways a mine may impact the surrounding environment?
   - How can impacts be minimized?
   - What are some of the other issues related to developing a mine site that may have an impact on the environment?

Explore

2. Distribute the *Reclamation and Rehabilitation Information Bulletin*. Give students sufficient time to read and ask questions in advance of the group discussion.
3. Discuss the issues around pit and quarry rehabilitation. Rehabilitation involves the return of land used in the pit and quarry operation to its former use or some other suitable use. It involves creating new landforms, replacing soils and establishing new vegetation. Once the land has been prepared, it can be used for conservation or recreation, developed into a golf course, or as a place to build a school or houses.
4. Show the figure: *Reclamation (Underground Mine) and Rehabilitation (Sand and Gravel Pit).* Ask the students to give their thoughts on the projects and use this opportunity to discuss any relevant information.

Explain, Elaborate

5. Explain that one of the easiest mine types to rehabilitate is an aggregate pit or quarry. Using the provided brochures What is Aggregate? (https://www.ossga.com/faq/) and The Importance of Aggregate (https://www.ossga.com/primer/), explain that aggregates are very important in the building process and are usually mined close to populated areas. Because of this fact, ask the class why it might be important for old

quarries and pits to be rehabilitated. What kinds of uses might there be for these large mined areas? Use the provided brochure Environment and Rehabilitation to provide information and examples of rehabilitation projects such as parks, lakes, and wetlands.

Evaluate

6. Give students handout: *Reclamation and Rehabilitation Activity*. The assignment consists of designing a reclamation or rehabilitation plan that is creative but also has reasonable expectations. Students need to have a clear understanding of the purpose behind reclamation so that their design reflects the needs of the community and surrounding environment.
7. Provide students with the *Self-Evaluation* sheet for them to reflect on their presentation before completing the work.

SUPPORTING INFORMATION

Issues associated with rehabilitation can include the length of time that it can take to complete a project following resource depletion, ensuring that a site is safe, by removing any dangers, following a mine closure, and selecting an appropriate secondary land use for the land. Brainstorm with the class as to how to deal with these problems or avoid them all together.

Key Words:

Basic Terms: mining, reclamation, rehabilitation, reforestation, tailings, mineral resource

Secondary Terms: biologist, environmental specialist

RECLAMATION AND REHABILITATION

Mining is a temporary use of the land - no mine will last forever. It is an important goal of the mining or aggregate company to return the site to a natural and stable state, making it available for other uses. When a mine, quarry or pit is closed, the site needs to be restored to a useable state, or changed to another use or state that complements the surrounding landscape.

Mine Closure in Canada

Before mining ever begins a mining company must make sure that the environment will not be harmed by their mining practices. It is the priority of the mining company to conduct their business in an environmentally responsible manner. Long before the mine, the first rocks are broken in a mine and the mineral resources removed, *biologists and environmental specialists* research all aspects of the environment and collect huge amounts of data against which future test results will be compared. These specialists look at the soil, water, wildlife and vegetation and also the air quality and climate. It is very important to the mining company that the environment at the mine is left exactly as it was before the mining activity began.

In Canada, the provincial and territorial governments regulate the mining industry, and have all developed and enacted legislation and regulations for the administration of mining activities and mine closure. The federal government has also developed policies that govern mine closure, and is responsible for mine reclamation and closure in Nunavut, the Northwest Territories, and on First Nation Reserves. All the jurisdictions require that closure plans are put on file and funds for the cleanup and reclamation are provided by the mining company before mining operations can begin. Reclamation is completed according to the approved closure and reclamation plan, which must be continuously updated by the mining company and approved by the responsible government agency.

Mine Closure Plans

Mine closure plans are specific to each mine, and include details on how the mining company will close the mine site, how environmental protection will be achieved, and how the site will be returned to an acceptable state for a pre-arranged land use. The terms *reclamation, rehabilitation, remediation,* and *restoration* are all used to describe mine closure activities. The terms are closely linked, but refer to distinct steps in the preparation of the site for another use:

- **Reclamation:** The physical stabilization of the terrain (dams, waste rock piles), landscaping, restoring topsoil, and the return of the land to a useful purpose. This process usually occurs in northern Manitoba where zinc, copper and nickel mines are common. This process, like rehabilitation, also involves removing all the buildings or physical property, but also includes treating the mine tailings or wastewater, stabilizing the underground workings and closing the mine shafts and tunnels.
- **Rehabilitation:** The establishment of a stable and self-sustaining ecosystem, but not necessarily the one that existed before mining began. The process of rehabilitation includes removing, relocating or demolishing buildings and physical property (crushers, conveyor belts, etc), stabilizing the soil or slopes by recontouring or filling the pits, and revegetation and reforestation of the land. In many cases, complete restoration may be impossible, but successful remediation, reclamation, and rehabilitation can result in the timely establishment of a functional ecosystem. There are a number of excellent examples of rehabilitation; one of the most famous is Butchart Gardens in Victoria, British Columbia. In 1904, Butchart Gardens began as an effort to beautify a former limestone quarry. The Garden today has established itself as a world-renowned botanical garden.
- **Remediation:** The cleanup of the contaminated area to safe levels by removing or isolating contaminants. At mine sites, remediation often consists of isolating contaminated material in pre-existing tailings storage facilities, capping tailings and waste rock piles with clean topsoil, and collecting and treating any contaminated mine water if necessary.

- **Restoration:** The process of rebuilding the ecosystem that existed at the mine site (where applicable) before it was disturbed. The science of mine reclamation has evolved from simple revegetation activities to a discipline which involves using native plants to mimic natural ecosystem development over an extended period of time.

For more information about mine closure practices in your region visit your provincial or territorial government office website (e.g. Ontario Mining Association, Ontario Sand Stone and Gravel Association, Québec Ministère de l'Énergie et Ressources Naturelles, Saskatchewan Mining Association, Yukon Government Energy, Mines and Resources, etc.).

BEFORE AND AFTER RECLAMATION

Underground Mine

Photo of Quirke II Mine, Rio Algom Limited – Elliot Lake , Ontario prior to reclamation.

Photo of Quirke II Mine following removal of buildings and prior to reseeding and planting.

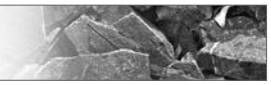
BEFORE AND AFTER REHABILITATION

Sand and Gravel Pit

Photo of the Fonthill Pit, Steed and Evans Limited, Fonthill Ontario during rehabilitation.

Photo of the Fonthill Pit showing final rehabilitation.

2 ACTIVITY: RECLAMATION AND REHABILITATION



STUDY THE FOLLOWING MATERIALS WHICH ARE AVAILABLE IN YOUR CLASSROOM:

Brochures from the Aggregate Producers Association of Ontario including What is Aggregate? Importance of Aggregate and Environment and Rehabilitation. In addition, your teacher has overheads of sites that have been reclaimed or rehabilitated. Look at these Before and After pictures and look at what has been done to the area when the operations closed.

Locate the closest mine, quarry or sand and gravel pit to where you live. After locating the operation, consider how you would either rehabilitate or reclaim the site, and the land the surrounds it, when the resource being mined or extracted has become depleted and the site closes. Prepare a presentation that includes an explanation of:

1. What the area will be used for, (e.g. golf course, community park, bird sanctuary, botanical garden).
2. What steps you will take in your rehabilitation or reclamation project, (e.g. filling in the area with soil to create hills for a golf course or leveling off the area in order to build a school or shopping mall).
3. What resources you will need and how they will be used (e.g. topsoil, trees, plants, sand and gravel for roads, etc).

Include two diagrams, one that shows how the area looks before and how it will look after reclamation.
Your presentation may be a report, poster, slideshow, or speech with visuals.

Use your imagination, be creative and have fun!

Other sources of information: http://www.mineralseducationcoalition.org/reclamation-stories

2 ACTIVITY: SELF-EVALUATION

Reflect on your presentation and evaluate how well you have completed the expected criteria described below.

Content – I have included:	Yes	No
Before diagram with labels and/or description		
Future use		
List of steps needed		
List of resources needed		
What each resource is used for		
After diagram with labels and/or description		

Comprehension – I have:	Not really	Partly	Very well
Designed an appropriate land use			
Identified and removed all hazards related to the mine			
Considered the needs of the natural environment (animals and plants)			
Considered needs of the local community			
Used creative ideas			
Designed a reasonable solution			

Presentation – I have:	Not really	Partly	Very well
Checked spelling			
Checked grammar			
Included visuals			

3 THE MINE DISCOVERY PROCESS

MATERIALS

- Handout: *The Mine Discovery Process Information Bulletin*
- Handout: *The Mine Discovery Process - Questions*
- Handout: *Investigate a Career in Mining*
- Video Careers in the Minerals Industry
- Opaque bag
- 99 plain popsicle sticks
- 1 red popsicle stick
- "Mining Explained" Publisher, The Northern Miner (Contact Mining Matters to request a copy of this book. Quantities limited. Subject to availability).

SUMMARY OF TASK

Students will:

- Identify past and present-day applications of technologies that have contributed to the study of geology (e.g. surface observation, core sampling, seismology, magnetometry, satellite technologies)

EARTH SCIENCE LITERACY PRINCIPLE(S)

BIG IDEA 7 Humans depend on Earth for resources.

BIG IDEA 9 Humans significantly alter the Earth.

OBJECTIVES

1. Be familiar with the basic stages in the discovery and development of a mine.
2. Use terminology associated with the mining process.
3. Understand that exploration is dependent on technology.
4. Investigate careers in the modern mining industry.

INSTRUCTIONS

Engage

1. Introduce to the class that mining is an industry with many aspects to it and that to keep in step with society's attitudes the mining business will continue to change to better integrate technology, environmental best practices and community needs.

Explore

2. Conduct the 1 in 100 Chance demonstration:
   - a. Present a bag that you cannot see through. Inside you should place 100 plain Popsicle sticks with one of the sticks coloured red.
   - b. Explain that the chances of discovering an economic orebody is very small (approximately 1 in 100) and that the plain Popsicle sticks represent mineral prospects and the red stick represents an economic orebody.
   - c. Have each student reach in the bag a pull out a stick and see if anyone finds an economic ore body, i.e. red Popsicle stick.

Explain

3. Raed the handout: *The Mine Discovery Process Information Bulletin* and have students complete the handout: *The Mine Discovery Process - Questions* Material in the Information Bulletin can be supplemented with chapters 3, 4 and 5 from the book *Mining Explained*.
4. Explain that the process of discovering a mine site begins with exploration and evaluation and relate this back to the demonstration.
5. Share with students the video Careers in the Minerals Industry.

Elaborate

6. Have students complete the assignment *Investigate a Career in Mining* to research a career of their choice.

Evaluate

7. Hand each student a sticky note, and have them write their response to the question: What are the most important ideas related to the mine discovery process? Display and discuss their responses, looking for similarities, outliers, and connected themes. Correct any misinformation.

SUPPORTING INFORMATION

1 in 100 Chance demonstration:

Although the red Popsicle stick may be chosen at anytime, the randomness of the exercise demonstrates that even with cutting edge technology the chances of finding a prospect that can become an economic orebody is very slim. These are the chances that mining companies take in the discovery of a mine.

Information Bulletin:

Emphasis should be on the technology that is used to make exploration more successful. Also, an important point to mention is that the process of finding, developing and closing a mine can take a number of years so the decision to build a mine must be based on sound information, good judgement, and proper knowledge of the mining process.

Key Words:

Basic Terms: orebody, aerial photographs, gravity, magnetism, radioactivity, conductivity, anomalies, geochemical, geophysical, prospecting, core, analysis, assayed

Secondary Terms: geologist, geological sciences

THE MINE DISCOVERY PROCESS

Concentrations of metals and minerals that can become a mine are rare and not easy to find. These concentrations have to be large enough and rich enough that a company can sell these metals or minerals at a profit after spending the money to build and operate a mine. If a concentration of metals and minerals can be mined at a profit, it is called an **orebody**. *Geologists*, individuals who have been trained in the *geological sciences*, have developed a number of techniques to help them find an orebody. Some of these techniques are described briefly below.

1. Finding a promising mine area

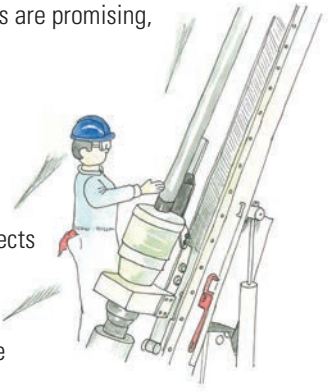
Geologists learn what geologic environments and rock types are favourable for hosting valuable mineral deposits. The first step in the mine discovery process is identifying areas where the rocks are likely to contain a valuable mineral deposit. Geologists will study aerial photographs, photographs taken from satellites, maps published by governments and previous work completed by other mining companies to help them find an area that might host an orebody. Depending on these studies, an area may be selected for further work.

2. Aerial Surveys

Concentrations of metals and minerals sometimes create areas of unusual **gravity**, **magnetism**, **radioactivity** or **conductivity**. These unusual areas are called **anomalies** and can be found using measuring devices carried in airplanes or helicopters. If interesting anomalies are found, geologists proceed to the next step.

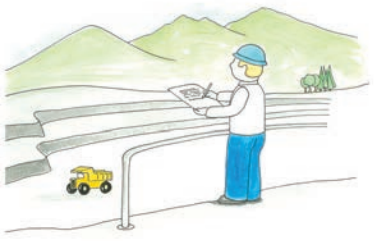
3. Ground Surveys

Before carrying out further work, the land covering the anomaly must first be acquired from the government or landowner. After acquiring the land, a location grid is made over the area. Detailed **geological mapping**, prospecting and sampling, **geochemical** and **geophysical** surveys are conducted over the grid on the ground. Geophysical surveys often use similar devices to those used in the aerial surveys. Geological mapping and **prospecting** is done to identify the different rocks in the area. During geochemical surveys, rock and soil samples are collected and analyzed for minerals. If the results of these surveys are promising, drilling is planned.



4. Drilling

A drilling machine bores small holes into the ground. These holes are only a few centimetres in diameter but sometimes they are as deep as one or two kilometres. As it makes the hole, the drill produces a continuous narrow cylinder of rock called a **core**. A geologist examines the core and selects interesting selections for **analysis**. Using chemistry, the core is **assayed** (analyzed) to find out how much metal or valuable mineral is present. If the results in a drill hole are encouraging many more holes are required to find out the size and shape of the body containing the metals or minerals. If the body is big enough and rich enough, a mine may be developed.



5. Developing a Mine

Millions of dollars may be spent constructing a mine. The mine is always designed to have the least possible effect on the surrounding environment. Once built, the mine will create jobs and produce metals and minerals needed for manufacturing the many products that you use in everyday life.

3 INVESTIGATE A CAREER IN MINING

Student Research:

- Choose whether you will use a paper copy of the Careers in Mining or allow students to access it through the internet. www.acareerinmining.ca/en/careers/index.asp
- Not every community has a mine right in its backyard, but every community will have some kind of career that can be related to the mining industry
- The Careers in the Minerals Industry supplement lists MANY careers that are tied to mining. Have students use the supplement to pick a career to investigate. They can choose from careers in Mining-Exploration, Mining-Extraction, Mining- Processing, Transport to Market, Smelting, Mining-Environmental Management and Reclamation, Mining-Suppliers, Contractors and Consultants, or Mining-Corporate Office.

Students will:

- Research their chosen career – including the education or training that would be necessary to work in that job
- Include which part of mining their job relates to –outline what this part of mining involves…eg, extraction – getting the minerals out of the ground
- Find pictures (at least 3) of people engaged in this occupation
- Include other people that you might have to work with – a geologist might work with a helicopter pilot and a mine consultant, etc.
- Find out how much these kinds of jobs pay each year
- Assemble their information in a brochure on their particular job
    - Brochures can be made by hand or through electronic means
    - Completed brochures can be displayed around the room
- BONUS: Some students may really be interested in some of these careers and may take the opportunity to interview someone currently working in that field.
- If a student chooses to interview an adult make sure that they generate a list of questions beforehand and check them to make sure that they are acceptable.
- Students will need to arrange to meet with the interviewee on their own time.

Additional Career Profiles: http://earthsciencescanada.com/careers/

3 QUESTIONS

Answer the following questions using the Information Bulletin-The Mine Discovery Process.

1. What is the first stage in the mine discovery process?

2. Name two methods that geologists use as a first step to identify an area of favourable geology.

a.

b.

3. _____ are areas where unusual results are detected and may be caused by concentrations of metals and minerals.

4. List three ground survey techniques used to investigate aerial anomalies?

a.

b.

c.

5. Why are geological mapping and prospecting carried out?

6. What happens during a geochemical survey?

7. _____ is a narrow cylinder of rock that is produced during drilling.

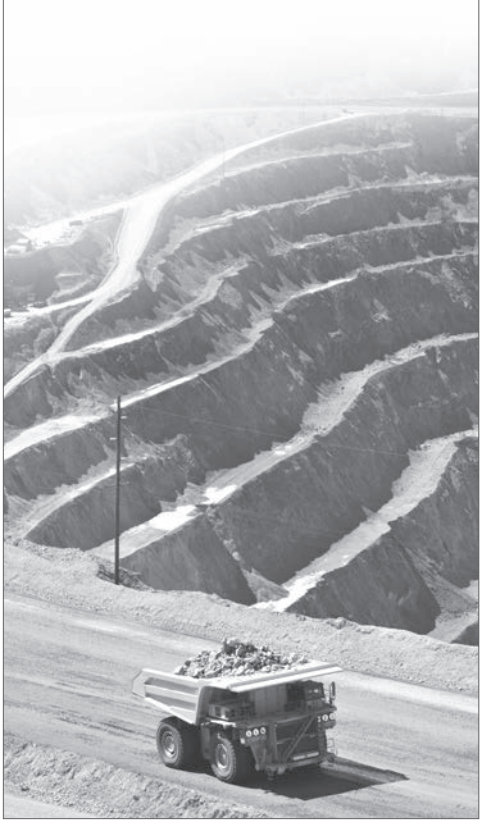
8. Drilling provides geologists with many pieces of important information. Explain this statement using examples from the text.

9. What are the benefits for developing a mine?

4 RECYCLE AND REUSE

MATERIALS

- Handout: *Recycling and Reuse Information Bulletin*
- Handout: *Recycling and Reuse Activity A – Let's Celebrate Recycling*
- Handout: *Recycling and Reuse Activity B – A Community Investigation*



Key Words:

Basic Terms: renewable resources, non renewable resources, recycling, sustainable, compost

SUMMARY OF TASK

Students will:

- Identify Earth resources used by humans to manufacture products and discuss what happens to the products when they are no longer useful.

EARTH SCIENCE LITERACY PRINCIPLE(S)

BIG IDEA 7 Humans depend on Earth for resources.

BIG IDEA 9 Humans significantly alter the Earth.

OBJECTIVES

1. Understand the difference between renewable and non-renewable resources
2. Identify the various destinations of products and materials when their initial use is completed, e.g. reuse, recycle, and disposal.
3. Communicate with others the ideas of recycling and reusing to minimise our impact on natural resources.

INSTRUCTIONS

Engage

1. Ask the students what the words "Recycle" and "Reuse" mean to them.

Explore

2. Read and discuss the handout: *Recycle and Reuse - Information Bulletin*.

Explain

3. Have students complete the handout: *Recycling and Reuse Activity A – Let's Celebrate Recycling*. Use strategies such as brainstorming, discussion, or looking at samples of songs and poetry to help their creativity. See the Evaluate section below and create an evaluation tool before they produce their work.

Elaborate

4. Have students complete the handout: *Recycling and Reuse Activity B – A Community Investigation*. They may survey peers in the school, or family and friends outside of the school.
5. You may wish to compile the interviews from Activity B into a scrapbook. This can be a good way of highlighting community viewpoints and knowledge regarding recycling.
6. Have students collect media articles on recycling and reuse, and display in the classroom to further reinforce the subject.

Evaluate

7. As a group, design an evaluation tool for the "*Let's Celebrate Recycling*" product. Once consensus is reached, use this tool to guide their creativity and evaluate their work.

RECYCLE AND REUSE

The world around us depends on our responsible use of its natural resources. The quantity of some of these resources is limited and they cannot be replenished once they are used up. These kinds of natural resources are called **non-renewable resources** and examples of these include fossil fuels like oil and gas, metals like gold, silver, and lead, and minerals like gypsum and calcite. Once these resources are used, they are gone forever unless they are recycled or reused. These resources differ from **renewable resources** which naturally replenish themselves through everyday processes. Examples of renewable resources include forests, fish, and groundwater. When a forest is cut down (logged) for its lumber, it can be replanted to later produce more trees. Unfortunately trees grow very slowly, so we must limit our use of paper products to avoid over-harvesting the mature forests that we have now. Using and extracting only the resources we need from the Earth at a rate that will allow the renewable resources to replenish themselves, and the non-renewable resources to last for years to come, is called **sustainable** living.

Wasting our natural resources is a problem. People naturally produce waste and have done so for thousands of years. During the early days of civilization, people had little difficulty finding a place to dispose of their garbage, but as the population increased and became more sophisticated, waste disposal became a major problem. The solutions found to handle the growing amount of garbage were either incineration (burning of garbage) or burial in a local dump or landfill site. Recently, some cities and towns have tried to send their garbage to other communities for burial and incineration, but this method has been largely unsuccessful. The solution is not moving garbage to another place, but limiting the amount of garbage we create.

Recycling, the reuse of items in order to conserve non-renewable resources, is practiced by a growing number of individuals, communities and corporations around the world. The key to understanding recycling is found in the word itself. The term recycling contains the prefix “re” meaning “to do again”, and “cycle” which comes from the Greek word “kyklos”, which means “circle where events return to their starting point over and over”. Therefore, recycling means that products or items are returned to their starting point again and again. When you finish reading your newspaper or drinking your pop and recycle the paper or can, the products will be broken down to their original state (paper or aluminum) and reformed into a new newspaper or can.

Recycling can be broken up into three general categories depending on the material to be recycled. The first is reintegrating waste back into the cycle of nature. An example of this is **compost** - adding food waste (like banana peels and egg shells) and lawn clippings (like grass and leaves) to soil so that when they break down, the nutrients in them will be available for the plants that grow in your garden.

A second category of recycling is using materials after reprocessing for the same or similar purpose. This is what happens when you put your pop can, glass bottle or newspaper into the recycling bin at home or at school. Your municipality will come and get your items for recycling, take them to a plant that will break down your paper, aluminum (pop can) or glass and make it into new newspapers, pop cans and bottles.

The third category of recycling is reusing materials more than once as opposed to throwing them in the garbage. You can reuse yogurt containers for leftover food, or wash and reuse old glass bottles to store nails or small household items. You could use a broken plastic cup to hold pens or pencils by the phone. All these things will keep plastics and other materials out of our garbage and out of our landfill and can be done at home to reduce the amount of waste going to landfills or incinerators.

The Earth’s natural resources once seemed unlimited. However, with population growth and increased use of natural resources, we are in danger of running out of non-renewable resources, and we’re placing our renewable resources in danger. Careful management of our resources and techniques such as reducing the amount of waste created, reusing, and recycling will give us hope for a future where needed resources are still available to us and future generations.

LET'S CELEBRATE RECYCLING

Write a song, poem, short story, create an anagram or limerick about recycling and reuse. You could also draw a picture or create a cartoon character that will encourage us to recycle and reuse.

Be creative! Student creations could be displayed or performed for the class.

Some words to think about and possibly include are:

- renewable and non-renewable resources
- recycle and reuse
- sustainable
- compost

There are many other words. These are only an example of the kinds of words that could be in your celebration.

Jot down a few ideas here:

A COMMUNITY INVESTIGATION

Every community has different recycling needs depending on the type and amount of garbage it produces and the size of the community. Investigate your own community's recycling and waste disposal facilities and see if you can find out where things go when you put them out on the curb in front of your house!

Interview your mom and dad, and use the internet (checking your local government municipality website) if necessary to find out about the recycling and waste disposal (landfill, dump, etc) facilities near you. Use the Interview Form below to collect the responses to your questions.

Interview Form "Where does all my garbage go?"

Name: Address:

What items does your community currently recycle? (i.e. newsprint, aluminum, etc).

Where is your local community landfill located? What items cannot be disposed of in a landfill?

Where in your community can you dispose of batteries, paint cans, motor oil or electronics?

What does your family do with old clothes?

What does your family do with yard waste (fall leaves, grass clippings, etc)?

Does your family compost kitchen scraps? Why or why not?