

NATURAL RESOURCE DEPLETION & MINING GRADE 8 AND UP READING

Improve students'
literacy skills

Science Applicability

Sub Plan



Reading Comment

“

Extremely satisfied - Great resource to work on student reading comprehension and it tied into the topic I was teaching. My students have been struggling with reading and I've been incorporating more reading into my lessons. Thank you for the resource.

”

SCROLL
to take a look inside!

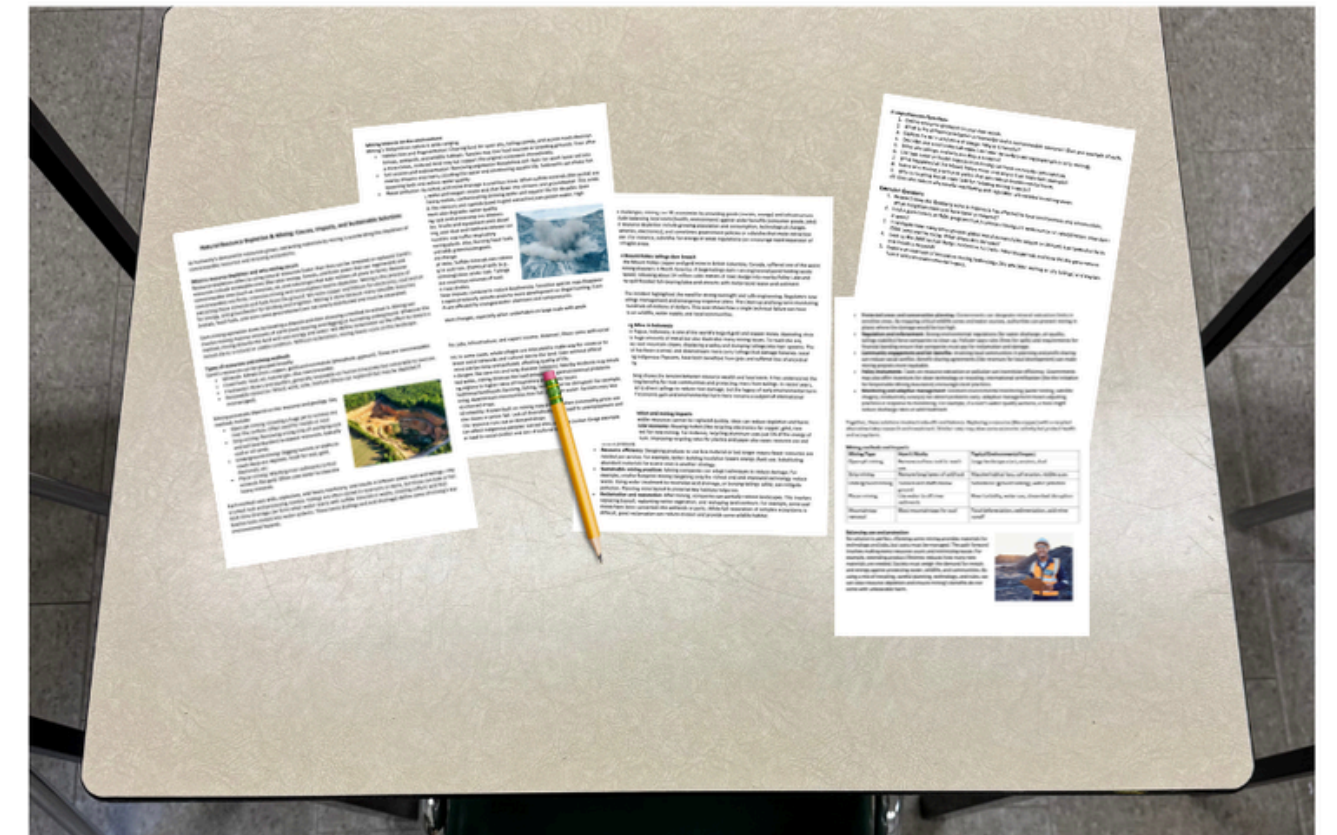


THE PROBLEMS YOU FACE

- Limited time to teach scientific literacy and strengthen students' reading and analysis skills.
- Need meaningful extension activities to engage fast-moving learners.
- Difficulty creating effective last-minute sub plans that still support student learning.

CLASSROOM READY

- Questions and Answer Key
- **No Prep, Ready-to-Use:** Print or assign digitally with Google Docs, Microsoft Word, and PDF formats for flexible classroom use
- **Includes Varied Question Types:** Knowledge, thinking, connecting, application, and open-ended questions.



What Will Your Students Learn?

READING COMPREHENSION ARTICLE & QUESTION BUNDLE

Article with
Comprehension
Questions

Grade 8 and Up

Print & Digital

- What Is Resource Depletion?
- Renewable vs. Nonrenewable Resources
- Why Mining Occurs
- Types of Resources (Minerals, Fossil Fuels, Water)
- Mining Methods (Open-Pit, Strip, Underground, Placer)
- Tailings and Mining Waste
- Acid Mine Drainage and Water Pollution
- Habitat Loss and Biodiversity Impacts
- Air Pollution and Climate Connections
- Social and Economic Impacts of Mining
- Case Studies (Mount Polley & Grasberg Mine)
- Recycling and Resource Efficiency
- Sustainable Mining Practices
- Reclamation and Environmental Restoration
- Regulation and Environmental Protection

Comprehension Questions

1. Define resource depletion in your own words.
2. What is the difference between a renewable and a nonrenewable resource? Give one example.
3. Explain the term acid mine drainage. Why is it harmful?
4. Describe one environmental impact common to surface mining (open-pit or strip mining).
5. What are tailings, and why are they a concern?
6. List two ways that mining can have on nearby communities.
7. Give one example of a sustainable mining practice.
8. What is the difference between a renewable and a nonrenewable resource? Give one example.
9. Explain the term acid mine drainage. Why is it harmful?
10. Describe one environmental impact common to surface mining (open-pit or strip mining).

Extended Questions

1. What is resource depletion and why mining occurs? Resource depletion refers to using natural resources faster than they can be renewed or replaced. Earth's resources include renewable ones (like solar energy, forests, and fresh water that can regenerate) and nonrenewable ones (such as minerals, oil, and natural gas that take millions of years to form). Because nonrenewables are finite, intensive mining and consumption lead to depletion. Mining is the process of extracting these minerals and fuels from the ground. We mine copper and lithium for electronics, coal and oil for energy, and groundwater for drinking and irrigation. Mining is done because many valuable resources (metals, fossil fuels, and even some groundwater) are not evenly distributed and must be excavated.
2. Each mining operation starts by locating a deposit and then choosing a method to extract it. Mining can involve moving massive amounts of earth (land clearing and digging) or tunneling underground. Whatever the method, mining disturbs the land and uses energy and water. We define reclamation as the effort to restore a mined site to a natural or usable condition. Without reclamation, mining leaves scars on the landscape.
3. Types of resources and mining methods Earth's resources can be grouped broadly:
 - Minerals: Metals (iron, copper, gold) and nonmetals (phosphate, gypsum). These are nonrenewable.
 - Fossil fuels: Coal, oil, natural gas. Also nonrenewable.
 - Freshwater: Rivers and aquifers, generally renewable on human timescales but vulnerable to overuse.
 - Renewable resources: Wood, wind, solar, biofuels (these can replenish but may be depleted if mismanaged).
4. Mining processes depend on the resource and geology. Key methods include:
 - Open-pit mining: Creating a huge pit to remove ore near the surface. Often used for metals or coal.
 - Strip mining: Removing a long strip of overlying rock and soil (overburden) to expose resources, typically coal or oil sands.
 - Underground mining: Digging tunnels or shafts to reach deep ore deposits. Used for coal, gold, diamonds, etc.
 - Placer mining: Extracting minerals from sediments to find heavy metals.



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Your Reading

Natural Resource Depletion & Mining: Causes, Impacts, and Sustainable Solutions

As humanity's demand for resources grows, extracting materials by mining is accelerating the depletion of nonrenewable resources and stressing ecosystems.

What is resource depletion and why mining occurs

Resource depletion refers to using natural resources faster than they can be renewed or replaced. Resources include renewable ones (like solar energy, forests, and fresh water that can regenerate) and nonrenewable ones (such as minerals, oil, and natural gas that take millions of years to form). Nonrenewables are finite, and intensive mining and consumption lead to depletion. Mining is the process of extracting these minerals and fuels from the ground. We mine copper and lithium for electronics, and groundwater for drinking and irrigation. Mining is done because many valuable resources (metals, fossil fuels, and even some groundwater) are not evenly distributed and must be extracted.

Each mining operation starts by locating a deposit and then choosing a method to extract it. Methods can involve moving massive amounts of earth (land clearing and digging) or tunneling underground. Mining disturbs the land and uses energy and water. We define reclamation as the process of returning a mined site to a natural or usable condition. Without reclamation, mining leaves scars on the landscape.

Types of resources and mining methods

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Mining processes depend on the resource and geology. Key methods include:

- Open-pit mining: Creating a huge pit to remove ore near the surface. Often used for metals or coal.
- Strip mining: Removing a long strip of overlying rock and soil (overburden) to expose resources, typically coal or oil sands.
- Underground mining: Digging tunnels or shafts to reach deep ore deposits. Used for coal, gold, diamonds, etc.
- Placer mining: Washing river sediments to find minerals like gold. Often uses water to separate heavy minerals.



Each method uses drills, explosives, and heavy machinery, and results in leftover waste rock and processing residue. Tailings are often stored in reservoirs or dams, but they can leak. Acid mine drainage can form when water reacts with sulfide minerals in waste, creating sulfuric acid that leaches toxic metals into water systems. These terms (tailings and acid drainage) define some of the environmental hazards of mining.

Mining impacts on the environment

Mining's footprint on nature is wide-ranging:

- Habitat loss and fragmentation: Clearing land for open pits, tailings ponds, and access roads destroys forests, wetlands, and wildlife habitats. Species may lose food sources or breeding grounds. Even after a mine closes, restored land may not support the original ecosystem immediately.
- Soil erosion and sedimentation: Removing vegetation destabilizes soil. Rain can wash loose soil into nearby streams and rivers, clouding the water and smothering aquatic life. Sediments can choke fish spawning beds and reduce water quality.
- Water pollution: As noted, acid mine drainage is a serious issue. When sulfide minerals (like pyrite) are exposed by mining, water and oxygen create acid that flows into streams and groundwater. This acidic water can dissolve heavy metals, contaminating drinking water and aquatic life for decades. Even without acid, metals like mercury and cyanide (used in gold extraction) can poison water. High turbidity from sediment also degrades water quality.
- Air pollution: Blasting rock and processing ore releases dust and fine particles. Trucks and equipment emit diesel exhaust. In coal mining, coal dust and methane release can occur. Nearby communities may suffer respiratory problems or dust covering plants. Also, burning fossil fuels mined from the ground adds greenhouse gases, contributing to climate change.
- Acid rain and chemical leaks: Sulfide minerals can release sulfur dioxide, leading to acid rain. Chemical spills (e.g., cyanide from gold processing) pose acute risks. Tailings dam failures can release enormous volumes of toxic sludge, as discussed in case studies.
- Biodiversity loss: All these impacts combine to reduce biodiversity. Sensitive species may disappear locally. Road networks open previously remote areas to more development or illegal hunting. Even aquatic insects and fish are affected by changed water chemistry and temperatures.



Mining can drive major ecosystem changes, especially when undertaken on large scale with weak environmental safeguards.

Social and economic impacts

Mining brings economic benefits: jobs, infrastructure, and export income. However, these come with social trade-offs:

- Community displacement: In some cases, whole villages are relocated to make way for mines or to avoid hazards. This can break social networks and cultural ties to the land. Even without official relocation, living near a mine can be noisy and polluted, affecting quality of life.
- Health risks: Miners face dangers like cave-ins and lung diseases (silicosis). Nearby residents may inhale dust or drink contaminated water, risking illnesses like lead poisoning or gastrointestinal problems. Studies have linked mining regions to higher rates of respiratory and kidney issues.
- Livelihood disruptions: Traditional livelihoods (farming, fishing, herding) can be disrupted. For example, if a river is polluted by mining, downstream communities lose fish and clean water. Farmers may lose land to soil erosion or dust-covered crops.
- Economic dependence and volatility: A town built on mining may prosper when commodity prices are high, but suffer when a mine closes or prices fall. Lack of diversification can lead to unemployment and economic hardship when the resource runs out or demand drops.
- Cultural impacts: Mining can affect indigenous peoples' sacred sites, as in the Juukan Gorge example. Loss of heritage or land can lead to social conflict and loss of cultural identity.

Despite these challenges, mining can lift economies by providing jobs and infrastructure. *Trade-offs include balancing local costs (health, environment) against benefits (economic growth, jobs). Resource depletion include growing population and demand for resources, and sometimes government subsidies for energy or weak regulations.*

Mount Polley tailings dam breach

In 2014, a tailings dam at the Mount Polley copper and gold mine in British Columbia, Canada, failed, releasing about 24 million cubic meters of toxic tailings sludge into a nearby lake and streams, devastating local wildlife, water supply, and local communities.

The incident highlighted the need for stronger oversight, better management and emergency response, and billions of dollars in cleanup costs. This case shows the risks of mining when safety is compromised.

Mine in Indonesia

Papua, Indonesia, is one of the world's largest producers of copper and gold. Mining has brought huge amounts of metal but also illustrates the environmental and social costs. Deforestation has been scarred, and downstream rivers that support indigenous Papuans, have both benefited and suffered.

The Grasberg mine shows the tension between resource extraction and the need to protect local communities and the environment. Efforts to divert tailings to reduce river damage and improve economic gain and environmental harm are ongoing.

Resource depletion and mining impacts

Nonrenewable resources cannot be replaced quickly. The circular economy, which focuses on reusing materials (like recycling), is needed for new mining. For instance, recycling metals can reduce the need for new mining. Improving recycling rates for plastics and other materials can also help.

Efficiency: Designing products to use less materials and energy can reduce the need for new mining. For example, better building insulation can reduce the need for new mining. **Mining practices:** Mining companies can adopt more sustainable practices, such as footprint mining (targeting only the richest parts of a deposit), water treatment to neutralize acid drainage, and careful planning, technology, and rules, we can slow resource depletion and ensure mining's benefits do not come with unbearable harm. **Reclamation:** After mining, companies can restore the land by replanting native vegetation, and reshaping the land into wetlands or parks. While reclamation can reduce erosion and provide some habitat, it often cannot fully restore the original ecosystem.

- Protected areas and conservation planning:** Governments can designate mineral-extraction sensitive areas. By mapping critical wildlife zones and water sources, authorities can prevent mining in places where the damage would be too high.
- Regulation and enforcement:** Strong environmental regulations (for water discharge, air quality, and tailings stability) force companies to clean up. Polluter-pays rules (fines for spills) and requiring financial bonding ensure that companies must pay for reclamation and damage.
- Community engagement and fair benefits:** Involving local communities in planning and providing them with a share of the benefits (like revenues for local development) can make mining projects more equitable.
- Policy instruments:** Taxes on resource extraction or pollution can incentivize efficiency. Government incentives for clean technology or recycling. International certification (like the ISO 26000 for Responsible Mining Assurance) encourages best practices.
- Monitoring and adaptive management:** Constant environmental monitoring (water testing, biodiversity surveys) can detect problems early. Adaptive management means adjusting practices in response to monitoring. For example, if a river's water quality worsens, a mine might reduce discharge rates or add treatment.

Together, these solutions involve trade-offs and balance. Replacing a resource (like copper) with a different one (like aluminum) takes research and investment. Stricter rules may slow some economic activity but protect ecosystems.

Mining methods and impacts

Mining Type	How It Works	Typical Environmental Impact
Open-pit mining	Remove surface rock to reach ore	Large landscape scars, erosion, dust
Strip mining	Remove long layers of soil/rock	Massive habitat loss, soil erosion, visible scars
Underground mining	Tunnels and shafts below ground	Subsidence (ground sinking), water pollution
Placer mining	Use water to sift river sediments	River turbidity, water use, streambed degradation
Mountaintop removal	Blast mountaintops for coal	Total deforestation, sedimentation, acid runoff

Balancing use and protection

No solution is perfect. Allowing some mining provides materials for technology and jobs, but costs must be managed. The path forward involves making every resource count and minimizing waste. For example, extending product lifetimes reduces how many new materials are needed. Society must weigh the demand for metals and energy against protecting water, wildlife, and local communities. By using a mix of recycling, careful planning, technology, and rules, we can slow resource depletion and ensure mining's benefits do not come with unbearable harm.



Comprehension Questions

- Define resource depletion in your own words.
- What is the difference between a renewable and a nonrenewable resource? Give one example of each.
- Explain the term acid mine drainage. Why is it harmful?
- Describe one environmental impact common to surface mining (open-pit or strip mining).
- What are tailings, and why are they a concern?
- List two social or health impacts that mining can have on nearby communities.
- What happened at the Mount Polley mine, and why is it an important example?
- Name one mining practice or policy that can reduce environmental harm.
- Why is recycling metal important for reducing mining impacts?
- Give one reason why careful monitoring and regulation are needed in mining areas.

Extension Questions

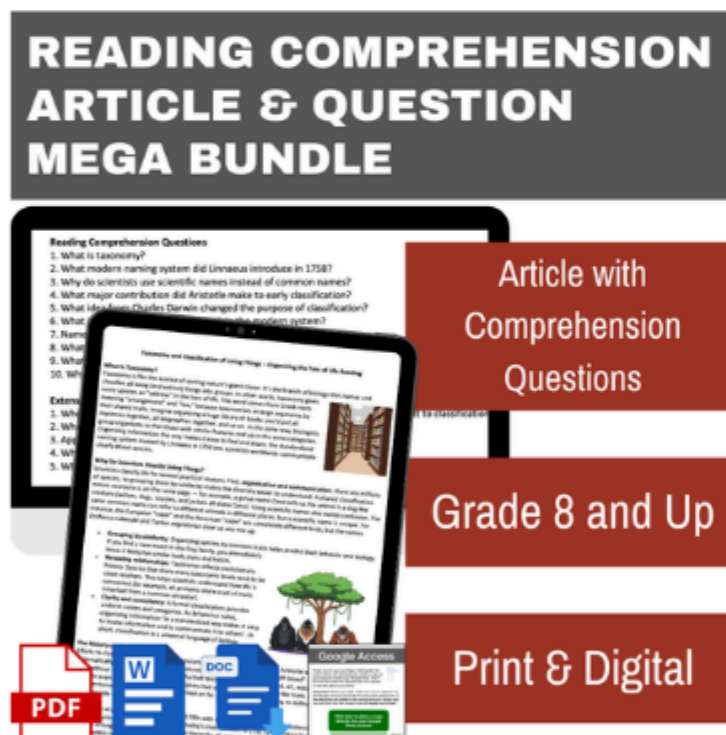
- Research how the Grasberg mine in Indonesia has affected its local environment and communities. What mitigation measures have been attempted?
- Find a government or NGO program that promotes mining site reclamation or rehabilitation. How does it work?
- Investigate how many times greater global metal demand (like copper or lithium) is projected to be in 2050 compared to today. What drives this increase?
- Look up the 2020 Juukan Gorge incident in Australia. What happened, and how did the government and industry respond?
- Explore an example of innovative mining technology (like precision mining or dry tailings) and explain how it reduces environmental impact.

Comprehension and Extension Questions with Answer Key



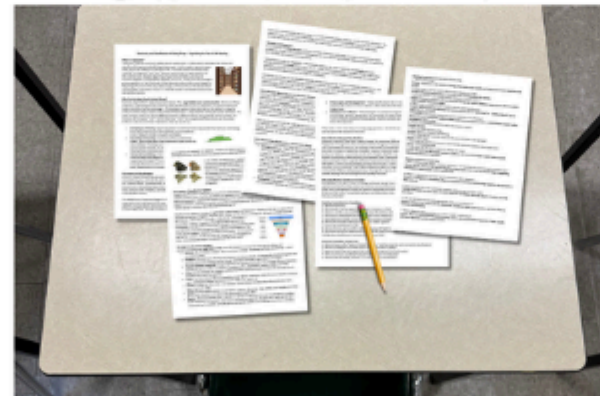
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Includes over 130 readings for students in grades 8 and up. The bundle covers all science topics and will save you over 75%.



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- **Includes Varied Question Types:** Knowledge, thinking, connecting, application, and open-ended questions.



★★★★★ Extremely satisfied - It is a good supplemental activity either for review and at the same time introducing some concept. I also use this for sub plan. It is well presented, organized and interesting.

★★★★★ Extremely satisfied - This a great resource. I used this for a sub plan. It was fun and engaging for my students.

Grade 8 and Up Scientific Reading Comprehension Article Mega Bundle

ALL my current and future grade 8 and up readings, covering the following subject areas:

Biology
Chemistry
Earth and Space
Ecology and the Environment
Energy
Health
Natural Disasters
Physics



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