



Lesson Five: Just a Little off the Top

Grade Level: 5th Grade

Time: 60 minutes

Essential Question: How can we be stewards of Wyoming's mineral and energy resources to benefit current and future generations?

Objective: Students will learn what reclamation is and why reclamation is important.

Purpose: Students create a model of the reclamation process and make connections between their model and actual mines.

Required Materials/Resources:

- Base layer (soil, sand, flour, oatmeal) (enough for each small group)
- Shaving Cream (not gel) (enough for each small group)
- "Minerals" to mine (flat rocks, marbles, glass stones, bingo chips, etc.) (5 per small group)
- Aluminum cake pans (1 per small group)
- Sprinkles (optional, used to represent vegetation) (enough for each small group)
- Pencils
- Toothpicks, transparent straws, plastic spoons, and other small tools for "mining"
- Plastic knives (one per small group)
- White paper (one sheet per student)
- Camera/phone to take *before* pictures of the "mines" (step 4)

TEACHER NOTE:

The video is about gold mining, but the process and principles about reclamation and stewardship are still very applicable to surface mining in Wyoming.

- Teacher computer for video and pictures
- Video: <https://www.youtube.com/watch?v=RRjZlYh0qM0>
Gold Rush: Land Reclamation: The Process (Source 1) Video length: 2 minutes 24 seconds
- Reclaiming Mine Sites PowerPoint presentation
- Reclamation slide show
<https://www.cnet.com/news/from-coal-mine-to-wind-farm/> (Source 3)
- Wyoming Minerals Quick Write sheet (one per student)

Suggested Teacher Preparation:

- Gather all materials for the “mining” and “reclamation” activity.
- Preview video and slideshow.
- Be able to display Reclaiming Mine Sites PowerPoint presentation.
- Assign students to groups of 2 or 3 depending on how many groups you want to have for the “mining” and “reclamation” activity.

Standards:

Science: 5-ESS3-1, 3-5-ETS1-1 (Explicit)

Social Studies: SS5.5.4 (Practiced/Encountered)


Vocabulary:

- **Cross section** - sample of a larger group
- **Geologist** - a scientist who studies rocks and minerals
- **Landscape** - all the features of an area of land that you can see
- **Overburden** – (noun) rock or soil overlaying a mineral deposit
- **Reclamation** - the act of returning something to a former, better state

Instructional Procedure/Steps:

Part 1: This part of the lesson is to help students understand how difficult reclamation is. It should take about 40 minutes.

1. Say: **“Today, you are going to be extracting “minerals” and then reclaiming your mine sites.”**
2. Put students into small groups (2-3) and give each group their mine site materials. Each group will need an aluminum pan, 5 “minerals”, a base layer, shaving cream, and sprinkles.
3. With their group, students will need to hide their minerals in their base layer. Say: **“Your group needs to hide your minerals in your base layer. Once your minerals are hidden, you need to create a realistic landscape that includes hills, valleys, and other landforms. It cannot be just a flat surface. Once your base layer is in place, you will cover it with a layer of shaving cream and sprinkles.”** Allow students 5-10 minutes to hide minerals.

4.  Rotate students to a model that is not their own and pass out white sheets of paper. Say: **“Your group will now have to mine out the minerals of this model. First, however, your group must make a plan for the mining process.”** Be sure to take *before* photos of each landscape to see if they are reclaimed appropriately at the end of the lesson. Direct students to take the piece of paper and fold it into 4 equal sections. Each student must create his/her own sketch sheet. Have students label each part as listed below:



In this task, students will be engaged in the higher order thinking skill of synthesis by imagining, predicting, and inferring about the processes of mining and reclamation.

TEACHER NOTE: Labeled Landscape Sketches Set-up


Landscape in original state	Inside of landscape (guess)
Inside of landscape (based on core samples)	Reclaimed landscape

5. Say: **“In the first section, draw what your landscape looks like in its original state. Be sure to label your sketch.”**

Give students time to draw. When all have finished, say: **“In the second section, draw what you think the inside of your landscape looks like and where the minerals might be. Be sure to label your sketch.”** Give students time to draw. When all have finished, say: **“Geologists don’t know exactly what the inside of the earth looks like; much like you don’t know what the inside of your landscape looks like.”** Brainstorm as a whole group by asking this question: **“How would geologists study the earth to learn more about it and decide where to mine, or how could they figure out where the minerals they want are?”** Call on various students for ideas. If no students bring up the idea, say: **“Geologists take core samples, so they can see where minerals are in the ground. We can do something similar with our landscapes.”** Demonstrate how students can take a “sample” by “drilling” a hole with a pencil. To take the core sample, push the pencil into the dirt, and see if it hits something potentially worthwhile. Talk with students about the fact that geologists would probably use a GPS in order to mark potential mine sites and the area they should cover. Students should take multiple core samples in order to completely draw what they think the inside looks like.

When students are finished taking their “core samples” say:
“In section 3 of your paper, draw a cross section of what you think your landscape looks like on the inside based on your core samples. Be sure to label your cross section.”

6. When students have completed their sketches in section 3, say: **“Now, you are to extract the minerals out of your landscape. Remember, you will need to reclaim your landscape when you are finished mining to make it look like it did in its original state.”** Give students 5-10 minutes to mine and reclaim their landscape. Have extra shaving cream, sprinkles, plastic knives, and other mining tools available for the reclamation process. The goal is to make the landscape look as close to its original state as possible.

7.  When students are finished reclaiming their landscape, show students the picture of their original landscape. Ask students to think about the differences of their reclaimed landscape and their original. Have students sketch their reclaimed landscape in section 4 of their paper. Say: **“Now, section 4 of your paper, draw what your reclaimed landscape looks like. Be sure to label your sketch.”** When students are done sketching their reclaimed landscape, discuss the questions below, first with their landscape group then with whole class. *In these first several questions, it is important for students to articulate what the problem was and delineate possible solutions. DO NOT just give them the answers, part of the process is for them to struggle through solutions.*

- **“Did everyone’s reclamation process look the same?”** *Answers will vary: similar to real mines, reclamation looks different depending on the extraction method that is used.*
- **“Were some students’ reclaimed landscape closer to the original? What did they do different?”** *Answers will vary.*



In this task, students will be engaged in the higher order thinking skill of analysis.

- **“What were some of the problems you had when reclaiming your landscape?”** *Answers will vary.*
- **“How did you solve them?”** *Answers will vary.*
- **“What would have made reclaiming your landscape easier?”** *Answers will vary.*
- **“How can you connect reclaiming your landscape to the mines reclaiming land?”** *They are both difficult processes.*
- **“How are the processes similar?”** *The shaving cream represents the earth covering the mineral called the overburden, the rocks represents the mineral, and putting the shaving cream and sprinkles back on after mining is like reclaiming the land. They both attempted to reclaim what was on top of the land, and they both had a nonrenewable resource that was mined and is no longer present in the land.*
- **“How are the two processes different?”** *The model can be easier to “reclaim”. The shaving cream and sprinkles are fairly easy to replace on top of the model, but real-life vegetation can take years or even decades to regrow.*
- **“What happens when all the minerals are mined?”** *They are gone since the minerals in Wyoming are nonrenewable.*
- **“Why would reclamation be important?”** *It allows animals, plants, and people to use the land again. This would also be a good time to discuss how reclamation specialists spend time before mining observing the landscape and noting existing plants and animals. That way, when they are done mining, the overburden is replaced with the correct seed mixture.*
- **“Is reclamation an important part of stewardship? Why?”** *Yes, if mines didn’t reclaim the land it would stay messy like the landscape and would be unusable or harmful to animals. In*

addition, native plants may be unable to grow.

Part 2: This part of the lesson is to help students see that reclamation is difficult, expensive, and time consuming; however, it is a very important part of the mining process. It should take about 20 minutes.

1. Say: **“Minerals are a natural resource, and extracting them is a difficult, costly process. It's important that miners/mines use the land responsibly, and that consumers use mineral products wisely.”** Discuss the following points:
 - Talk with students about the fact that operating a mine is a long and expensive process.
 - As they did with their mine model, the mining process begins with geologists, who have to find a site to mine with a large enough mineral deposit to make a profit.
 - Mines also have expenses for testing, permitting, buying equipment, employee wages, and reclamation specialists/management.
 - The price that consumers pay for mineral products is directly related to how much it costs to mine those minerals.
- Say: **“Once the mining is complete, mining companies need to think about reclaiming the land that has been disturbed in the mining process.”** Watch the *Gold Rush: Land Reclamation: The Process* video. When finished, click through the reclamation slideshow that shows the reclamation of the Dave Johnston Coal mine into a wind farm. Say: **“Wyoming has the ONLY reclamation project that put a renewable energy source (wind) on top of a nonrenewable energy source (coal).”** Finally, display the Reclaiming Mine Sites PowerPoint presentation. Ask: **“How is a reclaimed mining site different than one that is not reclaimed?”** When students finish sharing, discuss the following points:

TEACHER NOTE:

Go to

www.wyomingmining.org/reclamation

(Source 2) for additional information on reclamation.

- Remind students that reclamation is the act of returning something to a former, better state.
- Mines have reclamation specialists who work with state and federal agencies in order to complete the reclamation process.
- Reclaiming mine sites was not required before the Mining Reclamation Act. Today, mining companies are legally required to replace mine sites with wildlife habitats, recreation areas, and other developments.
- When the land is reclaimed, it is hard to tell the mine site ever existed.

Assessment: Pass out the Wyoming Minerals Quick Write sheets. Give students 2-3 minutes to complete a quick write for the prompt: **“Why is reclamation important for the good stewardship of our minerals and other resources?”** *Student answers should include that, when mining companies reclaim the land that they have disturbed, they are providing people and the land with the opportunity to be used again for another purpose rather than being an eyesore on the landscape. Also, they are recreating habitats that may have been previously lost.*

Credits/Sources:

1. Discovery. (2015, December 8). *Gold Rush: Land Reclamation: The Process*. Retrieved July 31, 2017 from <https://www.youtube.com/watch?v=RRjZlYh0qM0>
2. Wyoming Mining Association. (2017). *Reclamation*. Retrieved July 31, 2017 from <https://www.wyomingmining.org/reclamation/>
3. CNET magazine. (2009, July 24.) *From coal mine to wind farm*. Retrieved July 18, 2018 from <https://www.cnet.com/news/from-coal-mine-to-wind-farm/>
4. Photo credits are listed in the PowerPoint presentation.