

Human's Dependence on Earth's Mineral Resources

Unit 3

Mining Methods and Impacts

Part I: Muffin Mining

Guiding Questions

Learning objectives

- Describe different mining methods, under what conditions they are used, and their impacts.
- Explain the purpose of beneficiation and the importance/challenges of managing mining-related waste products.
- Explain challenges to reclamation and remediation.

Do not eat your muffin until given permission! Please work through these questions as you mine your muffin(s). We will discuss at the end of the activity, although we may not cover every question.

Question Set 1a (after mining the muffin)

- 1) Describe the process you used to locate the ore.
- 2) Describe the process you used to extract the ore.
- 3) Did you consider blueberry-stained muffin to be valuable ore or just the blueberries themselves? Explain your answer.
- 4) How much of the muffin was waste rock (“disturbed” or removed but without ore)? Estimate the percentage volume of your (a) collected ore in relation to (b) the “contaminated rock,” (c) the disturbed non-ore portion of the muffin (waste rock), and to (d) the entirely undisturbed portion (if any).
- 5) In what ways would this have been easier if you did not have to worry about preserving the surface or underground? In what ways would your percentages be different? *[Don't use this question if completing this as a two-muffin activity]*

Question Set 1b (answer these questions only if you are given a second muffin to mine)

- 1) Describe the process you used to locate the ore and how it was different from the first muffin.
- 2) Describe the process you used to extract the ore and how it was different from the first muffin.
- 3) How much of the muffin was waste rock (“disturbed” or removed but without ore)? Estimate the percentage volume of your (a) collected ore in relation to (b) the “contaminated rock,” (c) the disturbed non-ore portion of the muffin (waste rock), and to (d) the entirely undisturbed portion (if any).
- 4) Were you able to obtain the same amount of ore from this muffin as the first muffin? Why or why not?
- 5) Describe the additional challenges caused by mining in this fashion.

Question Set 2 (after reclamation of muffins)

- 1) Were you able to successfully restore your muffin? Explain differences you noted in the muffin from before you removed the ore and now that you have reconstructed it.

- 2) What might be the differences in the reclamation process and the success rate of reclamation if one muffin is completed with the least amount of disturbance possible, while another is completed without regard for disturbance or creation of waste?
- 3) If the blueberry ore was precious (economically very valuable) and you wanted to get as much of it out from your muffin as possible, what might you do differently in regard to the “contaminated” waste product? What other resources might be useful in helping to get more ore from this portion of the rock (muffin)?
- 4) Imagine that the blueberry is the ore but not the ultimate desired product. Instead, we want the potassium (K) within the blueberry. Further concentration needs to occur in order to obtain the potassium from the overall blueberry.

Estimate: Assuming that we could get perfect separation, what percentage of the blueberry is still a waste product (ending up in tailing pond or leach heap) for 500 grams of blueberries if 148 grams of blueberries contains approximately 114 mg of potassium (<http://nutritiondata.self.com/facts/fruits-and-fruit-juices/1851/2>)?

- 5) Muffins are small, but the Earth is large. Drilling/mining is expensive and time consuming. Ores are also not distributed equally (via geologic processes) nor are all equally accessible (i.e., due to economics or political situations). What would you need to do or do differently in order to be effective in your choice of mining location on the Earth?