Introduction to Environmental Science (ENR2100)
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COAL MINING IN THE USA

Patriot Coal's Horbet-21 strip mine in West Virginia is almost 12,000 acres and one of the largest strip mines. The ecosystem was destroyed by mountaintop removal and nearby residents of Boone County West Virginia suffer from the mining. *The image was taken by Melissa Farlow.* http://science.nationalgeographic.com/science/enlarge/strip-mine.html

Coal Mining in the USA

Coal-fired power plants generate approximately 30% of the electricity in the United States. Each year about 900-million tons of coal is mined in the USA, or almost 6,000 pounds for each U.S. citizen. Most of this coal is mined from Wyoming, West Virginia, and Kentucky. The mining process can pollute freshwater resources and destroy natural ecosystems. One type of mining that is particularly destructive is called mountaintop removal (MTR). This is the process of extracting coal seams from a mountain using explosives to remove the summit of the mountain. The excess rock and debris is discarded in the valleys because it is less expensive than removing it completely from the area. MTR predominantly appears in West Virginia, Kentucky and Tennessee. The explosives destroy the vegetation on the mountain and by filling the valleys with the debris, wildlife and valley streams are destroyed. Nearby people and organisms suffer from pollution in the air and water (e.g., heavy metals, acid mine drainage).

Watch/read the following and type your answers in a Word document (or any other word processing software that you are comfortable using). After you are done, log onto https://carmen.osu.edu and upload your Word document (or PDF file) with your answers to the Carmen dropbox. The dropbox will close exactly at the deadline and if you miss the deadline then you will not be able to complete this assignment and you will earn a 0%. Do not wait until the last minute to upload your answers to dropbox because if something goes wrong with your Internet connection and you miss the deadline, then you are out of luck. We do not accept assignments by Email and we do not accept late assignments. One word of caution. As with most classes offered at OSU, we use TurnItIn software http://turnitin.com to check for plagiarism against previously published articles and books and against student papers from universities all over the world. So it is in your best interest to make sure that you assignment is your own. We really do want to hear from you and your thoughts and ideas on the various topics below. You will no doubt offer exciting insight and novel solutions to these issues and it is important for your success in our class that you use your own ideas and talents to complete this assignment. When you answer these questions we are looking for you to provide substantial insight and knowledge of the subject matter. As such, your answers will likely require between 250-500 words for each question 1-6 listed below. For comparison, this paragraph that you are currently reading contains approximately 300 words.

1. (4-points) Watch the video *Not On This Land* (http://e360.yale.edu/feature/not_on_this_land_a_western_tribe_takes_a_stand_and_says_no_to_big_coal/2932/) and answer the following questions. How does mining affect the people of the Northern Cheyanne Reservation? What do you suppose that humans can do to stop the mining? What other methods might be used that are more efficient for the health of the planet and the future generations than coal mining?

2. (4-points) What is Selenium (hint: read the article by Lindberg et al. Included in the assignment directions "*Cumulative Impacts of Mountaintop Mining on an Appalachian Watershed*") and how does it relate to mountaintop removal? Explain how the release of Selenium affects ecosystems in West Virginia. Give two other examples of chemicals from the mine run-off that affect the environment and explain what happens to the environment due to the chemicals you have chosen.

3. (4-points) Go to http://e360.yale.edu/feature/leveling_appalachia_the_legacy_of_mountaintop_removal_mining/2198/ and watch the video *Leveling Appalachia: The Legacy of Mountaintop Removal Mining,* which discusses the effects of mountaintop removal. Make sure you watch the whole video as there will be questions about the video on Carmen.

    a. Who is Dr. Dennis Lemly and how does he describe the Mud River? What toxins affect this River?

    b. What is the Clean Water Act? How do you suppose that the coal miners can continue to practice mountaintop removal with this law in place?

    c. If mountaintop removal mining continues, what do you believe will happen to the organisms and the water streams? Use the article in the previous question to back-up your answer.

4. (4-points) Go to Google Maps (https://maps.google.com/) and search: Coal River Mountain, West Virginia (make sure you are in satellite image). Zoom out until you see a mountaintop removal site. Approximately what is the size of the sites? Approximately how close is the site to the towns? How close is the site to the Marsh Fork Elementary School? What could be the effects of the mountaintop removal site being so close the the elementary school? What could be the effects on the surrounding ecosystem?

5. (4-points) Go to the website www.pubmed.gov and find the article: *Mercury and Selenium in Fish of Fountain Creek, Colorado (USA): Possible Sources and Implications*. Download the pdf file of the article to your computer. This article is free. If you are asked to pay money for the article then you have done something wrong and should start over.

    a. What is the journal's name where the article was published? What volume was it published in? What are the page numbers for the article?

    b. What is causing the high selenium content in Fountain Creek, Colorado? Name two of the fish collected in order to conduct the scientists' research (you may use their common names or their scientific names).

    c. Name one of the fish that was found with the highest selenium content found? Did the selenium (Se) content increase or decrease as the water flowed downstream? What about the mercury (Hg) content?

    d. Based on this article that you found on www.pubmed.gov, describe what you learned from two of the figures and/or tables.

6. (5-points) Selenium is a chemical that affects the water stream. There are many chemicals that affect the Earth and it's organisms. Visit the Environment Protection Agency's website (epa.gov) and find "Chemicals and Toxics" under Environmental Topics to answer the following questions.

    a. Choose at least three chemicals at random. Read about each chemical and explain where it is found and how it affects organisms, air, etc.

    b. Create one master list of all the chemicals you researched and categorize them as either human caused or caused by natural events. Which list is longer, human-caused or nature-caused?

    c. Does human impact play a role in the creation of these chemicals? What actions could humans take to decrease the development of these chemicals? What actions might you specifically take to decrease the development of these chemicals?