



EXERCISE FOR MONTANA

CREATED BY



This exercise was developed in consultation with the benchmarks outlined in the Montana Education Content Standards for Social Studies. The questions encourage students to take an in-depth look at the imagery provided by Google Earth, and should prompt students to think about ways in which we can learn about our state through satellite imagery and remote sensing. Some questions will require specific answers, while others are designed to encourage exploration of the imagery and prompt further student research. The questions follow key geographical concepts pertaining to: general remote sensing, water bodies, landforms, human disturbance, and economics.

Before beginning:

- Make sure the following layers are turned on in the Google Earth layer menu: Terrain, Geographic Web, Roads, Borders, and Populated Places.
- Students should be familiar with the zoom tools and should understand how to use the pointer coordinates (located in the lower left corner of Google Earth) to assist in locating specific places or features.
- Items in the exercise written in boldface font will assist students in locating the place referred to in the question.

More information on the features of Google Earth can be found at <http://earth.google.com/tour/>. You will also find the download link (in the upper right corner of the webpage) here if the product is not already installed on your computer. For more information or help with installation, visit <http://earth.google.com/support/>.

Note: All coordinates referenced in this lesson should include a negative longitudinal value. In some cases this has been left out since Google Earth does not write the coordinates this way in the bottom right hand corner of the map screen.

Ready-Set-Go!

Double-click on Montana when you open Google Earth

1. What characteristics about our state are visible when the whole state is in view? (Ex: the major mountain ranges? lakes? River valleys?)
2. Find the Fort Peck Reservoir in Eastern Montana by zooming in to the northeast part of Montana. You will know the Reservoir by it's upside down V shape. What is the white object in the left branch of the lake at approximately 47° 45' N 106° 43' W? What is the dark area in the bay north of the white object?
3. While still looking at the Reservoir, what do you think the large gray colored polygons in the water are? How could you tell?

4. Follow the river west until you notice the river turn brown. Why is it this color? Google Earth is a mosaic of images stitched together, and images matching up in the same area may not be from the same capture time. What time of year do you think this image was taken?
5. Find **Flathead Lake** and using the ruler tool, estimate the length of the lake. Using the Internet, research the actual length and see how close your measurement comes. If you zoom in closer or back up, does your measurement change? Is the accuracy of your measurement affected by the zoom factor?
6. Zoom to the area where the Clark Fork and Flathead rivers meet (west of the Bison Range). Look for the area of the Flathead River where Route 382 meets Highway 200. (Type in **47° 21' 54" N, 114° 34' 34" W**) Notice the turquoise color of the river? Why do you think the river has such a distinctive color? In other words, where does the sedimentation that creates this color come from? If you need another clue, investigate the color of the high mountain lakes in the Mission Mountain area just across highway 93.
7. Just for fun, locate the Alberton Gorge on the Clark Fork River, west of Missoula (near the town of Alberton). Find the blue rafts along the river near pointer location **47° 00' 21" N 114° 34' 44" W**. (Tip: The most efficient way to locate this point is to copy the coordinates and paste them into the search line). Can you find more groups of floaters? What color are those rafts?
8. The Clark Fork River drains a large watershed, the source of which is Silver Bow Creek near Anaconda. Use the imagery to determine at least five communities that depend on this watershed for their drinking water. Think about some possible sources of pollution to this watershed. (Hint: Start near Anaconda at the confluence of Silver Bow Creek and Warm Springs Creek, and end in Lake Pend Oreille, Idaho).

Advanced Application (Optional): Use the imagery to determine types of land use along the river. What land use practices are possible sources of river contamination? Write down coordinates of point sources of pollution.

9. Type in the decimal degree location **45.7277, -110.3772** near Livingston, MT. You will find two same-sized irrigation circles; one is bright green and the other is half green and half brown. What's the reason for the different colors? What are all of the brown "dots" inside the circle? Use the measure tool to calculate the diameter of the circle on the right (in miles).
10. Type **Camas Prairie, MT** into the search line. You should be able to see a ripple mark pattern that resembles beach or sand marks. Do

you know what these are? Hint: What happened in this area of Montana during the last ice age? If you still need more information visit <http://www.glaciallakemissoula.org/virtualtour/camasprarie.html> and take the whole virtual tour of unique land formations left on our landscape from this giant glacial lake.

11. Locate the **Rocky Mountain Front, MT** and play with the 3-D view to see the “over thrust” character of the mountains in this area. Can you see how the newest layers of earth and rock have been “thrust” over the top of the older ones? What important energy resources are formed in pockets and folds of rock like this?)
12. Go to **Glacier National Park** and find the largest of the remaining glaciers in the Park. What are the general coordinates of the center of the glacier?
13. Can you find the highest peak in Montana? It is in the glacier-carved Beartooth Mountain Range near **Red Lodge, Montana**.
14. Find the **Ninepipe National Wildlife Refuge** in the western part of the State, just south of Flathead Lake and the town of Ronan. The refuge is surrounded by many small ponds from here all the way down to the Bison Range. From earlier questions and your knowledge of the geologic history of this area, can you guess what geologic processes formed these kettle ponds or pothole wetlands? (<http://www.fws.gov/bisonrange/ninepipe/>).
15. Can you recognize any ski areas in Montana? Which one(s) and how could you tell? Was there any snow on any of the runs or do you think the image is from the summer months?
16. The Berkeley Pit is remnant of a past economy based on copper mining. Find the Pit (**46°01'01" N, 112°30'38" W**) and use the measure tool to estimate its width (East to West). If you were given a set of images of the Pit from different time periods (for example, one from the 1980's and one from 2000's), what sorts of comparisons could you make between the two?
17. Look at the Northwestern region of the State between Libby and Rexford. Can you tell what natural resource extraction has occurred in these forests from the imagery? How did you know?

Bonus Question

Can you find the shortest river in the world? Hint: It is located in Montana. You may use other resources to find its name and location. List the general coordinates for the area and the town it is closest to.