

THE AMERICAN SOUTHWEST: ARE WE RUNNING DRY?

COLORADO RIVER BASIN

Activity 2a

The Basin

Overview:

This block is devoted to helping the students know where the Colorado River is, the basin in which it flows, the land that the river effects, and the effects the land might have on the river.

Block 1

Objectives:

- The students will locate the Colorado River on a map of the region.
- The students will identify the states through which the Colorado River and its tributaries flow.
- The students will identify and label the 17 dams along the Colorado River and its tributaries.
- The students will be able to discuss why the dams may have been built.
- The students will be able to define a river basin.
- The students will draw a diagram showing the flow of water and the interconnectedness of Earth's systems in the Colorado River Basin.

Materials:

- Copies of the attached map of the Colorado River Basin (Black and white), 1 per student
- Colored pencils
- Plain white paper

Procedures:

1. Distribute copies of the Colorado River Basin. Make sure all students have access to colored pencils.
2. Ask:
 - What country does this map represent? *United States*
Neatly write name of the country underneath the title on the map with you pen or pencil.
 - What region of the United States is shown? *Southwest*
 - Name the states shown. *Wyoming, Colorado, Utah, Nevada, New Mexico, Arizona, and California.*
Use a black colored pencil to lightly trace the border of each state.
 - What is south of California and Arizona? *Mexico*
It is not labeled on the map. Use your pen or pencil to neatly write it in the space just south of the U.S. border.

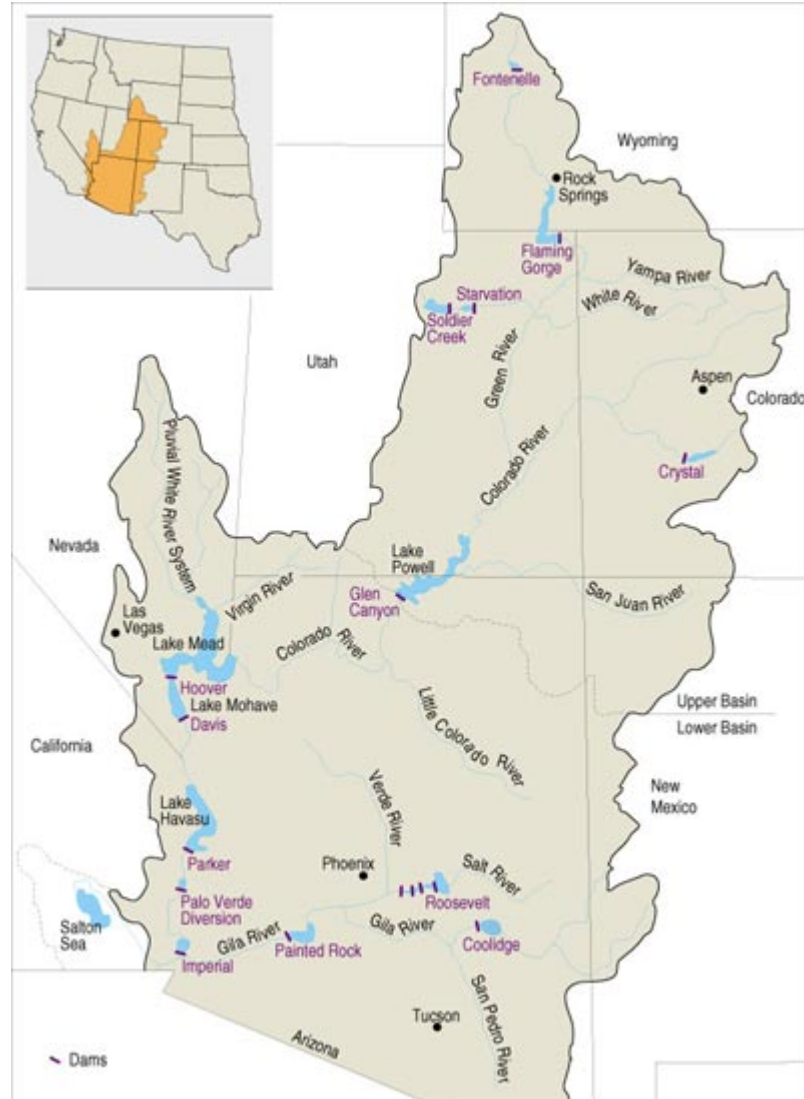
- Locate the lines that indicate rivers on your map. With your blue colored pencil neatly trace each line. Color the larger bodies of water on the map blue as well. What are those larger bodies of water? *The students should note the labels on the map that include Lake Powell, Lake Mead, Lake Mohave, Lake Havasu, and the Salton Sea.*
- At the bottom of the map is a very simple map key. It tells us that each dash on the river is a dam. Trace over each of these marks along the river with your red pencil. How many dams are there? 17
- Ask: What can you tell us about the relationship between the dams and the lakes you previously identified? Are the larger bodies of water lakes? Do you think those lakes may have been there before the dams were built? Just east of Phoenix, Arizona 4 dams were built on the Salt River. Why might there be 4 dams so close together? Why do you think we would have built 17 dams along the rivers in these 7 states?

Emphasize the following ideas: Dams were built along the Colorado River to create reservoirs. The reservoirs would hold enough water so farmers and communities along the river would have a guaranteed supply of water year-round. The Hoover Dam was also designed so that very large quantities of electricity could be generated from the constant flow of large amounts of water through the turbines on the downriver side of the dam. California and Arizona are the main users of this electricity.

- The American Heritage Science Dictionary defines a river basin as, "The land area that is drained by a river and its tributaries...funneling toward its delta and emptying into the (ocean)." Ask:
 - In what states is the Colorado River Basin located?
 - Where does the water come from that drains into this basin?
Rain, snow
 - Where does the water go? *The students should understand that the water fills aquifers and supplies groundwater as well as flowing into the river and downstream.*
 - How can you explain why the water goes into the basin and then empties into the ocean? *The simple answer would be that it flows downhill. Encourage the students to link this new understanding with the concept of interconnectedness learned in previous block.*
- Allow the students time to draw a diagram that shows a river basin, the flow of water, and Earth's systems. Explain that they should include the following labels: geosphere, atmosphere, hydrosphere, biosphere, river, delta, ocean, rain, snow, and groundwater. (*Allow that each of these may look very different, but as long as the concept and information is represented accurately, it should be considered acceptable.*)

"river basin." *The American Heritage® Science Dictionary*. Houghton Mifflin Company. 19 Sep. 2008. <Dictionary.com http://dictionary.reference.com/browse/river_basin>.

The Colorado River Basin



Map Source:
www.doi.gov/images/Colorado-basin.jpg

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Activity 2b The Basin

Block 2

Objectives:

- Students will identify source of sediments in river water.
- Students will describe where sediments from river water are deposited.

Materials:

- Pure water – 2L
- Sponges – 1 per team
- Coarse salt – ~½ cup per team
- Silt or fine soil
- Small cups – 1 per team (plastic, paper, beakers)
- Aluminum trays – 2 per team
- 1-inch cubes (or similar tool) to hold up one end of each aluminum tray – 2 per team
- Sieve or colander with small holes – 1 per team
- Hand lenses
- Color overhead of attached NASA image of the Delta

Prior to this activity:

Mix silt (or fine soil) with a small amount of water. The solution should be pourable. Place a dry sponge in the middle of an aluminum tray, 1 set-up per team. Pour as much of the muddy water solution as possible into each dry sponge, allowing the sponge to absorb the water and silt. Leave the sponges on the trays for a day or two so they dry completely.

Set up stations for each team that include:

- Aluminum tray with dirty, but dry sponge
- Small plastic cups
- ½ cup coarse salt
- Sieve

Procedures – Day 1:

1. Divide the students into teams of not more than four. Each team should go to a station with materials set up.
2. Tell them they will learn a bit more about how a river basin works.
3. The sponge on their tray represents the geosphere (soil and rock) in a river basin and the pure water represents rain or snow that falls on the soil.
4. Send one member from each team to get pure water. Label trays #1 and #2

5. Tilt aluminum tray #1 by lifting one end about 1 inch. Pour pure water onto the dry sponge allowing water to run out of the sponge and puddle at the bottom of the tray.
6. Describe the puddle. *There should be dirty water.*
Ask the students to describe what has happened. *The rain and snow have passed over the soil and rock in the river basin carrying some of it into a stream, river, or lake.*
Tell the students that the water has picked up **sediments**.
7. Leave Tray #1 tilted so that the water can dry. *(When dry, there should be a bit of dirt left along the trail to the bottom of the tray, as well as a larger amount of soil left at the bottom of the tray.)*
8. Direct the teams to place the coarse salt into the sieve. They will then slowly pour pure water over the salt allowing it to empty into aluminum tray #2. Pour enough water over the salt so that water thinly covers most of the bottom of the aluminum tray.
9. Based on what they saw with the dirty water and sediments, ask the students to hypothesize what has happened. *The water picked up some salt. Because the salt dissolved it cannot be seen.*
10. Leave this tray long enough for the water to evaporate completely.

Procedures – Day 2:

This portion of the activity should take place after the water in the trays has evaporated. Have their hypothesis from Day 1 written on the top of a piece of butcher paper or on the board.

1. Have the students retrieve their trays. Allow the students time to observe their trays. Direct one person in each group to record their observations.
2. When they are finished, share their observations with the whole group. Write them on the board.

Emphasize the following:

- Water that passes over or through soil and rock picks up some of the soil and rock.
- These are called sediments.
- The water carries these sediments downhill into lakes, streams, rivers, and into the delta.
- Some of these sediments are left along the way, as evidenced by the trail of dirt in Tray #1, and the salt crystals that are left in Tray #2

3. Display color overhead of the Colorado River Delta. Ask the students to identify evidence of sediments. While much of the area is made up of sediments carried by the river, have the students focus on the tan and gray areas in the bottom half of the image.

Ask:

Why was there a build-up of sediments at this point?

What might the white areas indicate? *Salt*

4. Tell students that in the next block of **Water, Water Everywhere** they will learn more about salt in the Colorado River.

Additional information –

In the NASA image of the Colorado River Delta the water in the Gulf of California (Sea of Cortez) is clear, dark blue. Normally the river would appear the same color. Because the flow of the river has been reduced so there is not enough water to maintain a clear river channel, showing as purple in the image. In fact, the flow has been so severely reduced, the route of the river has actually changed since the early 1900's. Ocean water moving up the Delta has created new and different channels.

Notice the dark green area in the top right corner. This is the Cienaga de Santa Clara, wetlands at the "original" mouth of the Colorado River.

NASA Image of the Colorado River Delta
September 8, 2000



Image courtesy NASA/GSFC/MITI/ERSDAC/JAROS, and U.S./Japan [ASTER Science Team](#)