



# A river runs through it

from the Esri GeoInquiries™ collection for Earth Science

Target audience – Earth Science learners

Time required – 15 minutes

## Activity

Discover how water is gathered and travels to larger and larger watersheds to meet the sea.

## Science Standards

**NGSS:MS-ESS2-4** – Global movements of water and its changes in form are propelled by sunlight and gravity.

**NGSS:MS-ESS2.C** – Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.

## Learning Outcomes

- Students will explore local streams to determine from where their home use water originates.
- Students will follow local streams to see how water returns back to the nearest sea.

Map URL: <http://www.esriurl.com/earthgeoinquiry10>



## Engage

### Where does your water come from?

- ? Run water from any tap into a glass. Do you know from where this water comes?
- In the upper-right corner, click the link, Modify Map.
- With the Details button underlined, click the button, Show Contents of Map (Content).
- In the Find Address Or Place box at the top right of the map, search for your school address.
- ? What is the largest lake or river near your school? *[Answers will vary.]*
- Looking at the water nearest you on the map, trace how it flows eventually to a sea, ocean, or bay. (Zoom in and out to see where the water body flows.)
- Make a list of the other streams and rivers your local creek flows into before making it to the bay, sea, or ocean. (You may need to turn layers on and off to get all of the names.)



## Explore

### How removed are you from the ocean?

- As rivers split farther upstream, each side-branching stream or tributary is assigned a higher stream “order” number.
- Using the list created above, count backward from the farthest tributary to determine which stream order a local creek outside your school is considered to be.



## Explain

### What makes up an entire watershed?

- As part of the global water cycle, water evaporates from oceans, lakes, or rivers (or from plants or soil) and falls across continents. Because water is a fluid, it flows along a downhill path that eventually leads back to the ocean. All the areas draining into a single river system are known as that river’s watershed.
- Click the Edit button, and then click Areas to draw around each of the major rivers mentioned below.
  - Draw around the Mississippi River, including all rivers draining into it as part of the watershed.
  - Draw around the watershed of the Columbia River in Washington.
  - Draw around the watershed of the Colorado River in the southwestern United States.
  - Draw around the watershed of the Rio Grande River along the border of Texas and Mexico.
- To check your work, zoom in two clicks to see the smaller regional river watersheds.

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## Elaborate

### Can you find watersheds through the network of connected rivers?

- Turn on the layer, World Shaded Relief.
- ? Where do most rivers start? [*Many rivers start in highlands or mountains, where rains are encouraged because of uplift of the air containing evaporated moisture.*]
- Click the Hudson Bay Watershed bookmark.
- Click the button, Edit.
- Click the map at the upper edge of the Mississippi watershed (between Canada and the states of North Dakota and Montana), and continue drawing around the area of all rivers that drain into the Hudson Bay. You can use multiple smaller lines to create the boundary. Simply choose the Areas tool again for each section of line you want to draw on your current view of the map before panning.
- Continue drawing lines north along the Rocky Mountains to find the edge of where the rivers drain into the Hudson Bay and those that drain north into the Arctic through the Mackenzie River system.
- For a solution to the major North American watershed boundaries, turn on the layer, Watersheds.

## Evaluate

### What do other watersheds look like?

- Choose another large river system on another continent that is unfamiliar to you.
- ? Use the World Rivers and World Shaded Relief layers to guide where to draw the edges of the watershed. [*Possible rivers might include the Amazon of South America, the Nile or the Congo of Africa, the Danube or Rhine of Europe, the Ob of northern Russia, the Yangtze of China, or the Ganges of India.*]

### EDIT (ADD FEATURES)

- At the top of the map, click the Edit button.
- Click Areas, and drag the mouse to draw an area. Release the mouse when your drawing is complete.
- Click the Edit button to return to the layer contents.

### BOOKMARK

- At the top of the map, click the Bookmarks button.
- Choose your bookmark; the map will take you there.

## Next Steps

**DID YOU KNOW?** ArcGIS Online is a mapping platform freely available to public, private, and home schools. A school subscription provides additional security, privacy, and content features. Learn more about ArcGIS Online and how to get a school subscription at <http://www.esri.com/schools>.

### THEN TRY THIS...

- Log in to your ArcGIS organization account. Choose Perform Analysis > Find Locations > Create Watershed. Have students start the tool and place a point at their location or at the nearest stream.
- Explore the storymap from Esri entitled, *A River Reborn* at <http://esriurl.com/Geo1861A>.

## TEXT REFERENCES

This GIS map has been cross-referenced to material in the freshwater sections of chapters from middle-school texts.

- *Earth Science by Glencoe McGraw Hill – Chapter 9*
- *Earth Science by McDougal Littell – Chapter 1*
- *Earth Science by Holt – Chapter 10*
- *Earth Science by Prentice Hall – Chapter 12*