

Down to the last drop

from the Esri GeoInquiries™ collection for Environmental Science

Audience – Advanced environmental science

Time required – 15 minutes

Activity Explore the impact of human activities on water resources.

Science Standards APES: I. C. Global water resources and Use
APES: II. E. Natural Biogeochemical Cycles: water cycle
NGSS: HS-ESS3. Earth and Human Impacts

Learning Outcomes

- Explore consequences of human actions on water resources.
- Examine the health impacts of availability to clean water.

Map URL: <http://esriurl.com/enviroGeoInquiry5>



Engage

Can human actions alter water resources?

- Click the map URL link above to open the map.
- Examine the recent view of the Aral Sea in Central Asia.
- With the Details pane visible, click the button, Show Contents Of Map.
- Click the checkbox to the left of the layer name, Aral Sea, 2000 (image) & 1960 (black outline).
- The image is from 2000 and the outline shows the 1960 extent of the sea before humans began to alter water flow to the Aral Sea.
- ? What physical changes can be seen in the Aral Sea since humans altered the water flow? *[The smaller, shallower, upper portion remains more intact after a dam was added between the north and south sections.]*



Explore

Where are other lakes and rivers that are drying up due to human actions?

- Click the Bookmarks button. Select one of the other location bookmarks for a closer examination.
- Click the map marker to view detailed information about human alterations to this water resource.
- ? What human events have caused the changes in water resources? *[Water diversions, deforestation, and overuse]*
- ? What natural events have caused the changes in the water resource? *[Droughts and changes in rainfall patterns]*



Explain

Why is the water to the Aral Sea decreasing?

- Select the Bookmark, Aral Sea Region.
- ? Do both rivers reach the Aral Sea? (Zoom in and out.) *[The Amu Darya River does not reach the Aral Sea.]*
- Turn on the layer, Aral Sea Watershed Dams.
- Turn on the layer, Irrigated Lands In Aral Watershed.
- ? Do dams or canals have the greatest impact? (Zoom in to irrigated areas to view canals.) *[Canals]*
- ? What factors could influence placement of the dams and canals? *[Political boundaries, arable land, and geographic features]*

Elaborate

How would the Aral Sea drying up affect the surrounding areas?

- Turn on the layer, Aral Sea Dust Impact. Zoom out to see the impact area.
- Increased dust and salt storms sometimes send dust 500 km from the Aral Sea.
- ? What causes the dust and salt storms? [*The dry bed of the salty sea has no vegetation.*]
- ? What environmental, economic, and human health effects might this have on the surrounding areas? (Look closely at the areas within the buffer.) [*Environmental: desertification due to soil erosion; economic: salinization of soil in farmed regions; health: respiratory problems*]

Evaluate

How has human alteration affected the Colorado River?

- Press the button, Bookmarks. Select the Colorado River bookmark.
- Turn on the layer, Lower Colorado River Basin Dams and Canals.
- Zoom in and out to identify human alterations and causes.
- ? What are some similarities and differences between the effects of human alterations on the Colorado River and the Aral Sea? [*Both have dams and canals, and both fail to reach the ocean. The Colorado River supplies both agriculture and urban areas. The rivers of the Aral Sea are diverted primarily for agricultural areas.*]

BOOKMARK

- Click the button, Bookmarks.
- Select a bookmark name to zoom to its map location and scale.

IDENTIFY A MAP FEATURE

- Click a feature on the map, and a pop-up window will open with information.
- Links and images in the pop-up are often clickable.
- An arrow icon in the upper-right of the window indicates that multiple features have been selected.
- Click the arrow button to scroll through the features.

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...

- Using an ArcGIS Online organizational subscription for schools, investigate human alterations in your watershed. Open a map, click Analysis, and select Find Locations. Choose a point to start and trace the water path downstream. Measure distances and zoom in to look for human alterations.
- Explore the story map, *Discovering Liquid Water on Mars*, at <http://esriurl.com/Geo4193>.



TEXT REFERENCES

This GIS map has been cross-referenced to material in sections of chapters from these texts.

- *Living in the Environment* by Brooks/Cole Cengage Learning — Water Resources Chapter
- *Environmental Science for AP* by W.H. Freeman and Company/BFW — Water Resources Chapter