



Topography & our national heritage

from the Esri GeoInquiries™ collection for Earth Science

Target audience – Earth Science learners

Time required – 15 minutes

Activity Interpret the landscape using topographic maps of well-known national parks.

Science Standards NGSS:MS-ESS2-4 – Develop a model to describe unobservable mechanisms.

Learning Outcomes

- Students will interpret landform features within topographic maps.
- Students will determine distances and scale from the map.
- Students will predict implications of landforms for health and safety in recreation.

Map URL: <http://esriurl.com/earthgeoinquiry1>

Engage

How did Yosemite inspire the institution of the National Park System?

- Click the map URL above to launch the map.
- Investigate the pins that show on the map.
- ? Why is it important to dedicate these areas as national parks? *[As urbanization increases, many argue that we need natural areas for preserving the natural ecology, for rest and relaxation, and for reconnecting to global systems. These areas can remind us to live sustainably.]*
- ? What do the smooth brownish parallel lines around the map represent? *[They represent elevation.]*
- ? What do the blue squiggly lines represent? *[They represent surface waters like creeks and rivers]*
- ? What type of a landform is most visible on the map? *[A valley where the elevation numbers get smaller toward the Merced River is most visible.]*

Explore

What do the brown topo lines tell us about the landscape?

- Click the button, Bookmarks. Select Half Dome.
- ? Why do topo lines rarely touch or cross? *[If each line is a different elevation, then no point can be two different elevations. Cliffs or overhangs are exceptions.]*
- Half Dome is a large and steep-sided hill referred to as a mountain.
- ? What pattern do topo lines make around hills and mountains? *[Hills are concentric circles or closed figures.]*

Explain

When you get to the edge, what does it look like?

- Click the button, Bookmarks. Select El Capitan.
- ? What is the pattern of topo lines for very steep areas like this cliff? *[They are close parallel lines.]*
- Click the button, Bookmarks. Select Camp Ground.
- With the Details button underlined, click the button, Show Contents of Map (Content).
- Turn off the layer, USA Topo Maps.
- ? Why does this area not have concentric circles or parallel lines that are close together? *[This area is fairly flat.]*
- Some topo lines are thicker than others and are called index contours.
- ? What do index contours have periodically along their lengths that other lines do not? *[The elevation number is written along the line.]*
- ? What is the elevation of this area in feet? *[It is 4,000 feet.]*

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Elaborate

How do you show tall things on flat paper?

- Turn on the layer, USA Topo Maps.
- Zoom to Half Dome, and then find two index contours close together, with clearly marked elevations.
- ? How many lines are there between the two index contours? [*Every 5th contour line is an index contour.*]
 - A contour interval is the vertical distance between contour lines.
- ? Determine the contour interval. [*Take the difference in elevation, and divide by the number of intervals: 200ft/5. The contour interval is 40 feet.*]
- ? What is the elevation of the topo line atop "Half Dome?" [*8800 feet*]
- In the bottom left, there is a scale bar. Use a sheet of paper to copy the distance shown on the scale to the paper (it should be 0.2 mile).
- Teachers may copy the scale bar with paper held against the projection screen or white board.
- Click the button, Measure. Click the Distance button and select miles as the units. (See Tooltip below.)
- ? Measure the distance from the top of Half Dome to where the trail meets the river. How far is it? [*~3 miles*]



Evaluate

How difficult would the Half Dome trail be?

- ? Looking at Half Dome, which side of the hill would be easiest to climb? [*The slope on the southwest side is gentler. The current northeast trail has two handrails built in to assist hikers up the steeper slope.*]
- ? Which stream would be less strenuous to hike from the campground: a couple of miles up Tenaya Creek to the north of Half Dome, or a couple of miles up the Merced to the south of Half Dome? [*Tenaya is much flatter.*]
- Pan to the south until you find the Merced River.
- ? Which way is the stream flowing? [*The Merced River is flowing west to southwest. (Vs point upstream.)*]
- Zoom to the Yosemite bookmark.
- Which of the upriver canyons might be more likely to flash flood? [*The Merced River to the east drains a much bigger valley.*]

MEASURE

- Click the button, Measure.
- Click the Distance button and select the units of measure.
- Click once on the map to start measuring; click again to change direction, Double-click to stop measuring.

BOOKMARK

- Click the button, Bookmarks.
- Choose a bookmark.
- The map will change location and scale.

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 the school's ArcGIS Online organizational account and perform analysis on World Mountain Ranges. Consider using analysis tools, Create Watershed or Trace Downstream.
- Explore the U.S. National Parks with the story map, *The National Park Bird's Eye Quiz* at <http://esriurl.com/Geo5192>



TEXT REFERENCES

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

- Earth Science by Glencoe McGraw Hill – Chapter 6
- Earth Science by Holt – Chapter 1

- Earth Science by McDougal Littell – Chapter 1
- Earth Science by Prentice Hall – Chapter 2