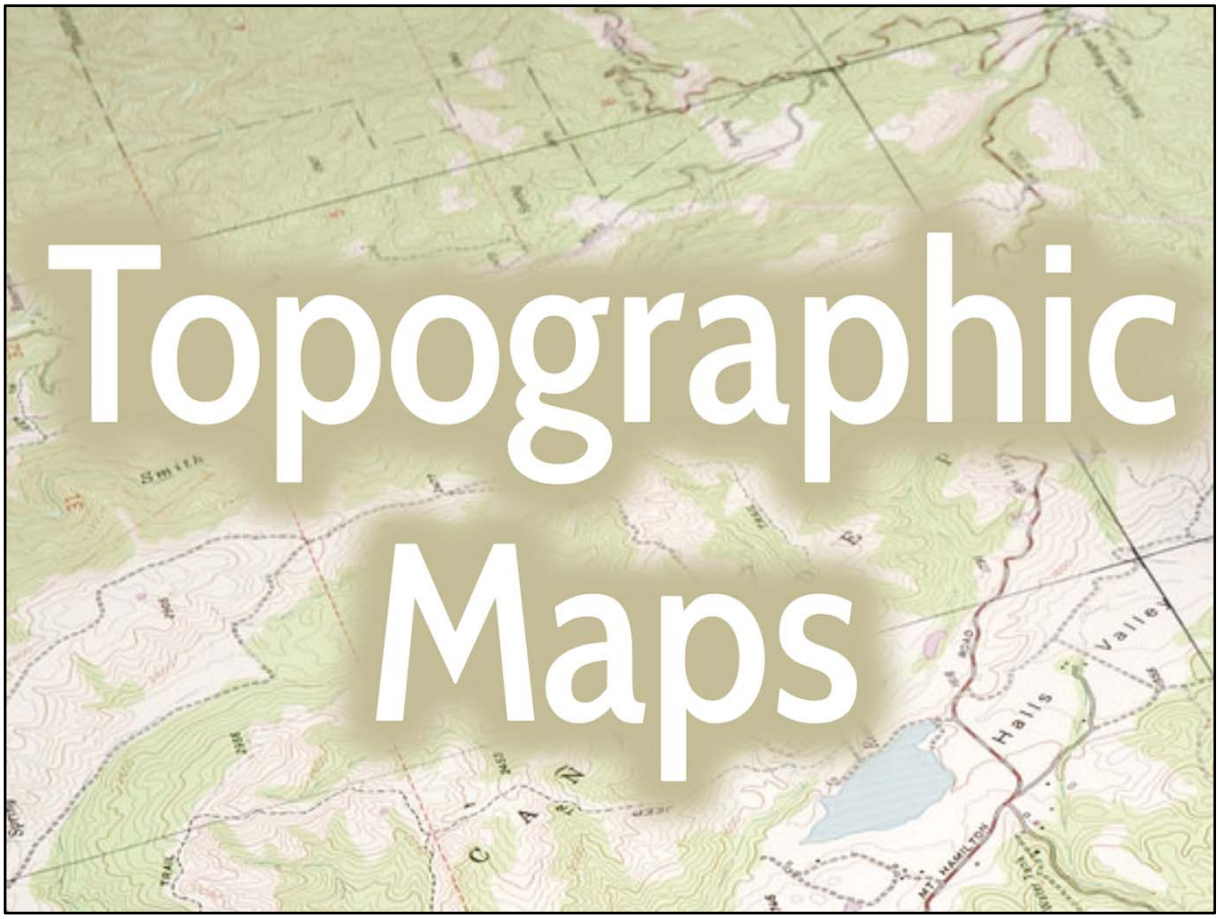
Module 2: Mapping

Topic 3 Content: Topographic Maps Presentation Notes



Topographic Maps

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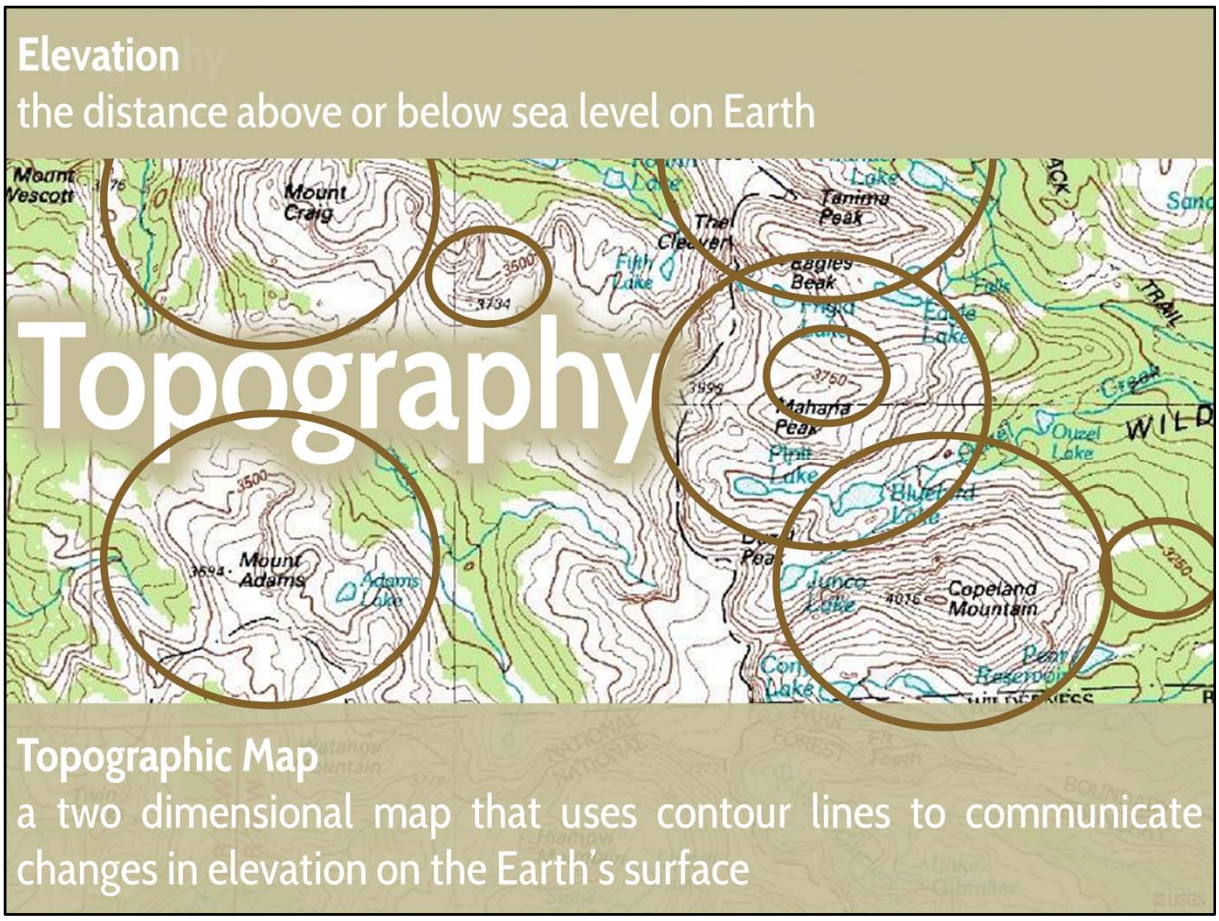

Take a few moments to study the map shown here of Isolation Peak, Colorado. What land features do you notice? Do you thinking hiking through this area would be easy? Did you see the mountains to the north, south, east, and west? Buildings, roads, rivers, and important locations with topography are all incorporated into one map. However, this map only shows land features, as it is a map of the Rocky Mountain National Park. Topography is the recorded elevation data over a land area. Elevation is defined as the distance above or below sea level measured on Earth. It may be confusing at first, but with a little help, you will better understand how to decode these maps. The map of Isolation Peak, Colorado is a topographic map.

A topographic map is a two dimensional map that uses contour lines to communicate changes in elevation on the Earth's surface. A contour line is a line that connects points of equal elevation. On this map, you will see labeled contour lines. These lines are index contours. Usually every fifth line on a topographic map is labeled with the elevation on it and serves as an index. The index contour lines on this map are circled.

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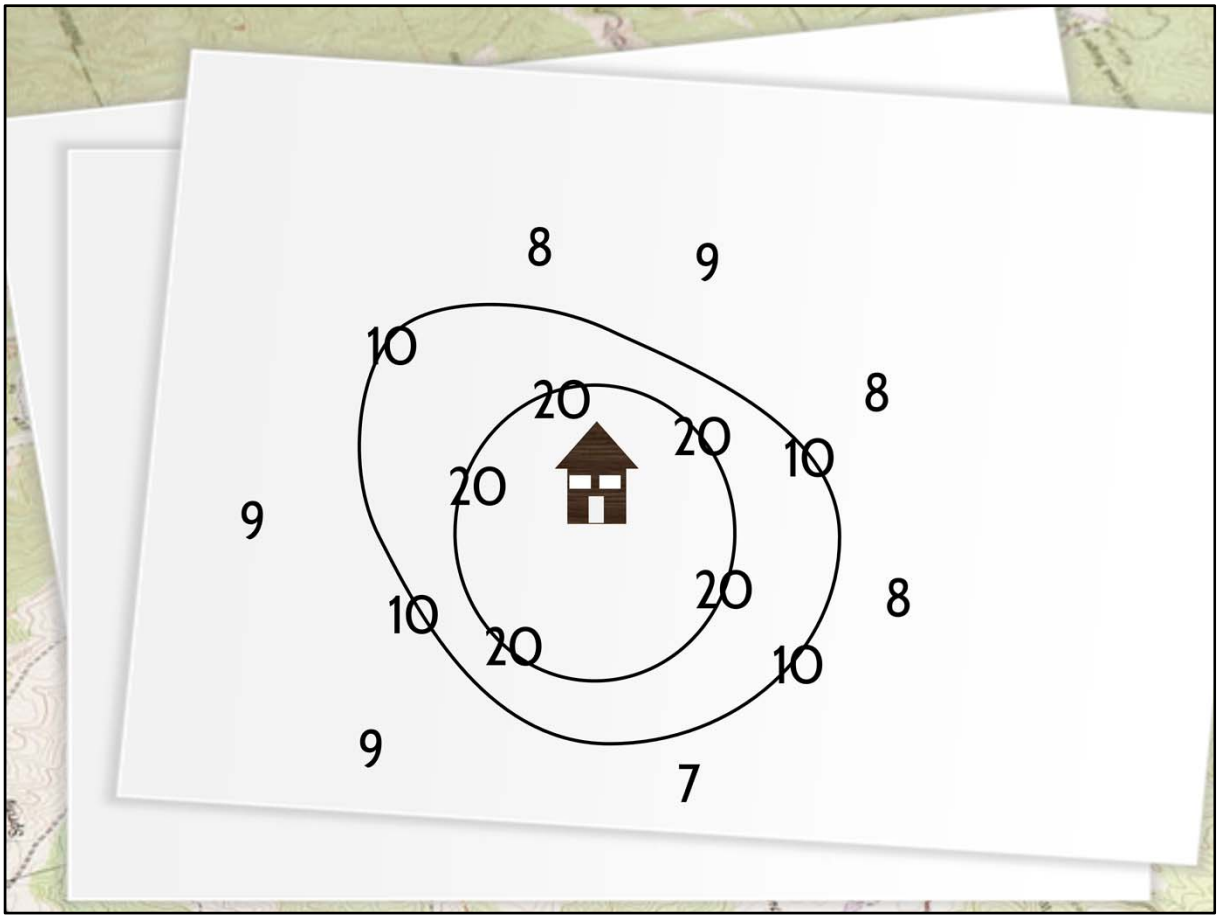

How are topographic maps drawn? Dedicated geologists enter the field, hike, and measure. Once they return with these measurements, they have a blank map that looks similar to the image on this page. Each of these numbers represents a value of elevation. As the geologist hikes, he or she uses a GPS to record elevations at certain points. These elevations are the numbers you see on the map. Does that help you draw a mental image of what that area would look like on Earth? Probably not. But if you add a few contour lines to organize this information, a new picture will come into view.

You will have to connect the lines by the contour interval. The contour interval never changes on a map. On this map, the contour interval is 10 meters. Contour intervals can be expressed in feet or meters, so always check the legend of the map. To draw a contour line, connect points of equal elevation on the map. This first contour line should be fairly easy to draw. Connect all points that are 10 meters in elevation.

Do you see where the 10 meter elevation should go? Sometimes, you will have to estimate where the elevations are located. Once you have estimated where all of the 10 meter elevations are located, you should be able to connect all of these points as well. Do you think you can do this?

Now can you visualize the map? It depicts a house on a small hill.

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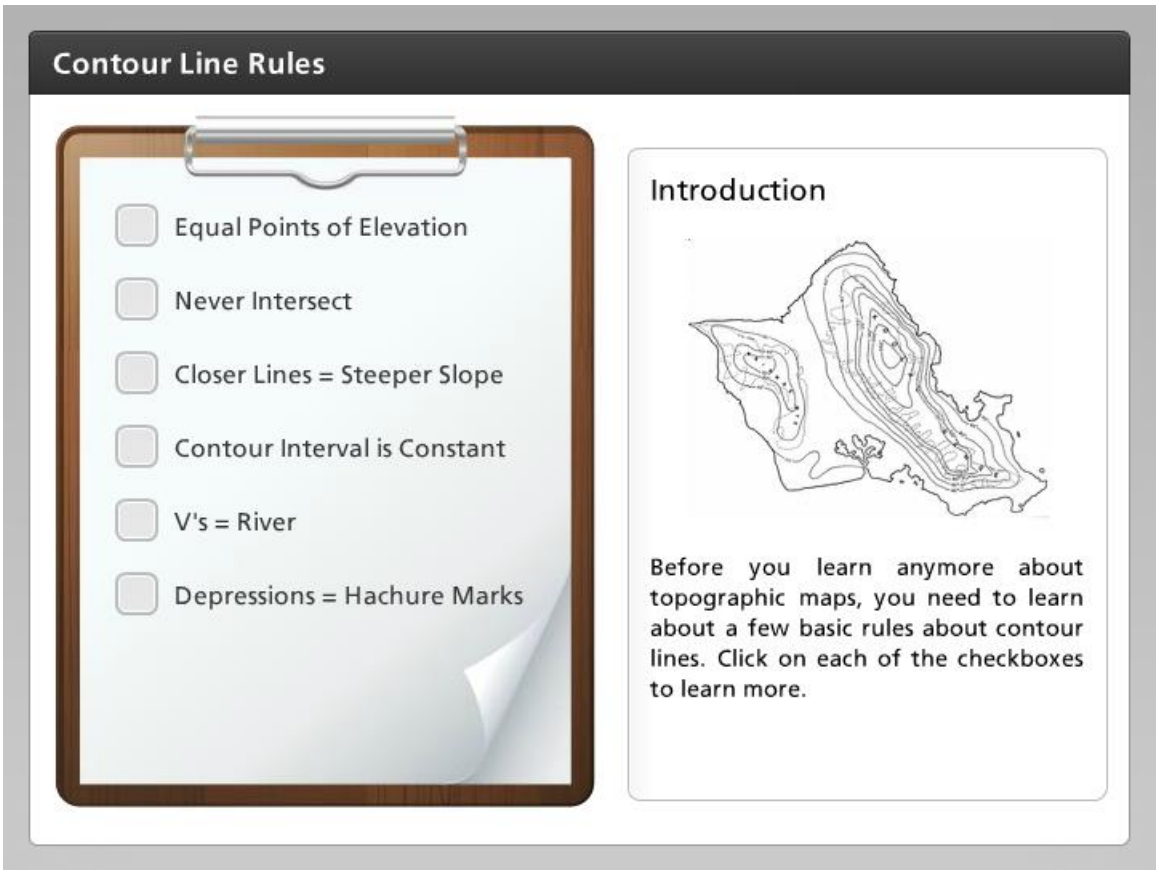
Introduction



Before you learn anymore about topographic maps, you need to learn about a few basic rules about contour lines. Click on each of the checkboxes to learn more.

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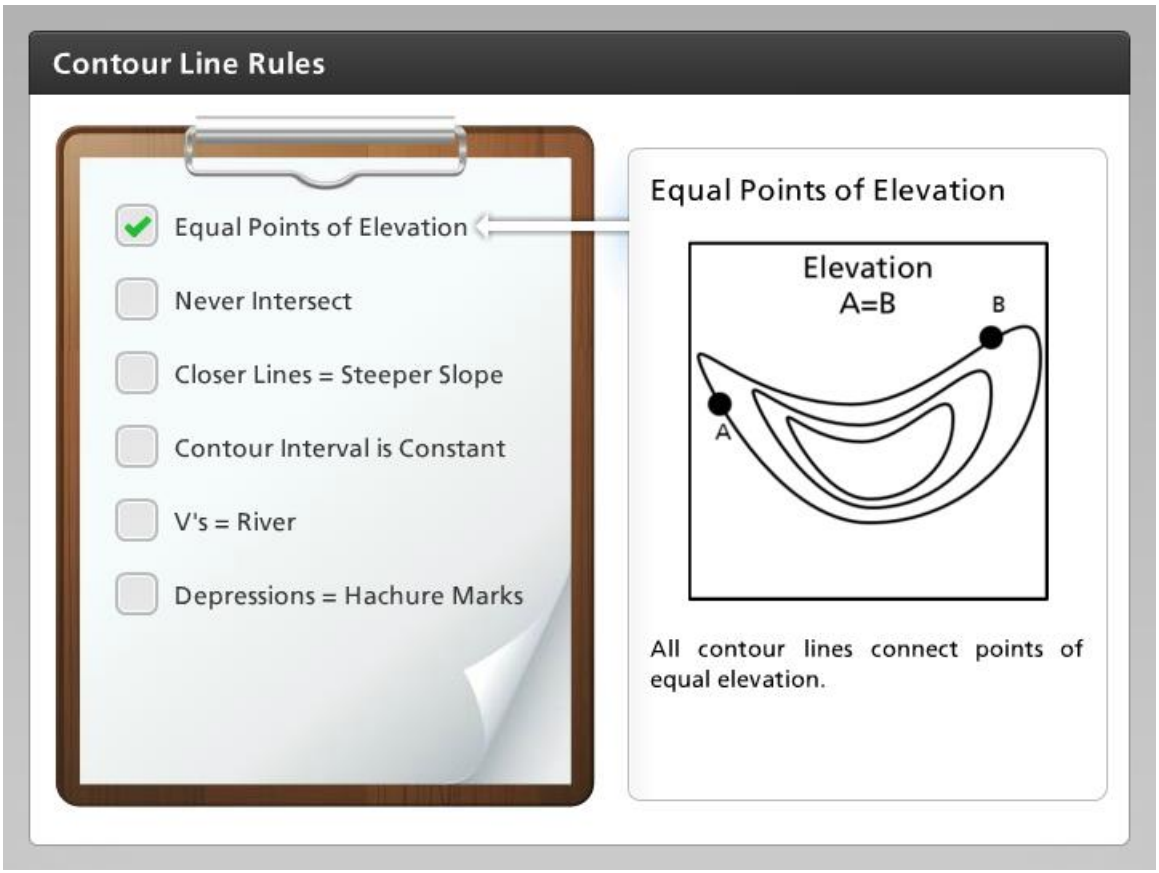
Equal Points of Elevation



All contour lines connect points of equal elevation.

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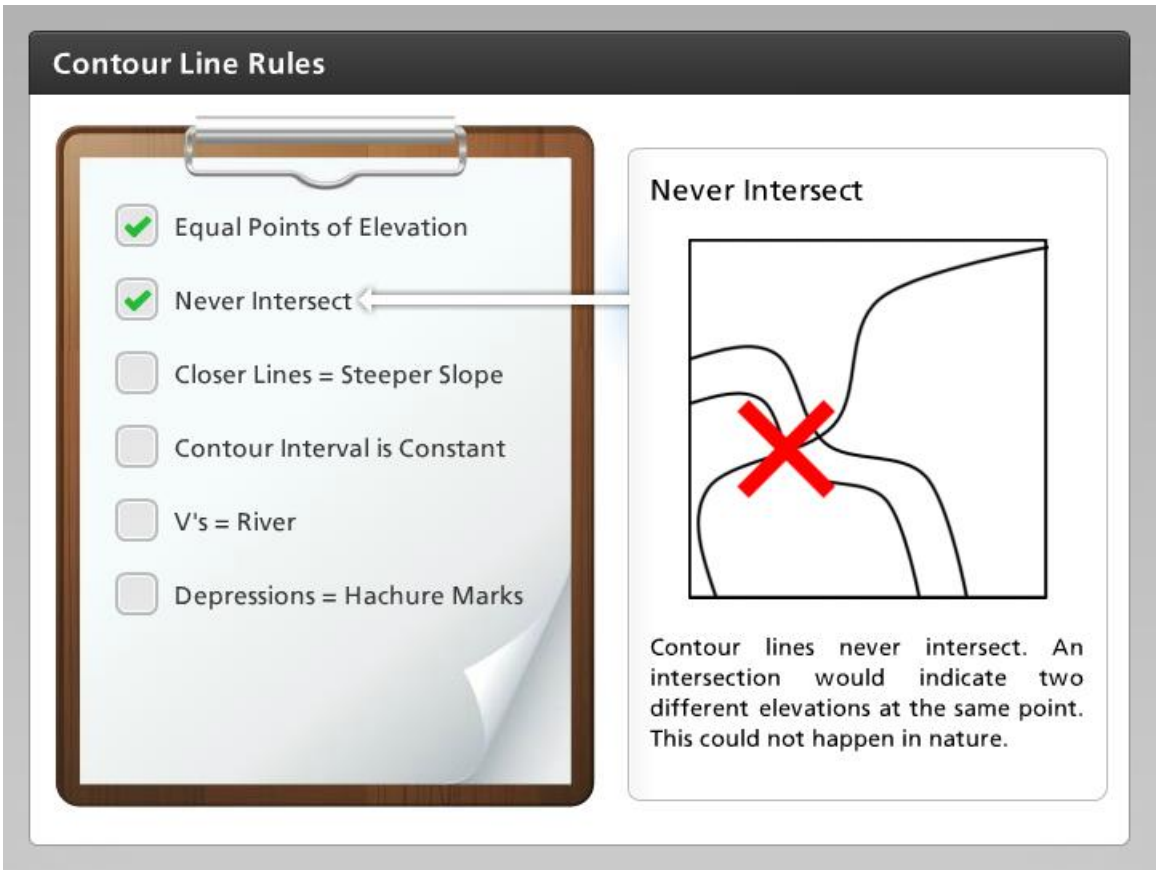
Never Intersect



Contour lines never intersect. An intersection would indicate two different elevations at the same point. This could not happen in nature.

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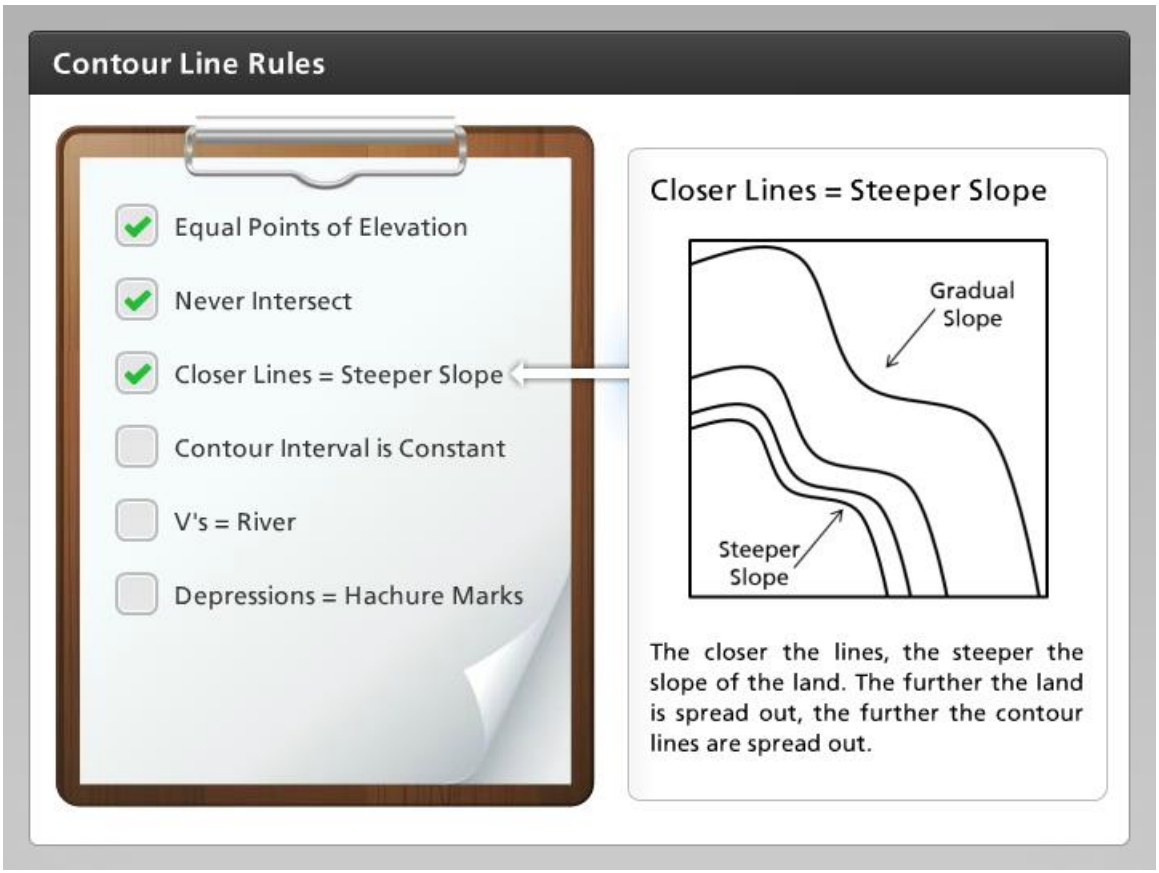
Closer Lines = Steeper Slope



The closer the lines, the steeper the slope of the land. The further the land is spread out, the further the contour lines are spread out.

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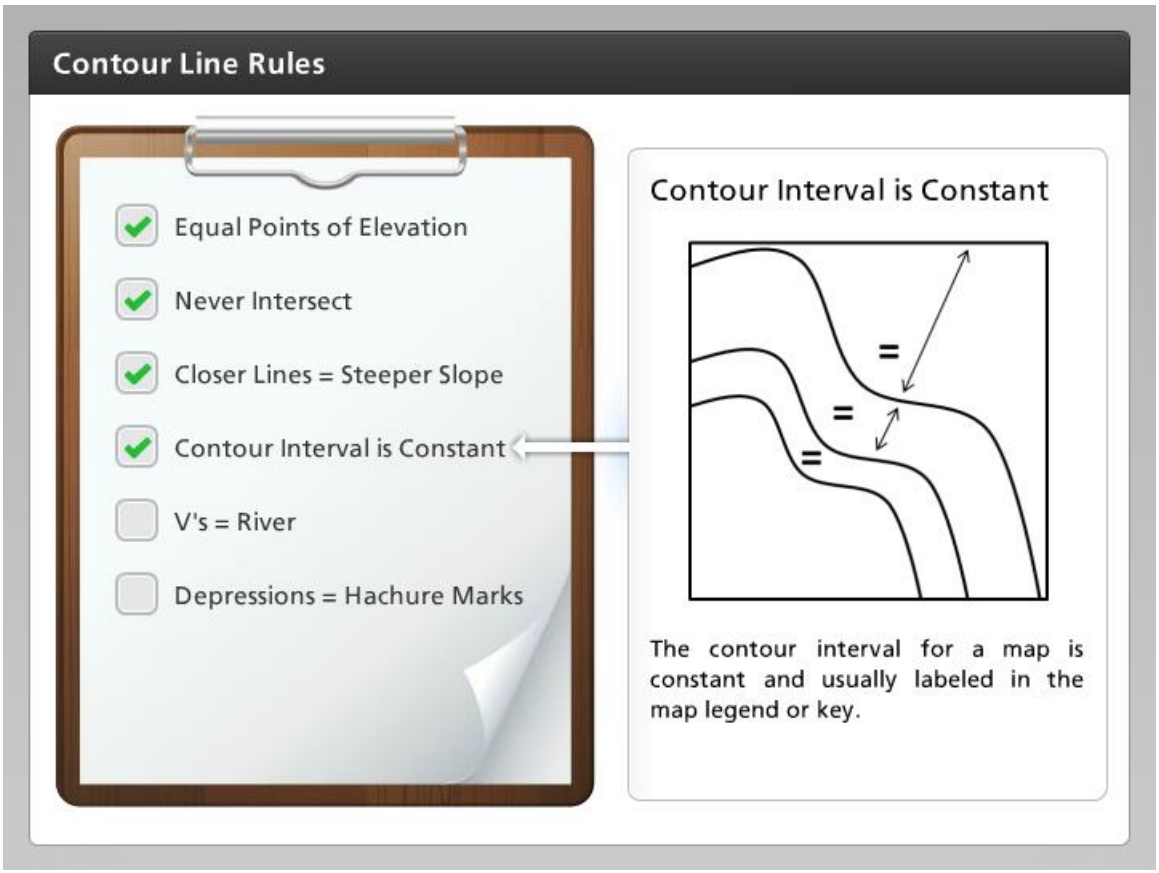
Contour Interval is Constant



The contour interval for a map is constant and usually labeled in the map legend or key.

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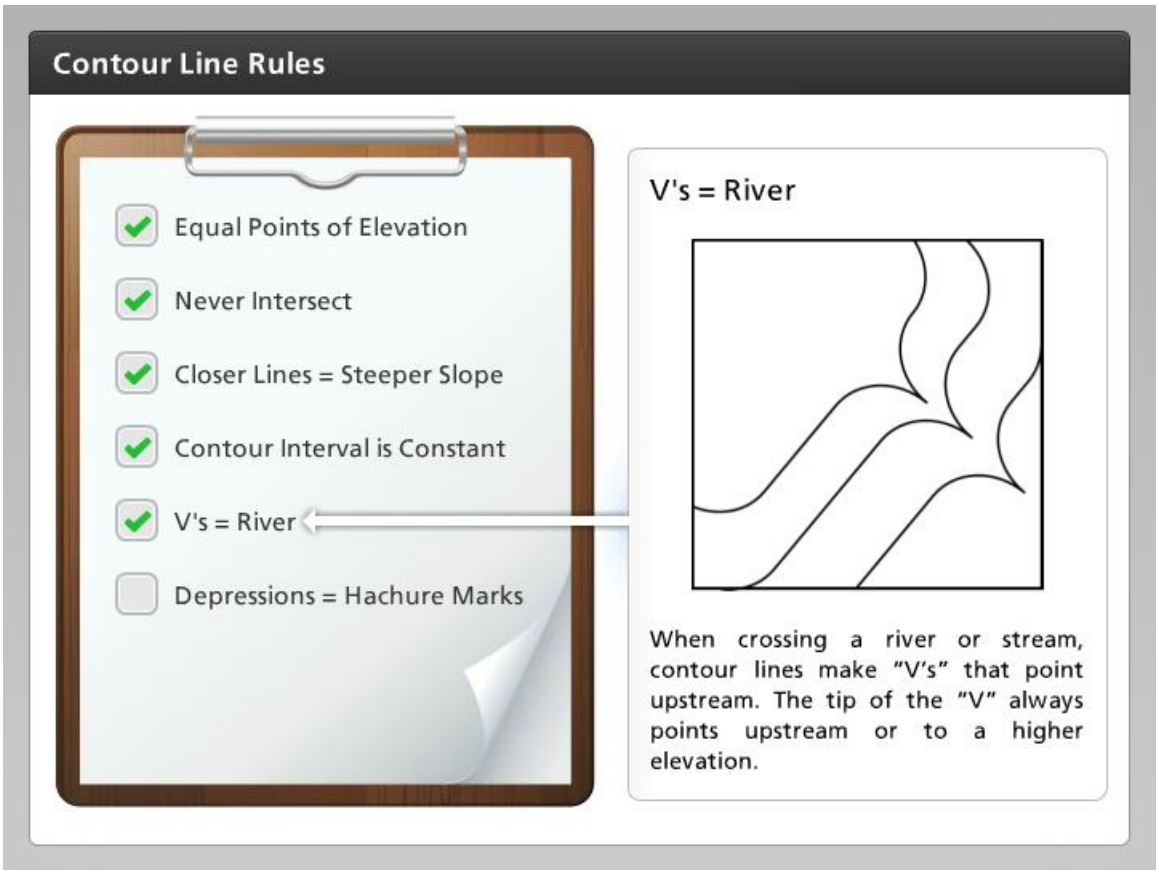
V's = River



When crossing a river or stream, contour lines make “V’s” that point upstream. The tip of the “V” always points upstream or to a higher elevation.

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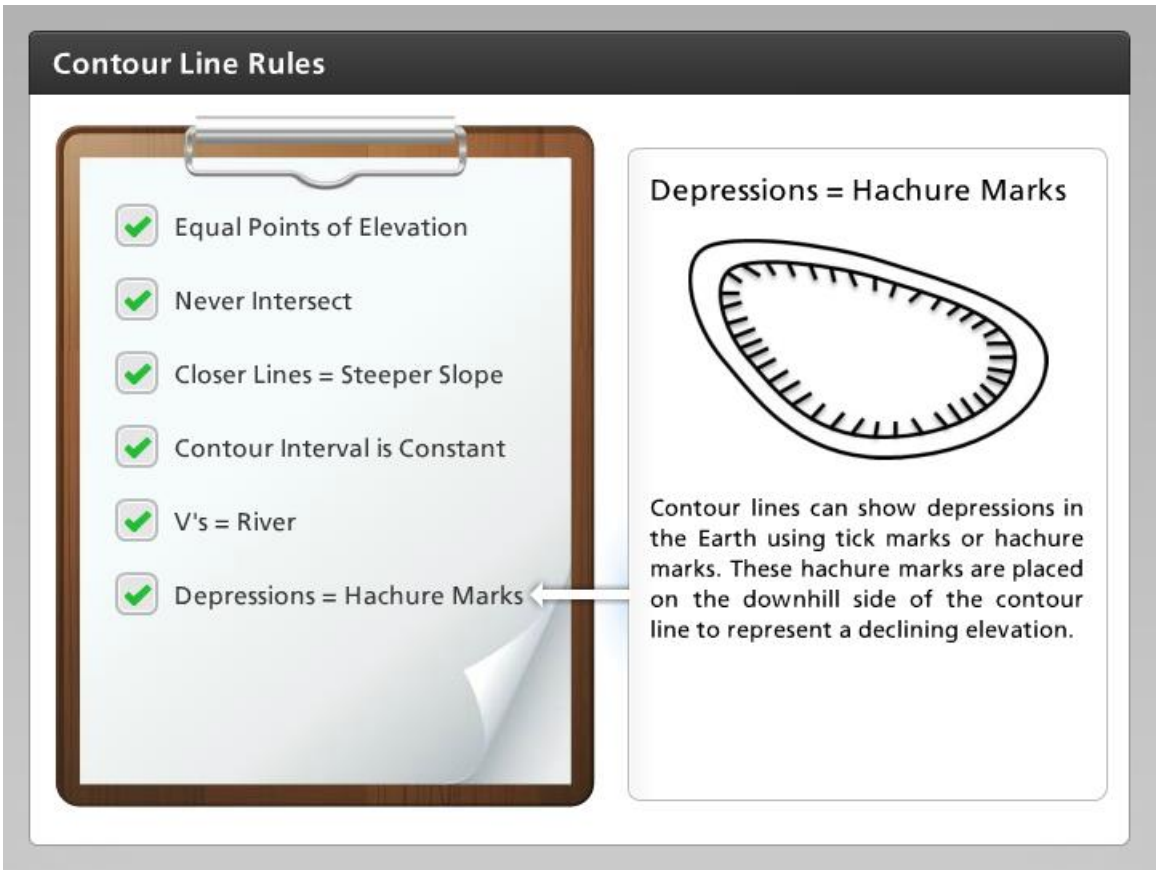
Depressions = Hachure Marks



Contour lines can show depressions in the Earth using tick marks or hachure marks. These hachure marks are placed on the downhill side of the contour line to represent a declining elevation.

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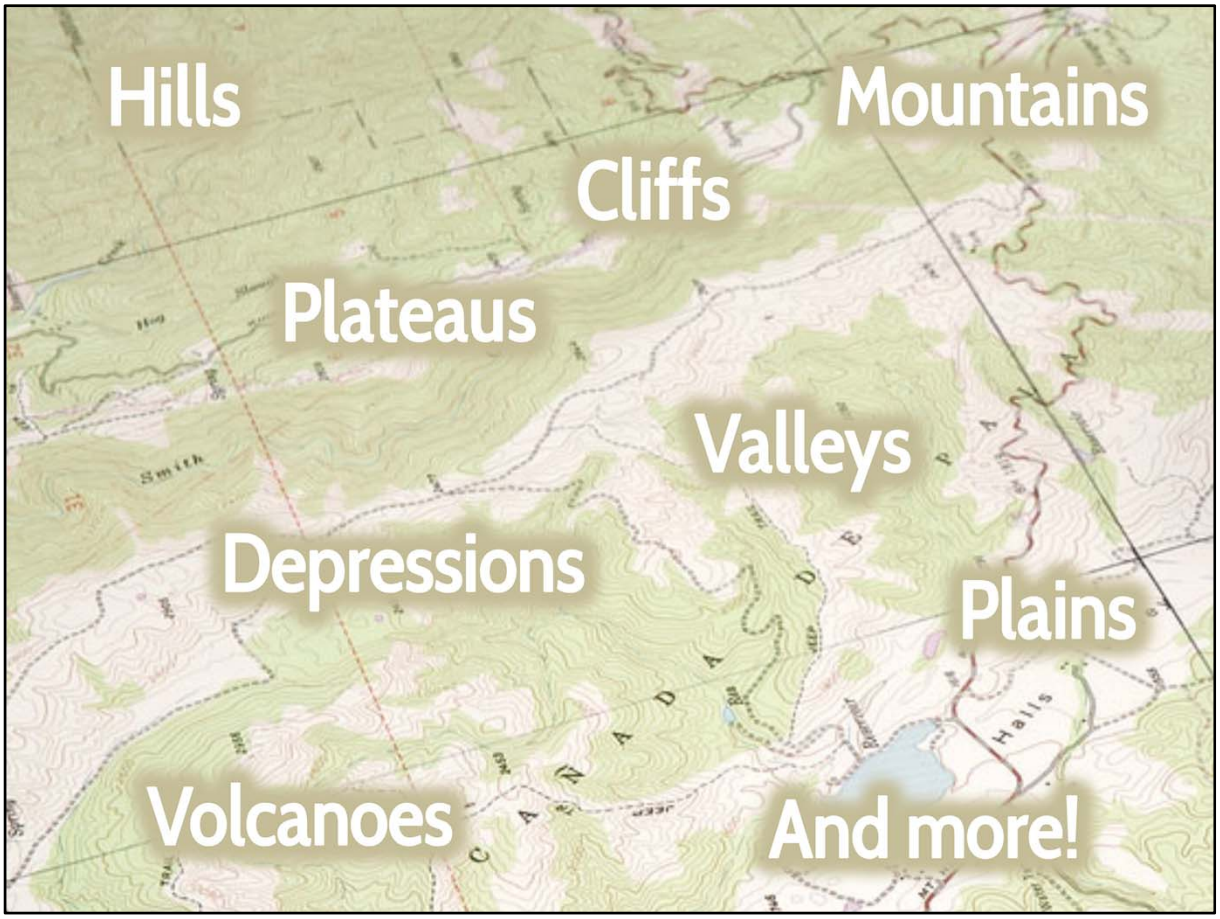

Landforms, or natural features on Earth's surface, create unique patterns in the contour lines. There are many different types of landforms that can be viewed on topographic maps such as hills, mountains, valleys, cliffs, depressions, volcanoes, plains, and plateaus.

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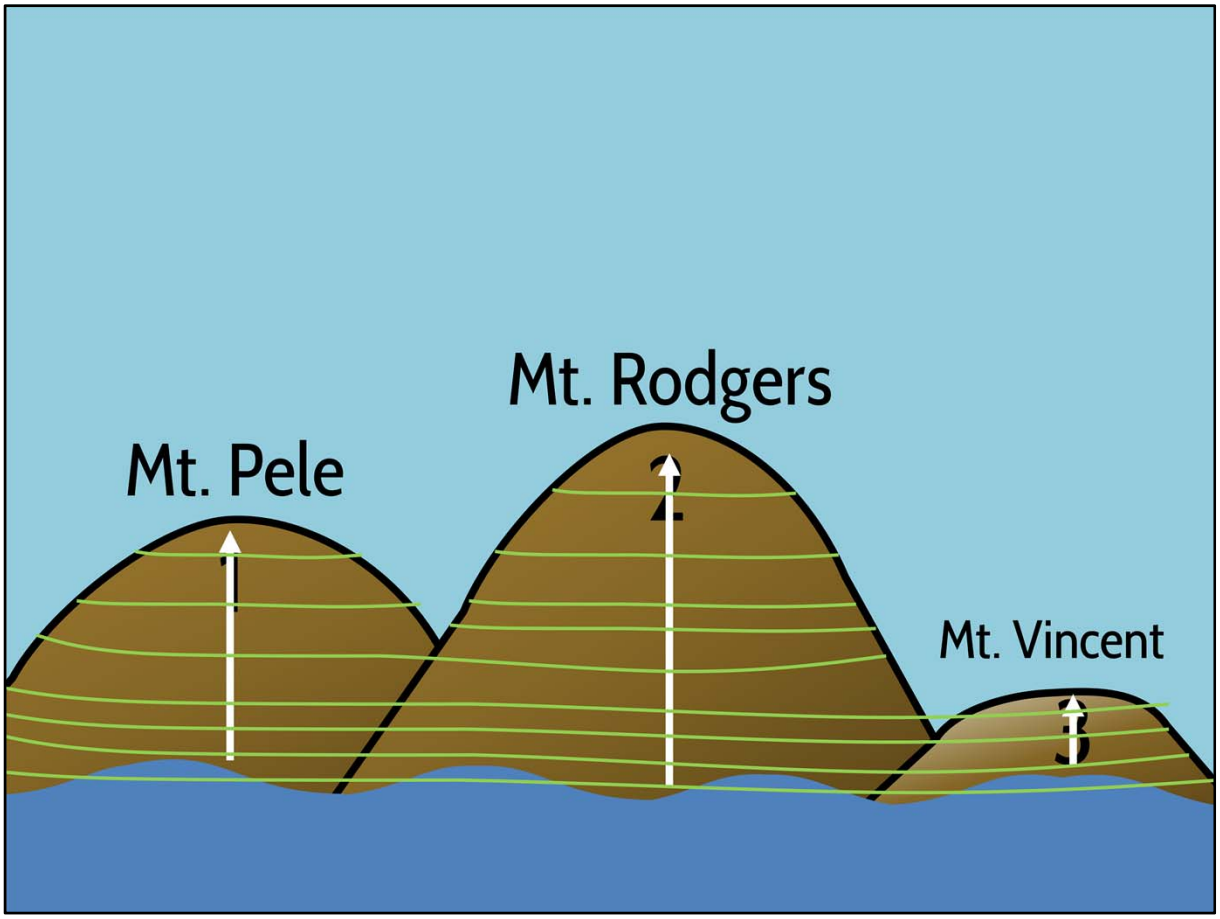

Take a moment to see how a topographic map is created from an island or a mountain, such as the one shown in the image. You can see that this island has three mountain peaks. Now, find out how contour lines can be used to describe this island's shape. First, you will notice that the three different mountain peaks all have a different elevation. Knowing this elevation above sea level will not provide you with enough information about the true topography of the island, or any mountain. Remember that sea level has an elevation of 0 feet. Now, watch as contour lines are drawn in at 500 foot intervals.

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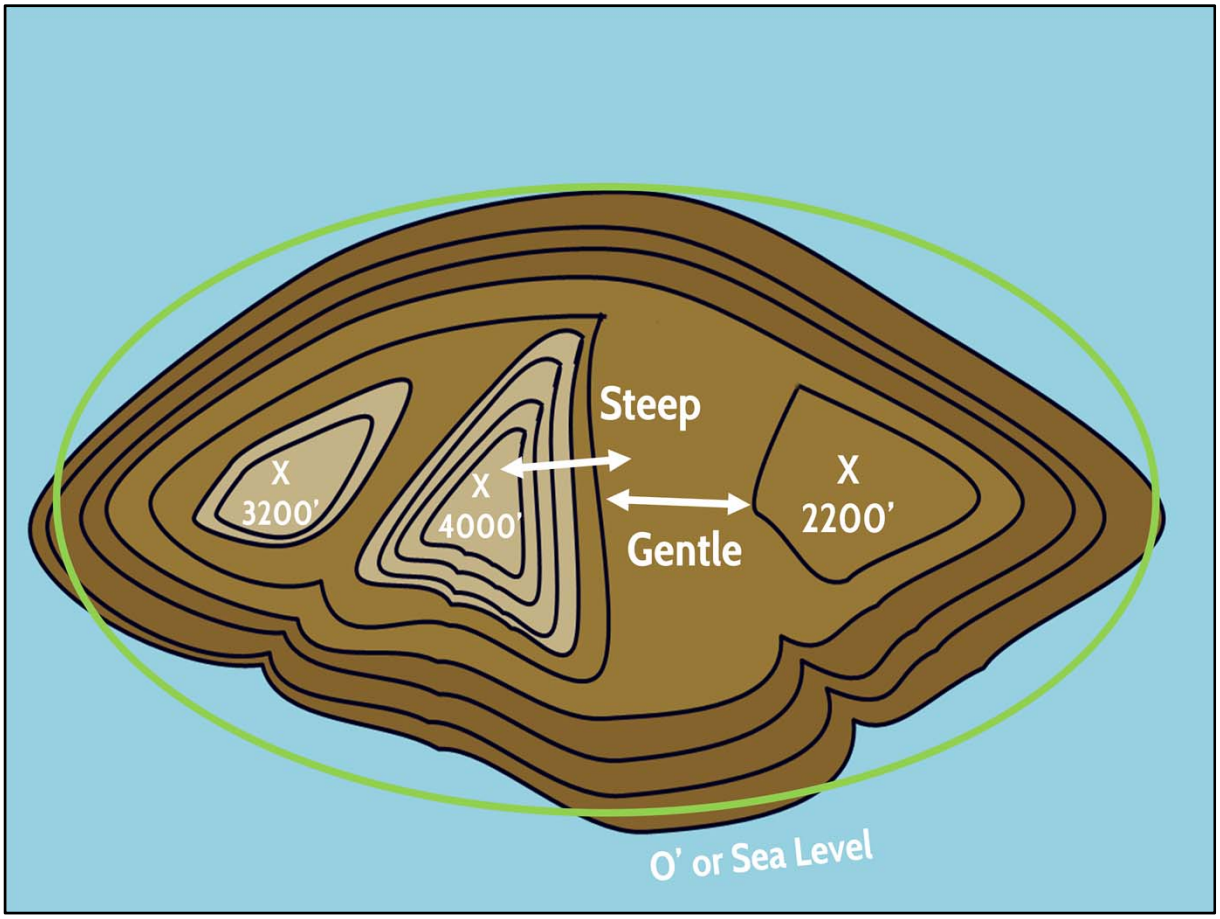

What did you notice about that island as the contour lines were generated? Were they close together, or far apart? Did the contour lines close in concentric circles? Sometimes, it is best to analyze topographic maps from above. Take a moment to analyze the same map of the three island mountains from a different angle. You should notice that the contour lines form concentric circles, like a target, around the isolated mountain peaks. The elevation values will continue to increase until you reach the peak of the mountain. The peak of a mountain or hill is generally marked with an "X" and the elevation.

Steep slopes and gentle slopes are distinguished by the amount of space between contours. In steeply sloping areas, the contour lines are positioned close together. In flat or gently sloping areas, the contour lines are positioned far apart. On the map, you can see areas where the slope is both gentle and steep. Make sure you realize that when a continent or island comes in contact with the ocean, the line between the ocean and land will have an elevation of 0, or sea level. This can always serve as a helpful starting point when reading and analyzing the elevation of a topographic map.

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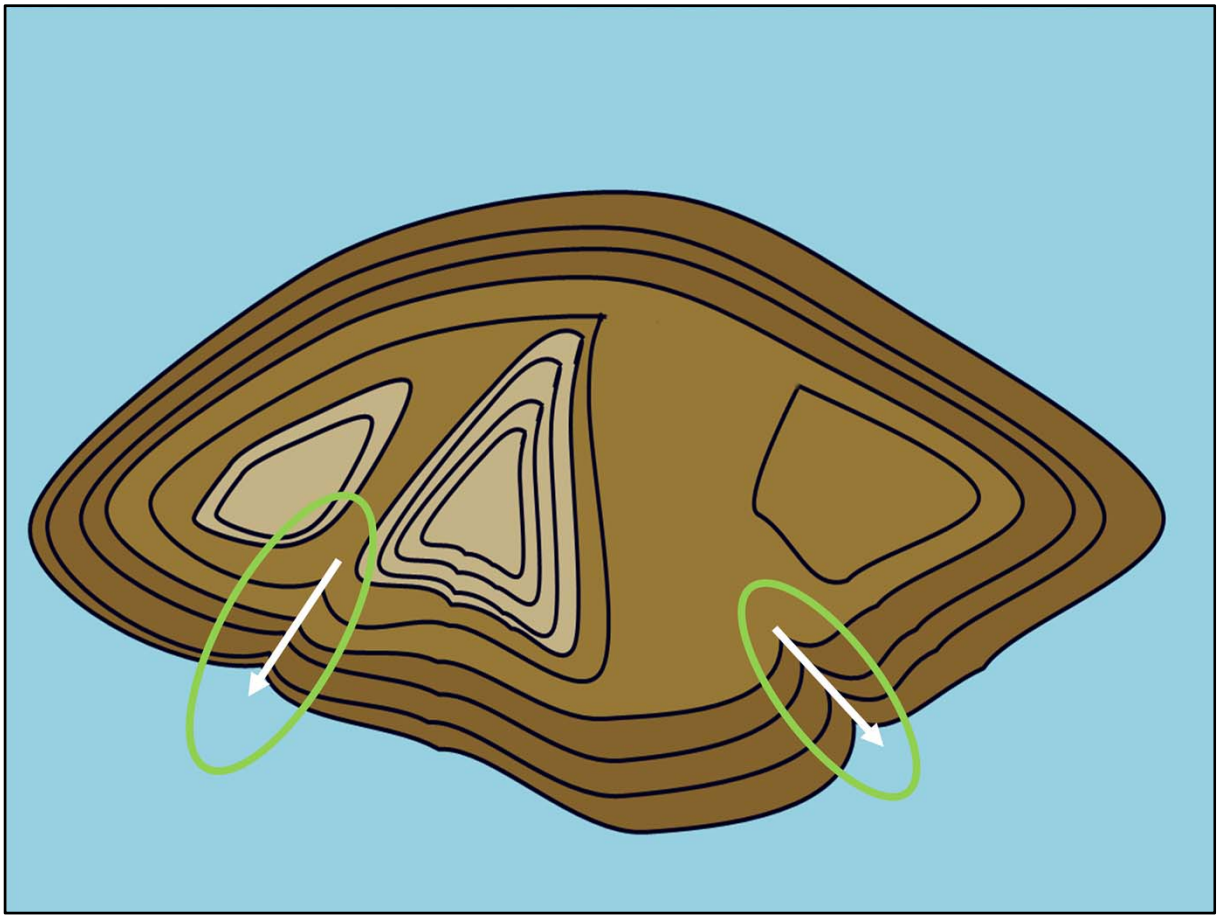

You may have noticed that no rivers were included on that topographic map of three mountains; however, there are rivers on this island. You can identify rivers based on the contour lines that make a "V" shape. The "V" points upstream when the contour line crosses a river or stream. Take a moment and look at the map and see if you can identify where the two rivers flow.

In addition to identifying the location of a river on a topographic map, you must be able to identify the direction in which that river is flowing. While all rivers flow downhill, not all rivers flow in the same direction (north, east, south, and west). The contours around a river are bent into a "V" shape. The river flows through the vertex of each V. One way to determine the direction of river flow is to imagine the V's as arrows. The arrows always point upstream, or opposite the flow of the river.

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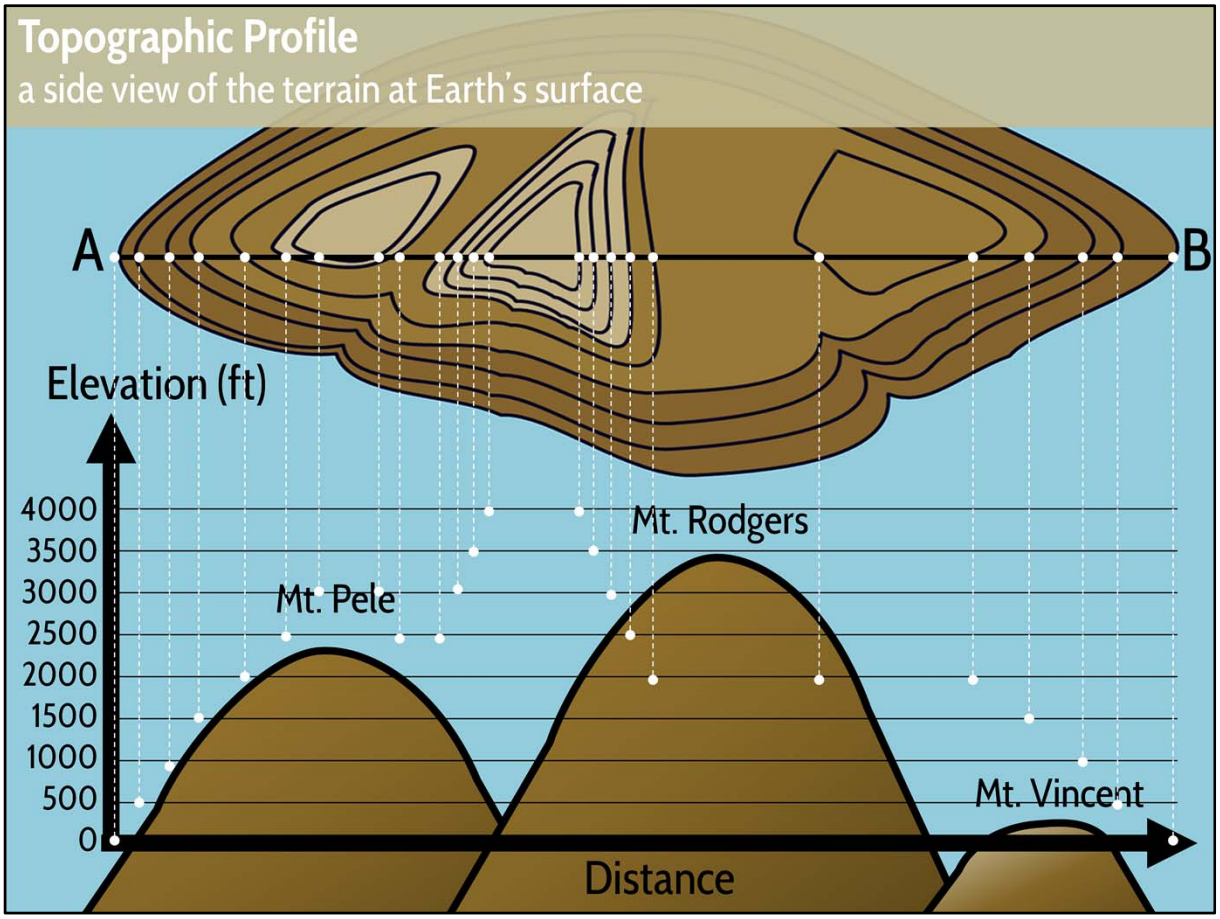

Are you still struggling to see a two dimensional map in three dimensions? If you are, then you will need to use the skill of making a topographic profile. A profile will create a side view of the terrain at Earth's surface. Basically, a profile depicts what the surface would look like if you were standing and observing that area on Earth.

Here you can see the profile of the island that was analyzed earlier. This is how the profile of the island should look after it is graphed. The profile takes place along the A-B straight line distance, traveling over all three mountain peaks on the island.

Follow these steps to create a topographic profile. First, make a graph on a piece of paper or below the straight line distance you would like to profile. Then, on the y-axis label, fill in the increments for each line. Generally, this will be the contour interval of the map. If you remember, the contour interval was 500 feet. Therefore, each number on the y-axis increases by 500 feet.

Now, you are ready to create the topographic profile and the next steps are really quite simple. Each time a contour line crosses the A-B line, just measure straight down from the intersection and mark the correct elevation on the graph. Once you have finished, you will have a very accurate profile of the island. Just watch how it is done!

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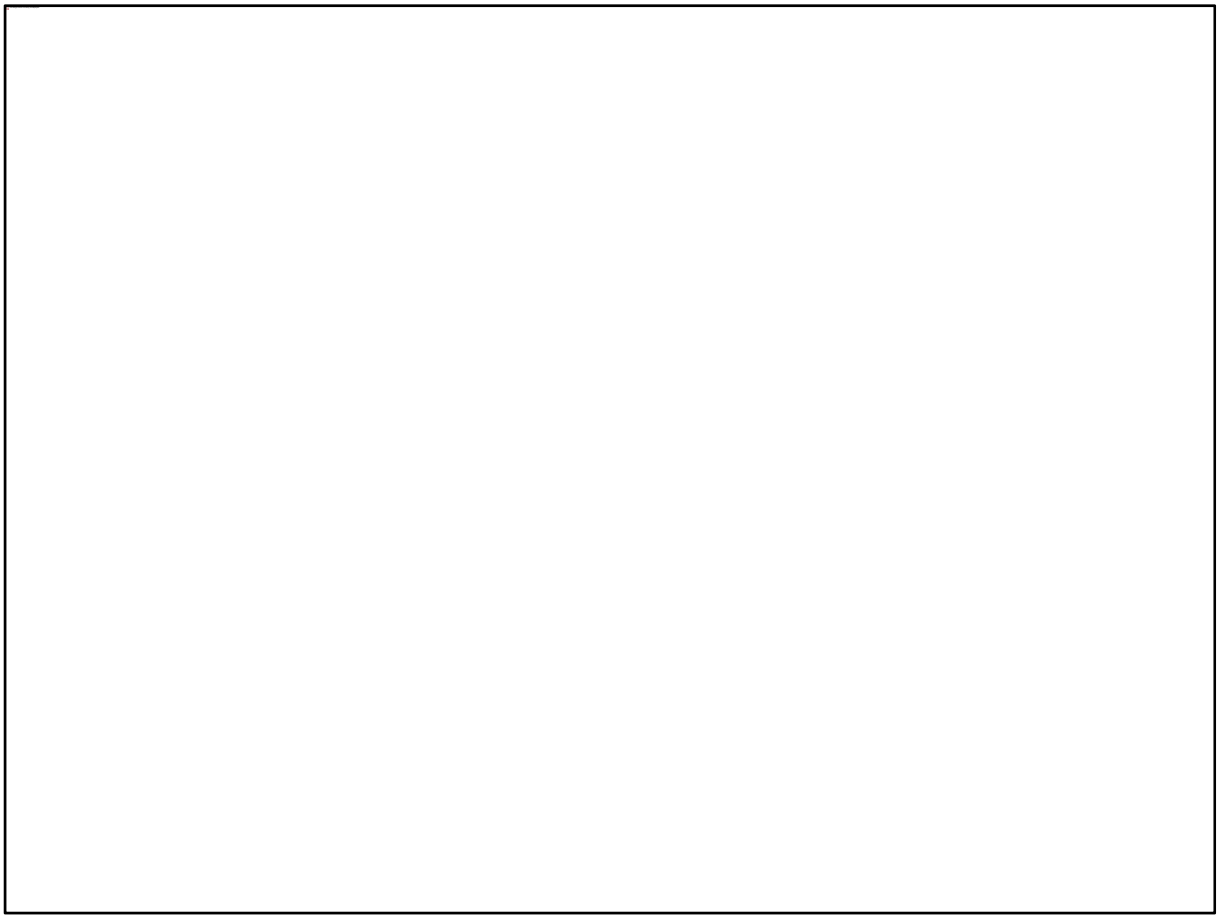

Erosion, volcanic activity, and other geologic processes can cause the Earth's surface to wear away or subside. To show a decrease in elevation on a mountain top or hillside, special contour lines are drawn with hachures. Hachures are tick marks drawn on closed contour lines to indicate decreasing elevation. A contour line with hachures represents a depression, and the elevation will decrease according to the contour interval.

The image shown is Meteor Crater in Arizona. This crater was caused by a large meteor striking Earth many years ago. How would this object look on a topographic map? Here you can see the elevation reaches a total of 5,300 meters in elevation and then suddenly drops to 5,122 meters. That means that the crater is 178 meters, or 534 feet, deep. That must have been some impact!