

Topo Map Tidbits

Adapted from: An original Creek Connections activity.
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Grade Level: Basic

Duration: One class period

Setting: Classroom

Summary: Students are introduced to topographic maps and learn basic map colors, symbols, and lines.

Objectives: Students will be able to identify common topographic map colors, symbols, and lines and be able to describe several uses of topographic maps.

Vocabulary:

Topographic maps, topography, watershed, 7.5-minute quadrangles, scale, contour lines, contour interval lines.

Related Module Resources:

- Fact Sheets:
 - “USGS: Maps and Images—Topographic Maps”
 - “USGS: Topographic Maps”
 - USGS Maps: [Topographic Maps](#)
 - USGS: [Topographic Mapping](#)

Materials (Included in Module):

- Key: Common Topographic Map Colors & Symbols
- Overhead: Common Topographic Map Colors & Symbols
- Figures: Reading Contour Lines
- Overhead: Reading Contour Lines
- USGS document: [Topographic Map Symbols](#) (*Please return with module!*)
- Worksheet: Topo Map Tidbits
- Answer Key: Topo Map Tidbits
- Features: Topo Map Tidbits
- Answer Key: Topo Map Tidbits Features
- Laminated 11x17 Map Quad Sections:
 - Meadville (20)
 - Conneaut Lake (20)
 - Cambridge Springs NE (20)
- Wet-erase markers

Additional Materials (NOT Included in Module):

- Colored pencils, crayons, or markers

ACADEMIC STANDARDS: GEOGRAPHY

6th Grade

7.1.6.A. Describe geographic tools and their uses.

- Geographical representations to display spatial information: topography
- Basic spatial elements for depicting the patterns of physical and human features: point, line, area, location, distance, scale

7.2.6.A. Describe the physical characteristics of places and regions.

- Components of Earth’s physical systems (e.g., relief and elevation (topography))
- Comparisons of the physical characteristics of different places and regions (e.g., topography)

BACKGROUND:

What tool is used by hikers, miners, farmers, geologists, foresters, construction workers, urban planners, engineers, environmental scientists and geographers alike? **Topographic maps!** These two dimensional representations of **topography**, or the physical characteristics of the land, are rich in information; hence, their wide variety of uses, including planning a hike, making educated decisions about where to mine for mineral deposits, determining where to locate a new housing development, and evaluating land use effects on waterways.

Topographic maps are particularly useful in the context of watersheds. A **watershed** is the total land area that drains into a particular waterway. Topographic maps depict landforms and waterways and allow us to determine stream order, length, and gradient as well as to delineate a watershed and determine its area.

These watershed features can be determined for practically any watershed in the country thanks to the topographic mapping the United States Geological Survey (USGS) has done since 1879. One series of USGS topographic maps called **7.5-minute quadrangles** (7.5 degrees of latitude by 7.5 degrees of longitude rectangles) consists of over 57,000 maps that cover the coterminous 48 states on a 1:24,000 scale. **Scale** is the proportion of the distance depicted on a map to the actual distance in the real world. For example, one unit on a 1:24,000 scale map is equal to

24,000 units in the real world. Because scale is a ratio, any units may be used but inches and centimeters, which are then converted to miles and kilometers, are used most frequently. Although 1:24,000 is the most common scale used by the USGS, this agency does produce thousands of maps using other scales such as 1:100,000 and 1:250,000.

The 1:24,000 scale used in the 7.5-minute quadrangle series is sufficiently small to thoroughly detail an area. And although no single map can represent *all* the details of a specific place, topographic maps come close by depicting elevation, state, county, township, city, and park boundaries, fence lines, surface features such as levees and tailings ponds, mines and caves, various types of vegetation including woods, orchards, and vineyards, rivers, lakes, and canals, wetlands, wells, dams, various buildings and related features such as schools, churches, airports, cemeteries, and barns, travel ways and related features from primary highways to trails to railroads and bridges to tunnels, as well as power, telephone, and pipelines. In all, topographic maps represent over 140 physical features.

The physical features depicted by topographic maps each have a unique symbol and/or color. Thus, one key to deciphering topographic maps and gleaning the maximum amount of information from them is learning some of the common colors and symbols and understanding how to use a key to determine the meaning of unknown symbols. (See “Common Topographic Map Colors & Symbols ” and the USGS document [Topographic Map Symbols](#) for examples.) The most common colors on topographic maps are green, white, blue, black, red, brown, light pink and bright pink/purple. Green represents forest or woods. White represents cleared land, including crop- and pasturelands, lawns and fields, and areas with few or no trees. Blue indicates water. Black depicts man-made features of the landscape. Red represents certain types of roads as well as fence lines. Brown is used mainly for contour lines, gravel pits, and strip mines. Light pink and gray both represent densely built-up/urban areas. And bright pink/purple highlights features that have been added to the map since its last edition. Common symbols on topographic maps include black squares that indicate houses or buildings, outlined squares that represent barns, black squares with flags and crosses that denote schools and churches, respectively. Crossed shovels represent gravel pits. BM means benchmark and the precise elevation of locations labeled BM is indicated on the map.

Another crucial aspect of comprehending topographic maps is understanding how a two-dimensional map represents the three-dimensional physical feature of elevation above sea level. Like the other physical features on topographic maps, elevation is represented by a symbol: brown lines called **contour lines**. Contour lines distinguish topographic maps from other types of maps and connect points of equal elevation. That is, all points on a given contour line have the same elevation. The interval between contour lines varies and this interval is noted underneath the scale on 7.5-minute maps. Dark brown lines are called **index contour lines** and their elevation is written in dark brown somewhere along the contour line. Index contour lines are separated by lighter brown contour lines called **intermediate contour lines**. The closer contour lines are together on a map, the steeper the slope of the landform. For example, tightly clumped contour lines might depict a cliff while widely spaced contour lines represent flatter areas. Contour lines are not always

straight. They curve, zigzag, and form patterns to reveal what the topography of an area looks like, i.e., whether there is a hill, a plain, or a valley. Contour lines that form concentric circles or ovals represent hills. V-shaped contour lines indicate valleys, gullies or ravines (Figure 1). Small streams cut back into hillsides, carving out a ravine, gully, or valley. This ravine or valley is represented by V-shaped contour lines. Recall that hills are shown as concentric circles or ovals on topographic maps. Think of these circles or ovals as a pie. If you were going to cut a slice of pie, you would cut out a V-shape. Similarly, when small stream cuts ravines into hillsides, they form Vs (Figure 2). As the stream cuts deeper into the hillside, it forms more Vs. Thus, V-shaped contour lines denote valleys, ravines, and gullies that have been carved into the land by waterways.



Figure 1. V-shaped contour lines indicate valleys, gullies and ravines.

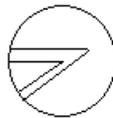


Figure 2. Small streams cut into hillsides creating V-shaped valleys and gullies.

Another common contour line shape is U-shaped. U-shaped contour lines depict ridges. Irregularly shaped contour lines, particularly zigzag contour lines, denote rugged, uneven terrain. (See the “Reading Contour Lines” handout and overhead for examples of the contour line patterns described above.)

References:

Allan, J. David. *Stream Ecology*. New York: Chapman & Hall, 1995.
 Fink Martin, Patricia A. *Rivers and Streams*. Danbury, Connecticut: Franklin Watts, 1999.
Topographic Map Symbols. USGS.

OVERVIEW:

Students use the documents, “Common Topographic Map Colors & Symbols,” “Reading Contour Lines,” and Topographic Map Symbols to complete a worksheet. They then apply their newly refined topographic map reading skills by identifying prominent features on a portion of the Meadville Quad topographic map.

PROCEDURE:

Note to Teachers: The Topo Map Tidbits Worksheet and Meadville Quad activity may be done individually. They are independent activities.

Teacher Preparation:

Worksheet

Make photocopies of “Common Topographic Map Colors & Symbols,” “Reading Contour Lines,” and the Topo Map Tidbits Worksheet for your students and locate the USGS documents Topographic Map Symbols in the module. If you cannot make color

copies of “Common Topographic Map Colors & Symbols,” have students use colored pencils, markers, or crayons to color in the squares themselves.

Meadville Quad Activity

1. Locate the laminated Meadville Quads and wet-erase markers in the module.
2. Make photocopies of “Common Topographic Map Colors & Symbols,” “Reading Contour Lines,” and locate the USGS documents Topographic Map Symbols in the module.

Student Activity:

Worksheet

1. Introduce your students to topographic maps using the information presented in the background section of this write-up. Distribute “Common Topographic Map Colors & Symbols,” “Reading Contour Lines,” and the USGS document Topographic Map Symbols to your students and refer to these documents as you proceed through the introduction.
2. Hand out the Topo Map Tidbits Worksheet to your students.
3. Have students work individually to complete the worksheet, referring to “Common Topographic Map Colors & Symbols,” “Reading Contour Lines,” and the USGS document Topographic Map Symbols as needed.
4. Go over the answers with your students.

Meadville Quad Activity

1. Introduce your students to topographic maps using the information presented in the background section of this write-up. Distribute “Common Topographic Map Colors & Symbols,” “Reading Contour Lines,” and the USGS document Topographic Map Symbols to your students and refer to these documents as you proceed through the introduction.
2. After the introduction, distribute laminated Meadville Quads and wet-erase markers to students.
3. Explain that they will be using “Common Topographic Map Colors & Symbols,” “Reading Contour Lines,” and the USGS document Topographic Map Symbols to locate and number various features on the topographic map.
4. Starting with number 1, read aloud a feature from the “Topo Map Tidbits Features” list. Have students locate such a feature on their Meadville Quads and label it with a number 1.

5. Proceed through the rest of the features, having students label each feature with the corresponding number as you proceed. Walk around the classroom as the activity progresses to make sure that students are on the right track.
6. When you have reached the end of the “Topo Map Tidbits Features” list, ask students to exchange topographic maps with a partner. Go through the features again and have students check their partners’ work. Allow time between features for students to point out mistakes or suggestions to their partners.

DISCUSSION:

What is topography? *The physical characteristics of the land.*

How are these physical features depicted on topographic maps? *Colors and symbols.*

What feature distinguishes topographic maps from other maps? *Contour lines.*

What is scale? How does scale help us convert distance on a map to actual distance in the real world? *Scale is the proportion of the distance depicted on a map to the actual distance in the real world. For example, one unit on a 1:24,000 scale map is equal to 24,000 units in the real world. So, if we measure a distance on a 1:24,000 topographic map, we need to multiply that distance by the scale (24,000) to obtain the actual distance in the real world.*

What are some potential uses of topographic maps? *See background.*

Which U.S. agency is responsible for producing topographic maps of the United States? *The USGS (United States Geological Survey).*

EVALUATION:

- Discussion questions above.
- Students have correctly completed the worksheet and/or feature-labeling exercise.
- Do one activity as practice and use the other as a test.

EXTENSIONS AND MODIFICATIONS:

- Photocopy “Topo Map Tidbits Features” and distribute it to students. Have them work through and label the various features on their own.
- Come up with or have students create other Topo Map Features lists to test even more common topographic map colors and symbols.
- Instead of giving all students the same quad for the Topo Map Tidbits Features activity, give students different quads. Then, instead of going straight down the list of features, photocopy and cut up the list into individual features and place them in a hat or bowl. Draw out one feature at a time and have students mark this feature on their map with a penny or other marker. The first person to get 5 (or another predetermined number) features marked on their map wins!
- Have students write their names on their laminated Meadville Quads. Collect the quads and correct them. This might be a good way to evaluate or test your students.

- Try the Topo Map Features activity using another topographic map or section of a topographic map. Have students use removable tape to secure blank transparencies over the topographic maps. Make sure they do not write directly on the maps!
- Use a topographic map of your area to learn about the prominent features of your watershed.
- Have students draw topographic maps of the school grounds or an area of town. Although it will be difficult for them to determine elevation, they could still draw generalized contour lines to represent hills or valleys. Instead of focusing on the contour lines, stress the use of symbols and colors. After students have completed their topographic maps, compare them to USGS maps of the area.
- Have students go on hikes and use topographic maps to guide them.

NOTES (PLEASE WRITE ANY SUGGESTIONS YOU HAVE FOR TEACHERS USING THIS ACTIVITY IN THE FUTURE):



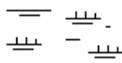
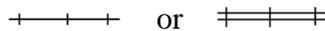
FEATURES : TOPO MAP TIDBITS

Number the following features on your topographic map using a wet-erase marker. If the map is not laminated, DO NOT WRITE DIRECTLY ON THE MAP!

1. An intermittent stream.
2. A densely built-up area.
3. A hilltop.
4. A perennial stream.
5. A barn.
6. A valley.
7. A steep slope.
8. A contour interval line.
9. A new feature that has been added to this map since its last edition was printed.
10. A potential agricultural area.
11. A church.
12. A gravel pit.
13. A ridge.
14. A golf course.
15. The scale of this map.
16. A school.
17. The contour interval of this map.
18. A wetland.
19. A township line.
20. Railroad tracks.
21. Power transmission lines.
22. A riparian (streamside) forest.
23. An unimproved road.
24. A fence line.
25. The southwest corner of the map.
26. The name of this topographic map quad.
27. A light duty road.



ANSWER KEY : TOPO MAP TIDBITS FEATURES

1. An intermittent stream. *Any dashed blue line.*
2. A densely built-up area. *The light pink shaded area around Meadville.*
3. A hilltop. *Concentric circular contour lines.*
4. A perennial stream. *Any solid blue line.*
5. A barn.  *Open squares or rectangles.*
6. A valley.  *V-shaped contour lines.*
7. A steep slope. *Closely spaced contour lines.*
8. A contour interval line. *Any light brown line labeled with its elevation.*
9. A new feature that has been added to this map since its last edition was printed. *Any bright pink/purple-colored feature.*
10. A potential agricultural area. *Any white area, but more likely in flat areas.*
11. A church. 
12. A gravel pit.  *or labeled "gravel pit."*
13. A ridge. *U-shaped contour lines.*
14. A golf course. *Labeled "golf course."*
15. The scale of this map. *1:24,000.*
16. A school. 
17. The contour interval of this map. *10 feet.*
18. A wetland. 
19. A township line. 
20. Railroad tracks.  or 
21. Power transmission lines. 
22. A riparian (streamside) forest. *A green-shaded area adjacent to a waterway.*
23. An unimproved road. 
24. A fence line.  (red) (black)
25. The southwest corner of the map.
26. The name of this topographic map quadrangle.
27. A light duty road. 