

Topo Bingo

Adapted from: US Geological Survey, Western Region, Menlo Park, CA: *Learning Web Topo Bingo* by Leslie C. Gordon.

Grade Level: 3rd to Adult

Duration: One class period

Setting: Classroom

Summary: Students become familiar with topographic map features by playing a Bingo-like game.

Objectives: Students will be able to identify topographic map colors, symbols, and lines and be able to describe several uses of topographic maps, while having fun; Or as an assessment of students ability to read topographic maps.

Vocabulary:

Topographic maps, topography, watershed, topographic map colors, topographic map symbols, scale, contour lines, and 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):

- Class Set of Different USGS Topographic Maps
- Plastic Bag or Envelope of Topographic Symbols Calling Cards
- Key: Common Topographic Map Colors & Symbols
- Overhead: Common Topographic Map Colors & Symbols
- USGS document: [Topographic Map Symbols](#) (*Please return with module!*)
- Wet-erase markers for marking map features

Additional Materials (NOT Included in Module):

ACADEMIC STANDARDS: Geography

7.1.3.A. Identify geographic tools and their uses.

- Characteristics and purposes of different geographic representations.
- Geographic representations to display spatial information

7.1.6.A. Describe geographic tools and their uses.

- Basis on which maps, graphs and diagrams are created.
- Geographical representations to display spatial information: topography
- Basic spatial elements for depicting the patterns of physical and human features: line, distance, scale

7.2.3.A. Identify the physical characteristics of places and regions.

- Physical Properties: Water, Landforms

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

- Comparison of the physical characteristics of the different places and regions.
- Components of Earth’s physical systems: relief and elevation

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), which are caused by small streams cutting back into hillsides. Recall that hills are shown as concentric circles or ovals. 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 cuts V's deeper into the pie. 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 USGS topographic maps to become familiar with the various symbols, colors, and lines use to designate topographic features of various places by playing a modified bingo game that uses symbols, colors, and lines from the topographic map key as calling cards.

PROCEDURE:

Note: The difficulty of the game can be adjusted by: by choosing which pieces to put in the hat. Game pieces that say “church,” “school,” or “railroads” are simple, and all levels of students should be able to find them on a map. “Depression contours” and “steep cliffs,” which require a knowledge of topographic map reading, are for the intermediate or advanced student. They require a knowledge of topographic map reading. Game pieces such as “sand dunes” require a knowledge of the landform itself and what it looks like on a topographic map. The level of your

students should dictate which of the game pieces to start with in the bag. You may choose to hide or show the symbol on the game pieces to students by folding them.

Teacher Preparation:

1. Make photocopies of “Common Topographic Map Colors & Symbols,” 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. This will allow students to have a key for understanding the topographic map colors and symbols. If you are testing the students on their topographic map skills, do not provide them with the sheet “Common Topographic Map Colors & Symbols.”
2. Distribute USGS topographic maps and wet erase markers to students. (Note: Make certain that the maps you distribute are laminated. Otherwise the wet erase markers will need to be replaced with pennies, squares of paper, or bingo marking coins.)

Student 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” and the USGS document Topographic Map Symbols to your students and refer to these documents as you proceed through the introduction.
2. Designate yourself or a student to be the caller.
3. Shake or mix-up the topographic map calling cards.
4. Take out cards and call the symbol and color out to the students, like you would call numbers in a typical bingo game.
5. Continue drawing cards out of the bag and calling them until a student has covered five features on his or her map and shouts “Topo!” A prize can be given under the teacher’s discretion. Continue play until several students have won.

DISCUSSION:

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

What are some of the symbols used to show water in a topographic map? *Solid blue lines, dashed blue lines, blue marsh and swamp symbol that looks like fans with lines.*

What symbols and colors show forest or other undeveloped land areas? *White sections, solid or dotted/dashed green sections, green grids, ect.*

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? *Possible answers: planning a hike, making educated decisions about where to mine for mineral deposits, determining where to locate a new housing development, evaluating land use effects on waterways, etc.*

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

EVALUATION:

- Discussion questions above.
- Do activity as practice and then later as a test.

EXTENSIONS AND MODIFICATIONS:

- Photocopy “Common Topographic Map Colors & Symbols,” and whiteout the labels of the symbols and have students label symbols on their own copy of the label-less sheet.
- Come up with or have students create other Topo Map Features lists to test even more topographic map colors and symbols.
- Use different topographic maps than provided in the game and play bingo. Discuss why specific features aren’t found in western Pennsylvania or other specific locations.
- 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):

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