

Topographic Profiles

A *topographic profile* is a diagram that shows the change in elevation of the land surface along any given line. It represents graphically the "skyline" as viewed from a distance. Features shown in profile are viewed along a horizontal line of sight, whereas features shown on a map or in *plan view* are viewed along a vertical line of sight. Topographic profiles can be constructed from a topographic map along any given line.

The *vertical scale* of a profile is arbitrarily selected and is usually, but not always, larger than the horizontal scale of the map from which the profile is drawn. Only when the horizontal and vertical scales are the same is the profile *true*, but in order to facilitate the drawing of the profile and to emphasize differences in relief, a larger vertical scale is used. Such profiles are *exaggerated profiles*.

Ideally both the horizontal and vertical scales would be the same. This is impractical in most cases. On a section with a horizontal scale of 1:1,000,000, the topographic features would be almost impossible to see if the same vertical scale were used. Both horizontal and vertical scales are usually provided with each profile. The exaggeration is determined by comparing the inches on the profile with feet in nature. Thus, on a profile with a horizontal scale of 1:24,000 and a vertical scale of 1/10 inch to every 100 feet of elevation:

Horizontally 1 inch represents 24,000
divided by 12 = 2,000 ft.

Vertically 1 inch represents 10 times 100 =
1,000 ft.

Vertical exaggeration is 2.0 times.

Be aware that vertical exaggeration not only increases but also changes the character of the profile. A volcano such as that shown in figure 2.14 would appear as a sharp peak at 10 times vertical exaggeration.

Instructions for Drawing a Topographic Profile

Figure 2.10 shows the relationship of a topographic profile to a topographic map. It should be examined in connection with the following instructions:

1. The line along which a cross section is to be constructed may be defined by an actual line drawn on the map, or by two points on the map that determine the terminals of the line of cross section.
2. Examine the line along which the profile is to be drawn and note the difference between the highest and lowest contours crossed by it. The difference between them is the maximum relief of the profile. Cross sectional paper divided into 0.1 inch or 2 mm squares makes a good base on which to draw a profile. Use a vertical scale as small as possible so as to keep the amount of vertical exaggeration to a minimum. For example, for a profile along which the maximum relief is less than 100 feet, a vertical scale of 0.1 inch or 2 mm = 5, 10, 20, or 25 feet is appropriate. For a profile with 100 to 500 feet of maximum relief, a vertical scale of 0.1 inch or 2 mm = 40 or 50 feet is proper. If the maximum relief along the profile is between 500 and 1,000 feet, a vertical scale of 0.1 inch or 2 mm = 80 or 100 feet is adequate. When the maximum relief is greater than 1,000 feet, a vertical scale of 0.1 inch or 2 mm = 200 feet is appropriate. The general rule for guidance in the selection of a vertical scale is: the greater the maximum relief, the smaller the scale. Label the horizontal lines of the profile grid with appropriate elevations from the contours crossed by the line of the profile. Every other line on a 0.1 inch or 2 mm grid is sufficient.
3. Place the edge of the cross sectional paper along the line of profile. Opposite each intersection of a contour line with the line of profile, mark a short dash at the edge of the cross sectional paper. If the contour lines are closely spaced, only the heavy or *index* contours need to be marked. Also mark the positions of streams, lakes, hilltops, and significant cultural features on the line of profile. At the edge of the paper, label the elevation of each dash.
4. Drop these elevations perpendicularly to the corresponding elevations represented by the horizontal lines on the cross sectional paper.
5. Connect these points by a smooth line and label significant features such as streams and summits of hills. Add the horizontal scale and write a title on the profile.

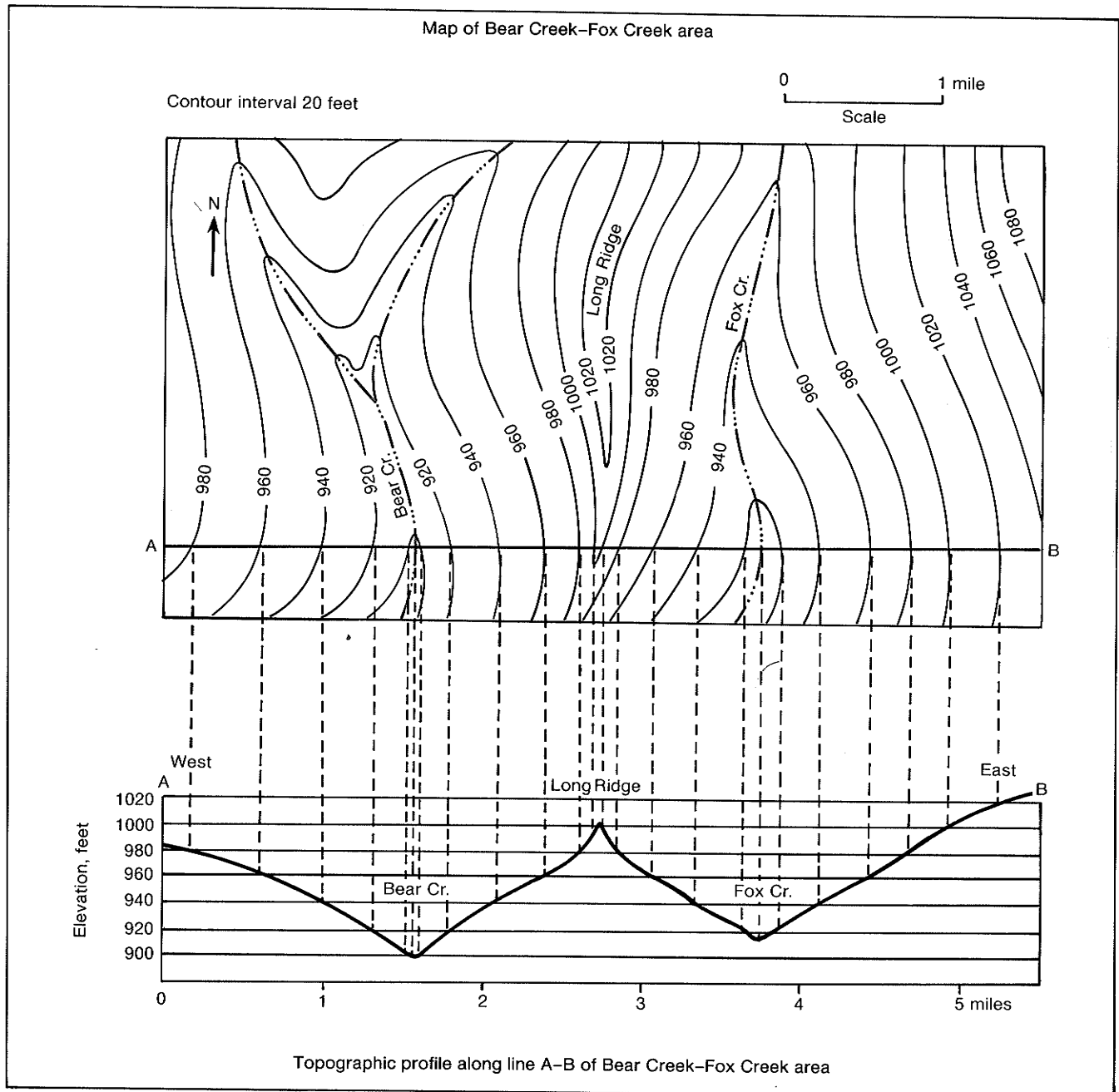


Figure 2.10 A topographic profile drawn along line A-B on the map of the hypothetical Bear Creek—Fox Creek area. See text for step-by-step instructions.

Exercise 7. Drawing Profiles from Topographic Maps

1. Draw a profile along line A-B of the topographic map in figure 2.8.
2. Refer to the Delaware Map of figure 2.12. Three north-south red lines and three east-west red lines intersect at approximately one-mile intervals. These north-south and east-west lines define the boundaries of *sections*. Each section is numbered, and the number is printed in red in the center of each section.

On the grid of figure 2.11, draw a north-south profile (in pencil) along the red line that defines the western boundary of sections 10, 3, and 34. The beginning point of the profile is the southwest corner of section 10, and the ending point is the shore of Lake Superior, which has an elevation of 602 feet above sea level. (Part of Lake Superior is indicated along the northern part of the Delaware Map.) The vertical scale has been established as

0.1 inch = 40 feet. The horizontal scale is the same as the map scale. Significant features along the line of profile have already been labeled.

3. What is the horizontal scale of the profile in feet per inch?
4. What is the vertical scale of the profile you have drawn in feet per inch?
5. By what factor is the vertical scale exaggerated?
6. In order to visualize more clearly the effect of vertical exaggeration, redraw the profile using a vertical scale of 0.1 inch = 80 feet. Use the grid in figure 2.11 and label the horizontal lines (according to the new scale) on the right-hand margin of the grid. The horizontal line now labeled 600 feet will be labeled 800, and the line now labeled 800 will be 1,200 on the new scale.

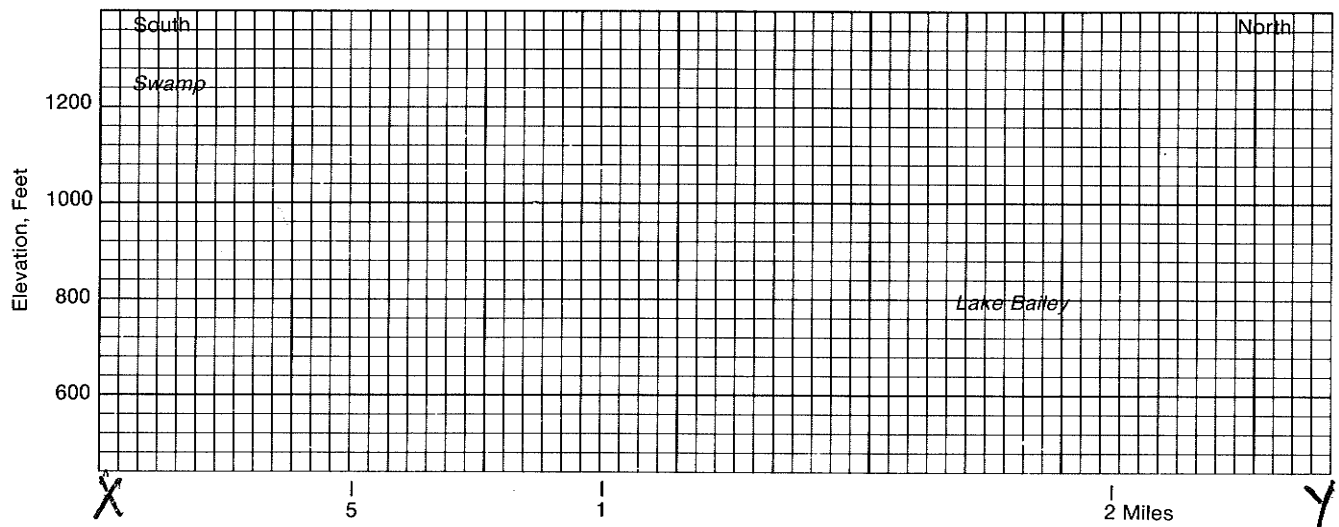


Figure 2.11 Grid to be used in drawing a north-south topographic profile from the Delaware Map (fig. 2.12). The south end of the profile is the southwest corner of section 10, and the north end is the shore of Lake Superior. The line of profile is coincident with the western boundaries of sections 3, 10, and 24.

Lake Superior

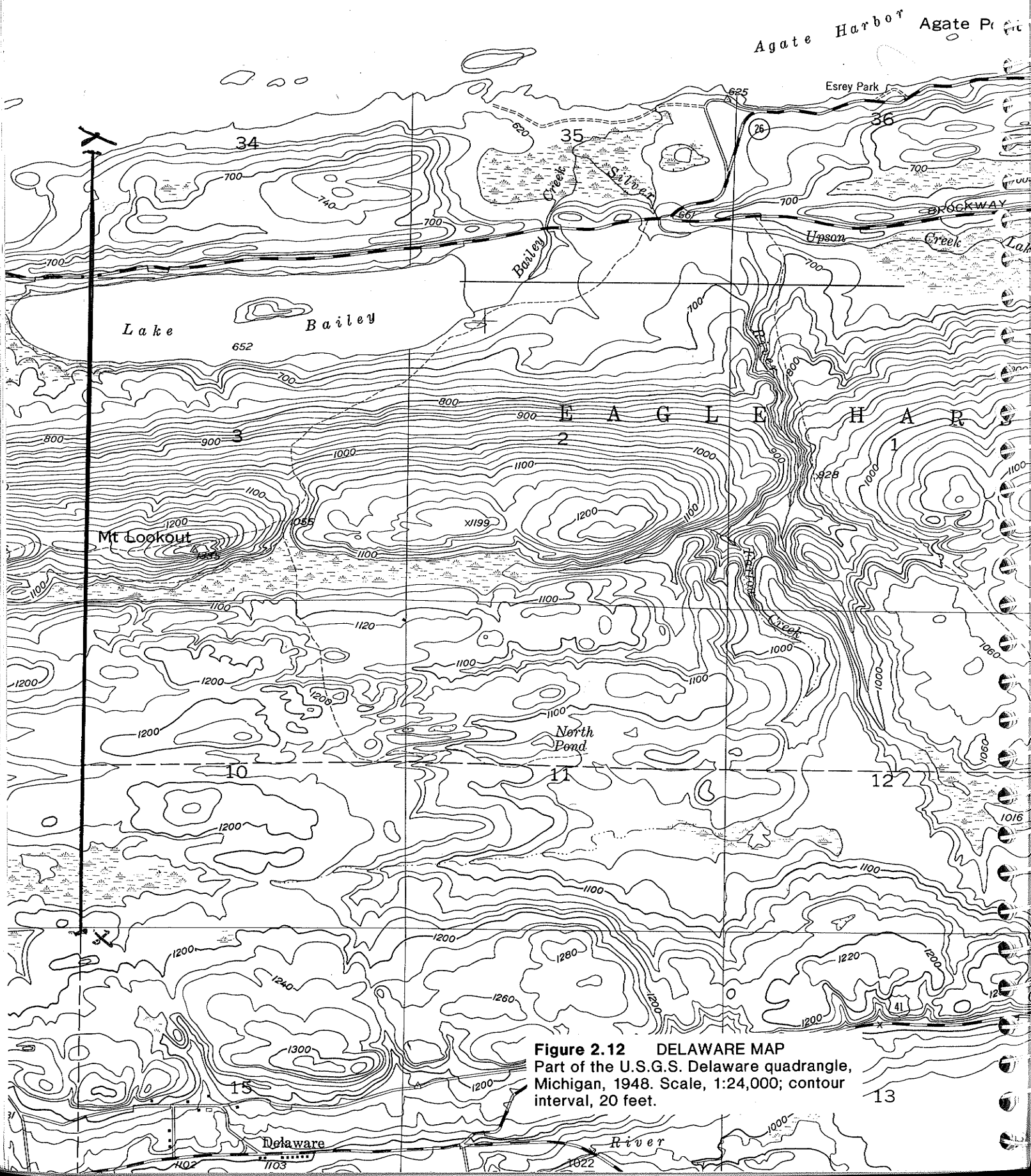


Figure 2.12 DELAWARE MAP
Part of the U.S.G.S. Delaware quadrangle,
Michigan, 1948. Scale, 1:24,000; contour
interval, 20 feet.