

Name: _____ Laboratory Section: _____
Date: _____ Score/Grade: _____



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23

LAB EXERCISE

Contours and Topographic Maps

Lab Exercise and Activities

SECTION 1

Contour Lines and Topographic Maps

Use the hypothetical landscape and topographic map in Figure 23.2 to answer the following questions:

- What is the contour interval?

20 ft is the contour interval for the topographic map of the hypothetical landscape.

How can you tell?

From the numbers on the lines (5 intervals between every 100 feet)

- In terms of local relief (the difference between the highest and the lowest elevation): what is the relief on the west (left) side of the river? **275 ft** on the east (right) side of the river? **260 ft**

- What is the highest point on the map, and what is its elevation?

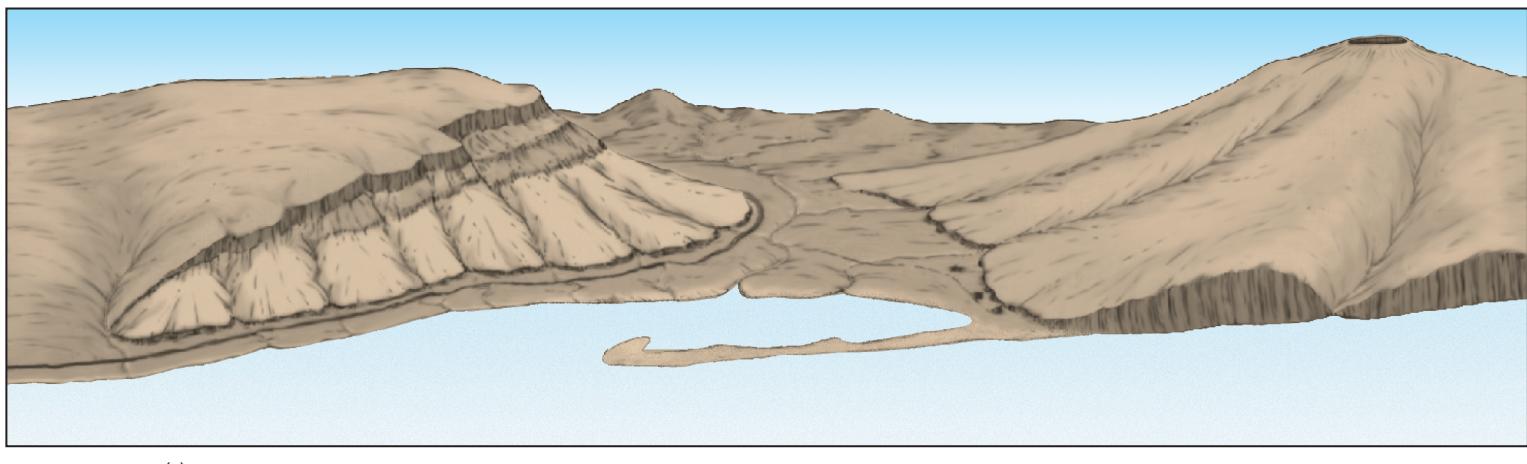
275 ft for hill on west side of map

- Imagine that you are planning a *low-exertion* walk from the church across the river to the high point on the west side of this landscape. First on **Figure 23.2a** and then on **Figure 23.2b**, use a red colored pencil to draw the route you would take; give your reasons for choosing this easier route in terms of elevation change per distance traveled.

Walk westward along the beach to the farthest western ravine, then turn northward up the gradual slope of the stream channel to high ground above the valley.

- On each figure use a blue pencil to draw in streams, using arrows to show the direction of stream flow. Note that there is a main stream in the valley and there are at least two tributary streams or creeks. How do the contour lines indicate the direction of flow?

Contour lines form an upstream-pointing, V-shaped pattern wherever contour lines cross a stream.



▲ **Figure 23.2** (a) Perspective view of a hypothetical landscape; (b) topographic map of that landscape. (After the U.S. Geological Survey)

SECTION 2

Constructing Contour Lines

Use Figure 23.3 to do the following work and answer the questions.

- Using a pencil, sketch 40-foot-interval contour lines using the specific site elevations given. Note that we have drawn the 40-ft contour line for you. You must *interpolate* (estimate) elevations between known values. Draw your contour lines lightly at first as you determine the best portrayal, then darken in your work and erase stray pencil marks. (Do not worry if your lines go through the elevation labels.) Remember the contour line basics given in Section 1.

The coastline is the datum—mean sea level. *Begin your work at the coast and work inland.* (*Hint:* Make this task easier by color-coding the elevations in 40-foot intervals. Circle all elevations from 0–40 feet in green, 41–80 feet in yellow, etc. Then, when drawing the contour lines, you will be “grouping” the colors, with the contour lines as separators between the color groups.)

- Three vertical control bench marks, indicated by the letters “BM” and marked with an “x,” are noted on the map. What are their elevations?

112 ft, 146 ft, and 401 ft.

- Three other specific spot elevations are noted with an “x.” What are their elevations?

489 ft, 492 ft, 730 ft

- What effect do the intermittent (periodically dry) stream channels have on the topography of the region?

Contour lines form an upstream-pointing, V-shaped pattern wherever contour lines cross a stream or intermittent stream course

- Given the trend and location of the 40-foot elevation contour, if you were walking along the water’s edge, how would you characterize the topography and relief of the coastline? Steep? Gentle relief?

The immediate coast is a wave-cut platform, or terrace, as noted by the 40-foot contour line marking a steep cliff close to the shore.

- In what compass direction does the river flow? How can you tell? (See Section 1, question 5.)

NW (315°), elevation of the river decreases to the northwest.

- Which portion (NW, NE, SE, or SW) of the map has the greatest relief?

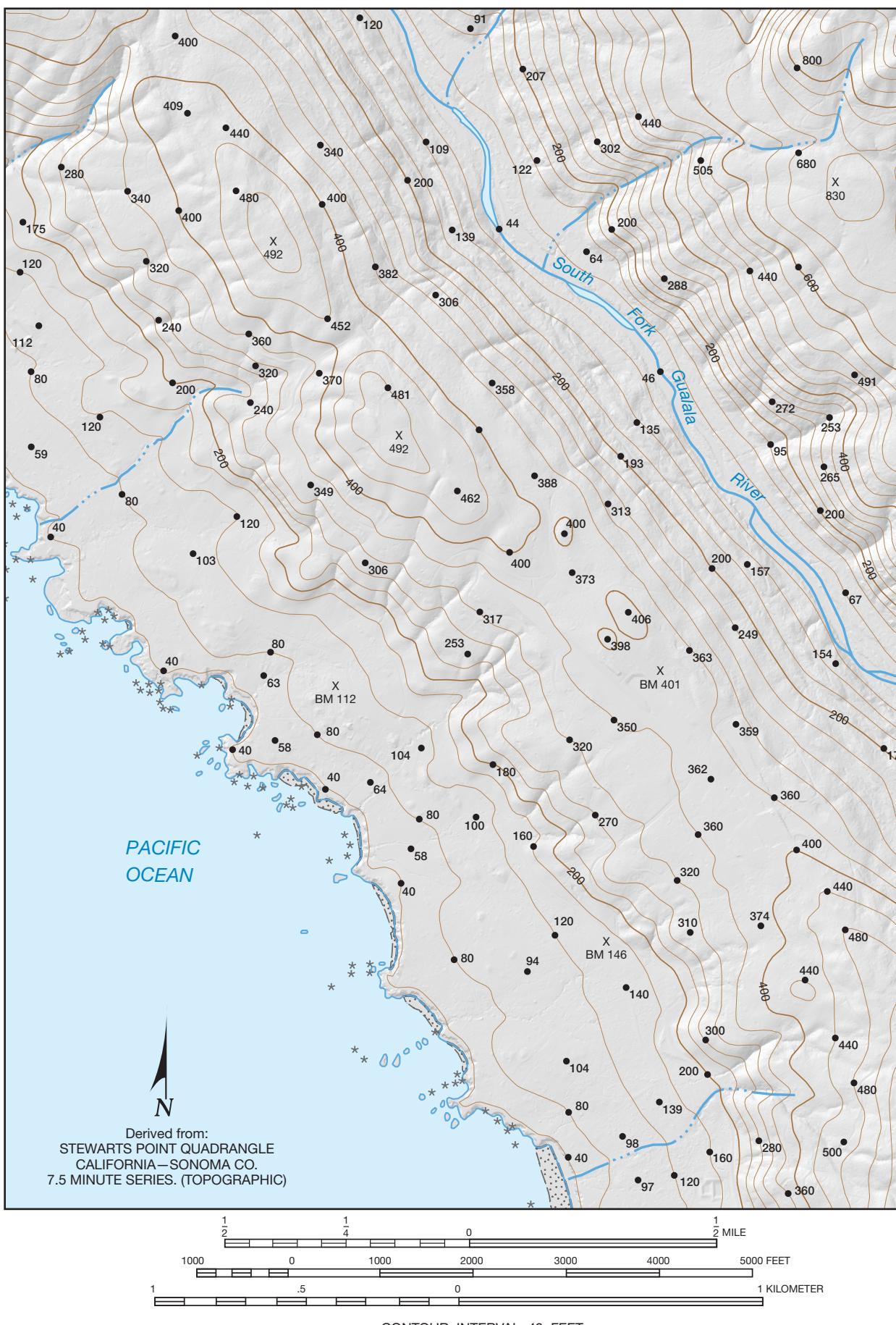
A steep slope rises in the northeast section of the map to the summit of the hill at 730 ft.

- Challenge question:** If you were assigned the task of building a single general aviation runway 3700 feet in length, where would you place it? Draw your runway plan on the map to the correct scale. (Make it 100 feet wide.) Give your reasons for this site selection.

Note the location on the map along the nearly level ridge—only 2 ft difference in elevation from one end of the proposed runway to the other. NW-SE between 405 and 403 elevation marks.

- Google Earth™ activity, Stewarts Point quadrangle. For the KMZ file and questions go to mygeoscienceplace.com. Then click on the cover of *Applied Physical Geography: Geosystems in the Laboratory*. Or visit the Mastering Geography Study Area.





▲ Figure 23.3 A portion of the Stewarts Point quadrangle, enlarged and adapted with 200-, 400-, and 600-foot index contours highlighted.

SECTION 3

Topographic Profile

Use the profile constructed in Figure 23.5 to answer the following questions and completion items.

- What is the horizontal distance of this topographic profile?

6000 ft

- What is the maximum relief along this profile?

192 ft

- The landform feature you have profiled is a drumlin. Drumlins are formed by glacial deposits and are streamlined in the direction of the glacier's movement. They have a blunt end upstream, a tapered end downstream, and a rounded summit. Using your protractor, what direction was the glacier flowing?

The glacier was flowing from 260° towards 80°.

- Measure from the 500' contour line on the west side of the feature, across the summit at 667', to the 500' contour line on the east side of the feature. How wide is the feature?

Approximately 2000 ft at the widest point.

The horizontal scale is $1.1'' = \underline{1000'}$, so each horizontal square represents **110'**. The vertical scale is $1'' = 100'$, so each vertical square represents **10'**. The total relief along the transect is **192'**. How many vertical squares does it take to represent the total relief along the transect? If each vertical square represented as many feet as each horizontal square, so that the vertical scale was the same as the horizontal scale, how many vertical squares would it take to represent the maximum relief along the profile? **2'**

- Google Earth™ activity, Palmyra quadrangle drumlin. For the KMZ file and questions go to mygeoscienceplace.com. Then click on the cover of *Applied Physical Geography: Geosystems in the Laboratory*. Or visit the Mastering Geography Study Area.

A second example of a vertical profile is in Figure 23.6. Using the same procedure as you did on the previous assignment, construct a topographic profile. Label the South Fork of the Gualala River (see Figure 23.4, Step 3), the bench mark at 112 feet, and various road crossings on your profile. The coastline forms a contour line of equal elevation—sea level. Note the change in contour interval and scale from that of Figure 23.5.

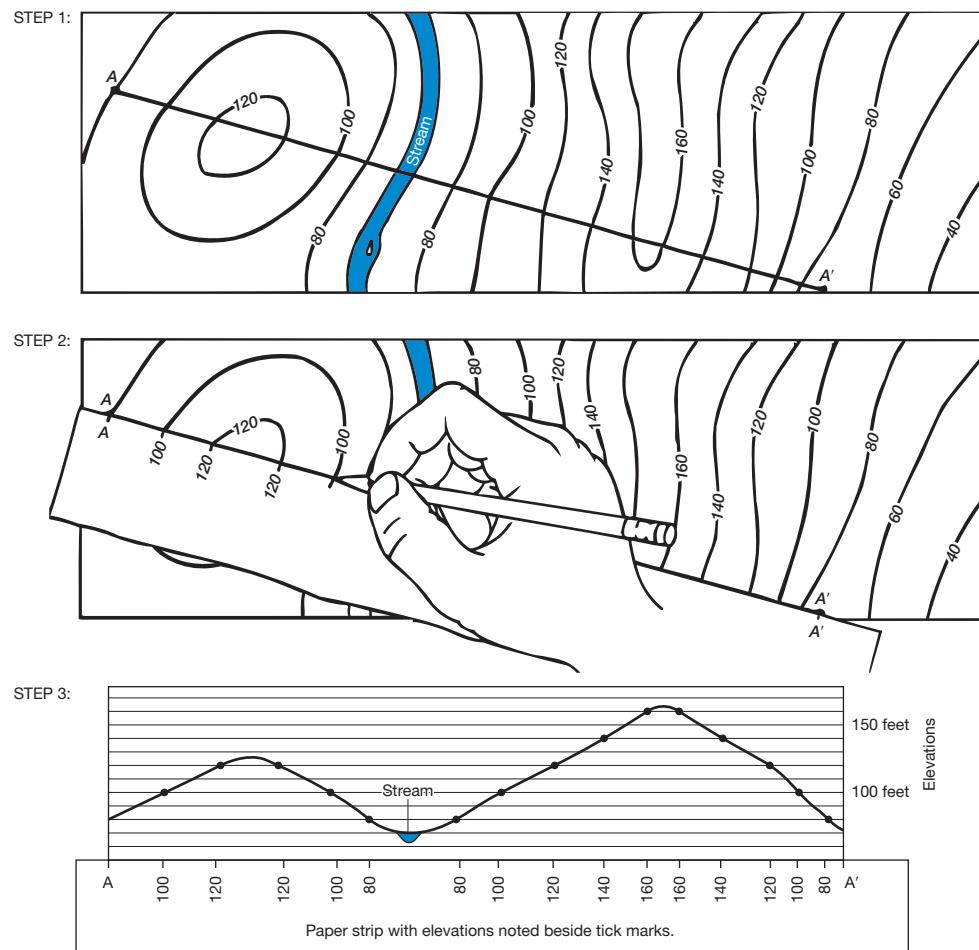
Use Figure 23.6 to answer further questions about preparing a topographic profile.

- What is the length of this topographic profile in miles? in kilometers?

1.625 mi; 2.6 km.

- After you complete the topographic profile you'll notice a marine terrace, a relatively flat platform or "shelf," along the coast. You can find where the marine terrace ends by looking along the topographic profile for where the slope changes from flat to steeper. What contour elevation marks this change from the marine terrace to the hills inland? How wide is this terrace from the coast line to that contour line elevation in feet?

2640 ft (0.5 mi, 0.8 km),



▲ **Figure 23.4** Constructing a topographic profile using the edge of a piece of paper.
(From Busch, Richard M., editor, *Laboratory Manual in Physical Geology*, 3rd ed., Macmillan Publishing Company © 1993.)

8. If we used a vertical scale identical to the horizontal scale, how many squares on the graph would accommodate the maximum relief along the profile? (Hint: use the same method you used in question 5 to find the answer.)

Less than five squares, or 671 ft.

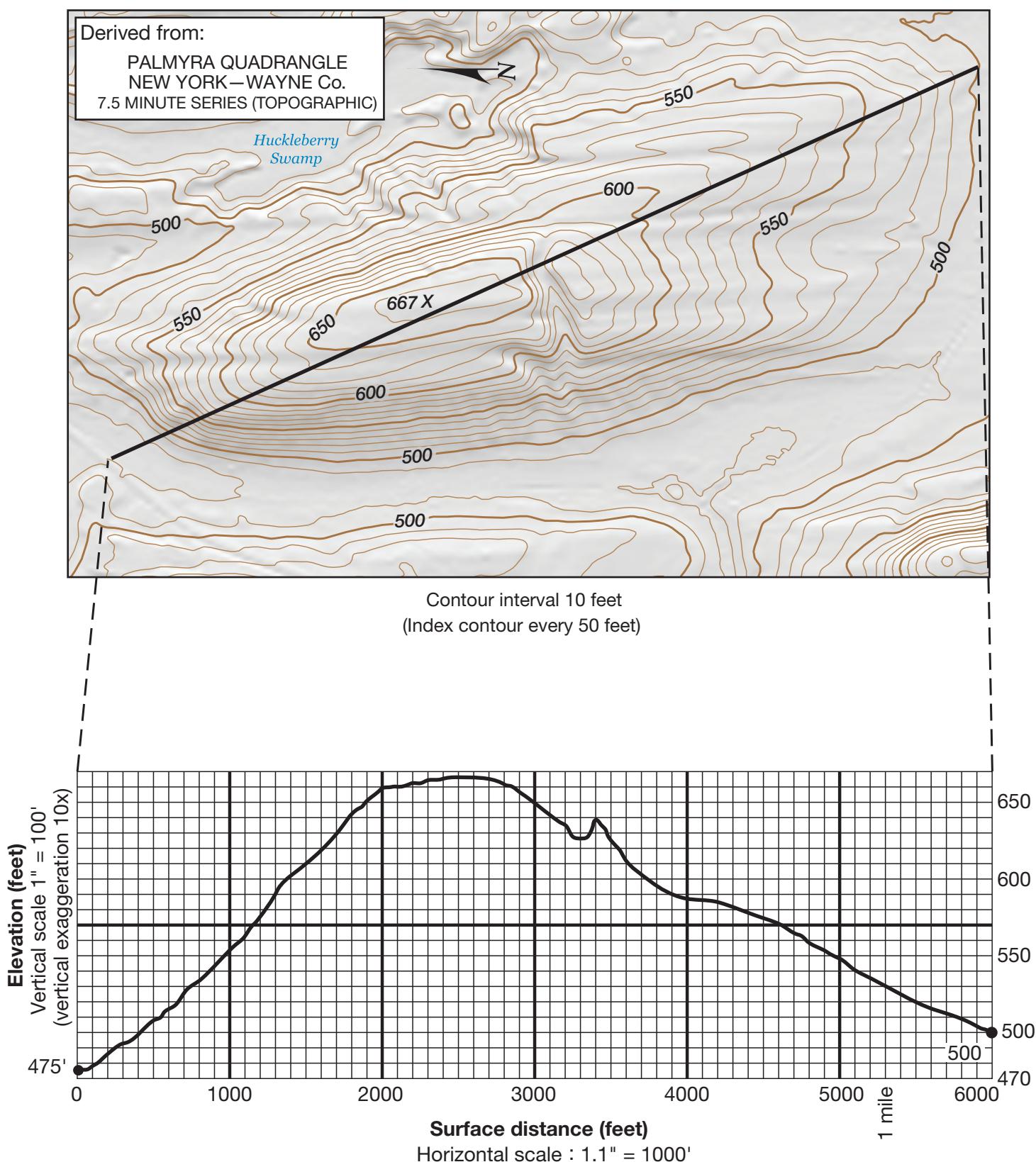
9. What is the relief (elevation difference between the highest and lowest points, in a local landscape) in the river valley along southwest slopes?

280 ft (80' to 360') on southwest side;

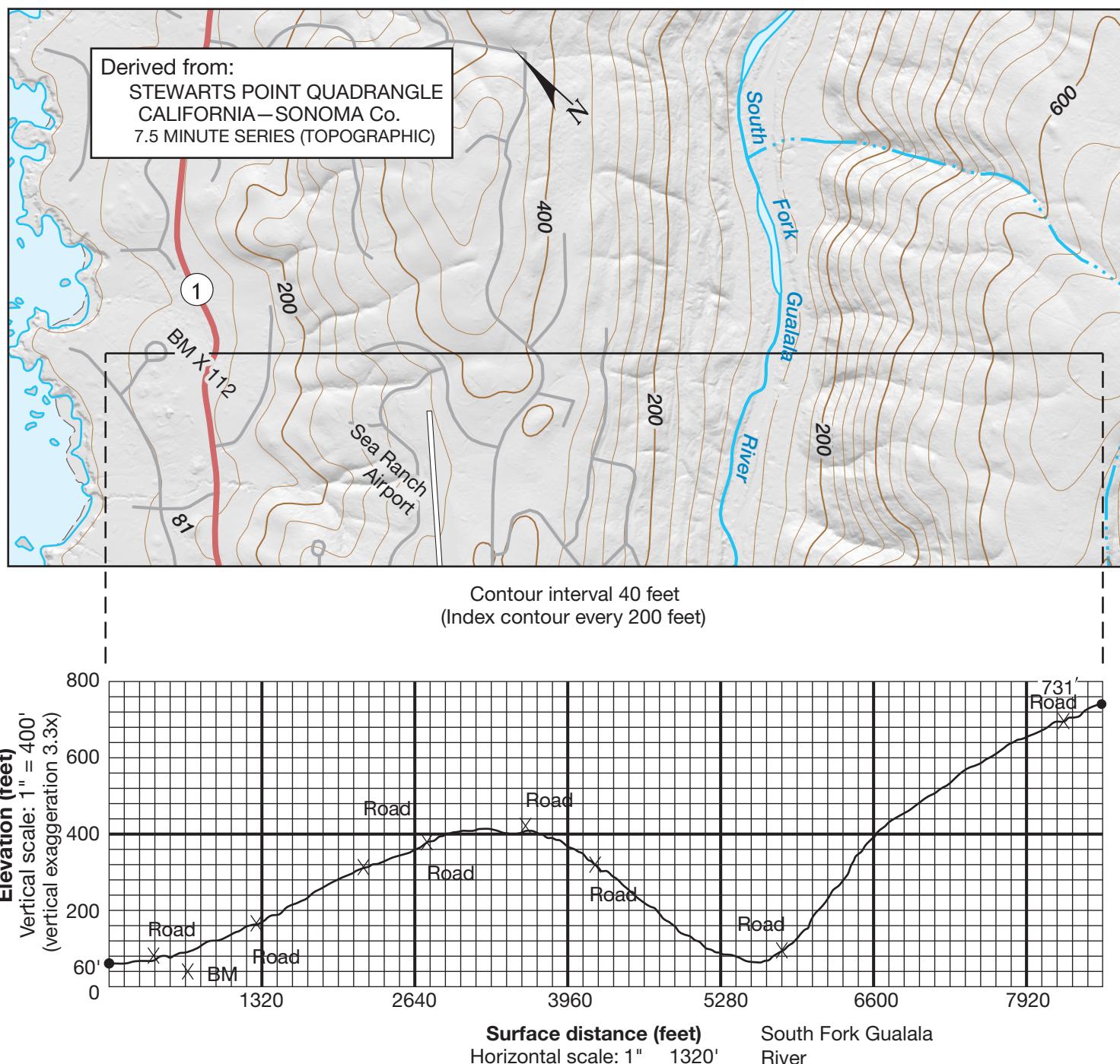
Along the northeast slopes?

600 ft (80' to 680') on northeast side.

10. Use your ruler to draw a line on the elevation profile in **Figure 23.6**. from the 731' dot to the crest of the hill on the transect. This line represents your line of sight from the 731' elevation. Lightly shade the locations that you cannot see from the 731' elevation.



▲ **Figure 23.5** Topographic profile from a portion of the Palmyra, New York, 7.5 minute series topographic quadrangle (enlarged).



▲ **Figure 23.6** Topographic profile from a portion of the Stewarts Point, California, 7.5 minute series topographic quadrangle (enlarged). From west to east along the profile, this landscape features a coastal marine terrace, a ridge, a river valley, and a hill rising to 731 feet above sea level. The coastline forms a contour line of equal elevation.

11. Can you physically see the shoreline when standing at the summit at 731 feet elevation? Explain.

No, the ridge blocks the view of the shoreline.

Can you see the marine terrace from the summit?

No, same reason, ridge blocks the view of the wave-cut terrace.

Can you see the northwest end of the runway at Sea Ranch Airport (a point just south of the profile) from the summit? Explain.

No, same reason, ridge blocks the view of the runway.

SECTION 4

Interpreting Topographic Map Information

Use a topographic map *provided by your lab instructor* to answer the following questions and completion items.

Answers for questions 1-13 will vary depending upon the topo map provided.