

Not-quite-lakeside vacation: Rate of Change

White Bear Lake in Minnesota has been shrinking: the level keeps going down, and beautiful lakeside homes are now swamp-side homes. What's happening?

Somewhere along its bottom, White Bear Lake is leaking water through the ground into a connected aquifer. In this series of worksheets, we'll explore some data about the shape and size of White Bear Lake and think about how much water it is losing each year. Here, we use rate of change to think about the shape of White Bear Lake.

1. The table below has some data about the elevation (in feet above sea level) and surface area (in acres) of White Bear Lake. Fill in the average rate of change between the first two points and the second two points, considering surface area as a function of elevation.

Elevation	Surface area	Average rate of change
903	840.1	
913	1454	
925	2735	
926.5	3070	

2. Fill in the following sentence: "At elevation 908 feet, the surface area of White Bear Lake increases by an average of _____ acres every time elevation increases by one foot."
3. Write a similar sentence for the elevation of 926 feet.
4. Use your knowledge of geometry to deduce whether the shore of White Bear Lake is steep or shallow compared to deeper parts of White Bear Lake.
5. It used to be that the surface of White Bear Lake was about 925 feet above sea level, but since 2003 the lake surface has dropped to about 920 feet above sea level. What impact do you think this has had on lakeside homeowners and people who like to fish?