

Water Supply

On May 15, 2015, Gov. Jay Inslee declared a statewide drought emergency. The declaration was made because 85% of the state was below 75% of normal water supply and users in 48 of 62 of Washington's river basins were experiencing hardships (or expected to experience hardships) because of the water shortages.

According to the Washington State Department of Ecology, as of October 15, 2015 almost 65% of the state was classified on the U.S. Drought monitor as extreme with an estimated 6,642,066 people affected. Eastern Washington was, and still is, heavily impacted by the drought conditions.

Recently (date unknown from source), the City of Spokane proposed a draft for water conservation designed minimize the amount of water wasted through evaporation. Specifically, it would restrict outdoor watering from noon to 6pm daily, from May through September. Residences in Spokane County, specifically in the Cheney where I live, dealt with a restriction this past summer. First watering hours were limited to 9pm-5am, then outdoor watering was restricted completely, then finally we were able to water every other day. These restrictions were put in place in an effort to let the wells refill to safe levels. The worry was that if the wells were too low, we would not have firefighting resources if needed.

In 2006, the average annual water use in Washington State was 114 gallons per person, per day but throughout Spokane County it was closer to 217 gallons per person, per day. An interesting note is that in the months of August and September 2006, was use was an astronomical 1,027 gallons per person per day!

The table below shows the population that can be served by a water supply pipe of the indicated diameter. The estimates are based on a supply of 60 gallons of water per day per person.

Diameter of Pipe (inches)	Population Served
6	1,647
10	5,908
14	13,706
18	25,677
22	42,433
26	64,447
30	91,580
34	125,840
40	188,320
48	297,600
60	511,200
72	800,000
80	1,064,000

Source: John C. Trautwine, *Trautwine's Engineer's Pocket-Book*, John Wiley & Sons, 1909, p. 653.

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I expect high quality, complete work. All graphs should be graphed on graph paper or using software such as excel, with titles, labels, etc...All work should be shown and I should be able to follow your thinking. Complete sentences and units are required for all questions. This should all flow nicely and be of presentation quality; a list of questions and answers will not earn you full credit. Good luck and have fun!

- a. Graph the data points (you may use excel)
- b. Use the statistical feature on your calculator or excel to fit a curve with the **power regression** option.
- c. The exponent in part b is close to a rational number. Rewrite the equation with a rational exponent.
- d. The population of Spokane County is 484,318 people. Approximately how large of a pipe diameter (to the nearest inch) would be needed to serve all of the people in Spokane if we suppose that each person uses a supply of 60 gallons per day?
- e. Based on the local average of water consumption in Spokane County in 2006 of 217 gallons per person, per day and the current population of Spokane County, what size pipe diameter would you need to provide 217 gallons to each person per day? Round to the nearest inch. *Hint: Every person that uses 217 gallons per day is equivalent to how many people using 60 gallons per day.*
- f. If because of current drought conditions our water supply is below 75% of normal, how many gallons per day could each person use to have the same amount remaining in the aquifer?
- g. Do you think it would be a good idea to restrict outdoor water use in Spokane County? Support your answer. Think about how that restriction would impact your community if enacted and how it would impact your community if it is not enacted.