While researching the state of California reservoirs ... acre-feet, chains, and draught

I started to find out more about the state of California's reservoirs since there is a lot in the news about the California draught and the dire levels of their reservoirs. I ran into some interesting data and some new measurements. Check it out!

There are more than 1,000 reservoirs in California. Here's what I found on the volume capacity of 12 of the reservoirs in California.

Name	Volume (acre-feet)	Volume (km^3)
Shasta Lake	4,552,000	5.615
Lake Oroville	3,537,577	4.364
Trinity Lake	2,448,000	3.020
New Melones Lake	2,400,000	2.960
San Luis Reservoir	2,041,000	2.518
Don Pedro Reservoir	2,030,000	2.504
Folsom Lake	1,120,200	1.382
Lake McClure	1,024,600	1.264
Pine Flat Lake	1,000,000	1.233
Millerton Lake	520,500	0.642
Castaic Lake	323,700	0.399
Lake Perris	131,400	0.162

Then I was going to find out the approximate levels of those reservoirs at present but I ran into some measurement confusion. I could imagine what a cubic kilometer is and it sounded really big but I had no idea what an acre-foot was.

1. Draw a simple picture with labels to show what you think a cubic kilometer might look like.

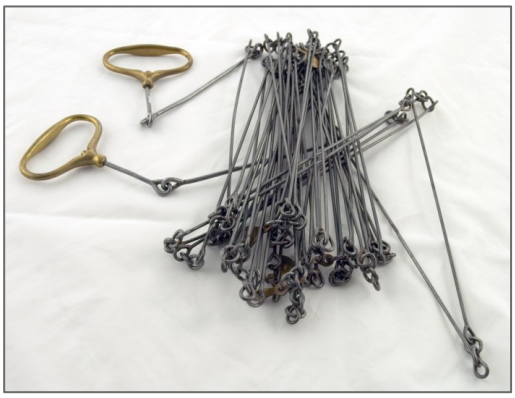
On the chart at the top of the page, volume is expressed in cubic kilometers but also in acre-feet. What is an **acre-foot**?

I looked this measurement up and found that an acre-foot has the volume equal to the surface area (or base area = $l * w$) of an acre and a depth of one foot.

2. Draw and label a rough sketch of what you think an acre-foot of volume would look like.

I looked up the size of an acre? Oh no, an acre is 10 square chains. Egad! What is a **chain**?

Evidently land used to be measured in a confusing number of ways. To unify those different lengths a clergyman named Edmund Gunter, in 1620, defined a length as "Gunter's Chain" to be used in surveying. This length appears even today in measurements of railroad tracks and evidently water volume. A Gunter's chain was a real chain made up of 66 one-foot links.



3. In feet, how long is a chain?

I found two definitions for an acre.
The *first definition* says that an acre is 10 square chains.

4. Draw a rough sketch of an acre and label your sketch in both chains and feet.

The second definition said that an acre was a chain by a furlong. Oh no! What's a **furlong**?

More research ... a **furlong** is the length of **10 chains**.

5. How long is a Furlong in feet?

6. Is a furlong by a chain the same area as 10 square chains? Please show your work.

7. Go back to that first chart and see if you can define a way of translating acre-feet to cubic kilometers. Describe your method here.

Back to water ...

Shasta Lake has the capability of storing 4,552,000 acre-feet of water or 5.615 km^3. Today, because of the extreme draught in California, Shasta Lake holds approximately 2,706,353 acre-feet of water.

8. What percent of Shasta Lake is now filled with water?

9. Translate 2,706,353 acre-feet of water into $kilometers^3$ of water.

10. Is the percentage of acre-feet that you calculated in problem #8 the same as the percentage of $kilometer^3$ that you found with the information from problem #9? Please show your work.

11. Do some research and find out how much of a water deficit California is in. How many cubic kilometers or acre-feet are the California reservoirs under filled?

12. The picture above is of a 5,000-gallon water truck. How many water deliveries with this size trucks would it take to replenish California's reservoirs?

Source: http://en.wikipedia.org/wiki/List_of_largest_reservoirs_of_California
http://cdec.water.ca.gov/cgi-progs/products/rescond.pdf
http://cdec.water.ca.gov/cgi-progs/queryF?s=SHA