8. (13 pts) Johnny Howard, the cubical long-nosed echidna, makes a habit of travelling so that his displacement from Yon River (as a function of time) is always a third degree (cubic) polynomial. This morning he left his home, travelling north to take a basket of scones to his Aunt Hillary. At 12:00 noon, he reached Yon River, but discovered he had forgotten the jam. He then went home again for jam, then back to the river. He crossed the river at 2:00 pm and proceeded to Hillary's house.

Let t be the time in hours after noon (so morning = negative t), and let D be Johnny's displacement north of the river in kilometers (south = negative displacement).

a) Sketch a graph of D against t, keeping in mind that the function must be a cubic polynomial.

b) Write a possible formula for D as a function of t.

c) Now modify your formula to include some additional information: At 3:00 pm, Johnny was 2 kilometers north of the river.

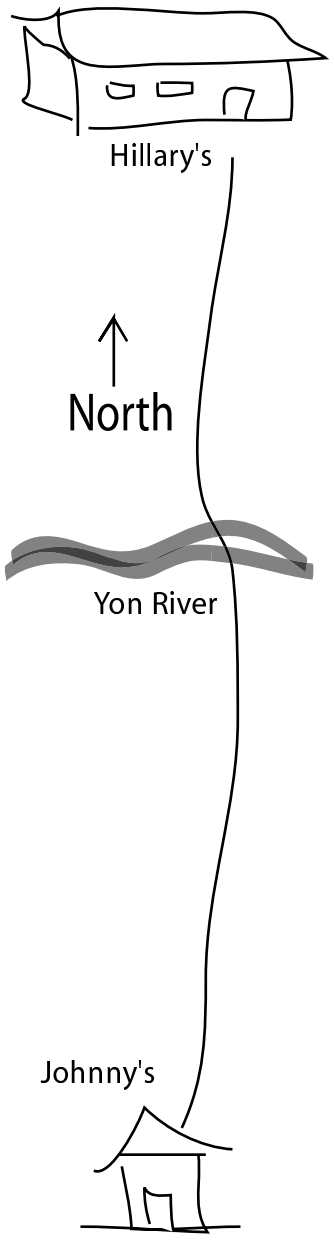

Figure 2: Map of the region