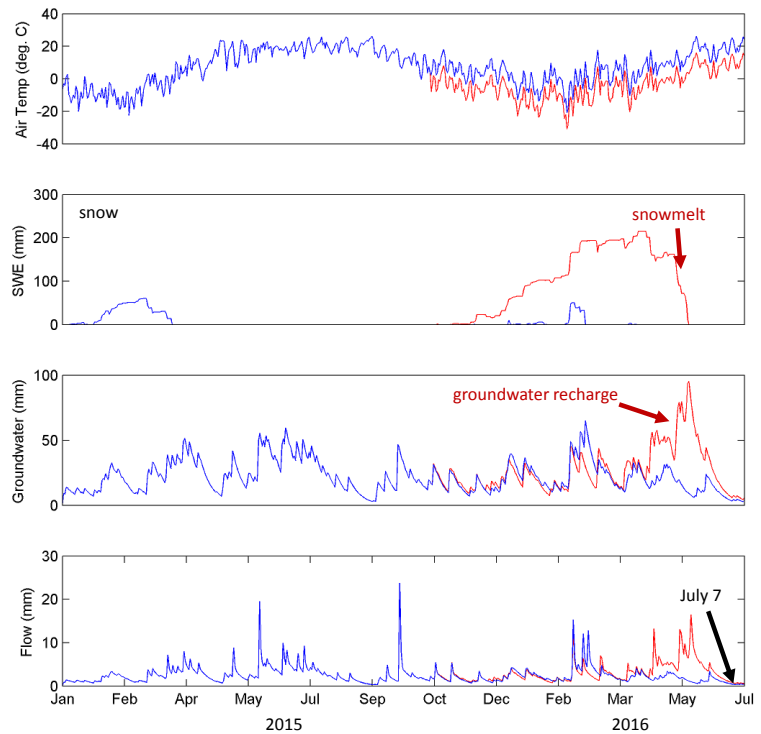


## Low Stream Flows – Even If We Had Seen Snow, It Would Not Have Helped Beyond Today

I have been fielding numerous questions about the current drought that is impacting much of central and western New York. The most common question is, “**Why are the streams so low?**” Until recently, I have been fairly confident that the low flow conditions were due to a lack of a snowpack that would normally have recharged our groundwater right up until before the leaves came out on our trees. As the weeks have slipped by with virtually no rain, I have been compelled to look more closely at what is going on.

James Knighton, a PhD student in the Department of Biological and Environmental Engineering at Cornell University, ran a model of Fall Creek, near Ithaca, NY. In one simulation, he used the daily weather for the last 16 1/2 months (blue lines in the graphs below) and in another, he lowered this past winter’s air temperatures by several degrees so that the simulated precipitation would fall as snow instead of rain (red lines in graphs below). As the bottom graph shows, stream flows would have been higher from April through June of this year had we had our usual snowy winter. But as of today (July 7), the simulated stream flows from the two scenarios have essentially converged. So, at this point, the low flows can be attributable to the prolonged lack of significant rain. According to Art DeGaetano, Director of the Northeast Regional Climate Center at Cornell University, rainfall from March through June of this year is the lowest on record. The winter precipitation was also low, but only approximately 75% of normal.



**Fall Cr. near Ithaca, NY - Blue shows observed temperature and simulated snow, groundwater, and stream flow from Jan 2015 – July 7. Red shows what we would have expected had the winter been more typically cold.**

The second most common question is, “**Will things get better?**” The trick to things getting better is recharging the groundwater, which is the source of sustained stream flow between storm events. We will need a period of sustained rainfall to recharge the groundwater because the soil needs to be nearly saturated before water starts leaking out of the root zone and recharging the groundwater. A few big events, like Hurricanes Irene and Lee in 2011, would help some, but usually these types of events bring too much rain too quickly so that, while the soils may saturate, additional water will run off into the streams providing short-term high flows (or even flooding) without necessarily recharging the groundwater. Notice in the groundwater graph below, there was a relatively large groundwater recharge period for the scenario that generated snow (red line) and it has essentially disappeared.

Thirdly, I am asked, “**Are the low flow conditions due to climate change?**” Without being annoyingly nuanced, it is difficult, if not impossible, to attribute any one event or season’s weather to climate change. Our relatively high winter temperatures were linked to a very strong El Nino (hot southern Pacific Ocean waters). What we can say is that climate change is setting-up conditions that will make events like this past winter more likely.