WAS 2012 A TASTE OF GROWING SEASONS TO COME?

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Southern Wisconsin suffered through a drought during the 2012 growing season that rivaled that of 1988. Affected areas were at the northern fringe of a devastating drought that engulfed over half of the contiguous United States. The 2012 drought joins about 15 previous ones, some of them multi-year, that Wisconsin has endured since 1900. For the practicing agronomist it will be one of two or three profound droughts of a career. As with most droughts it was associated with warmer-than-average summer temperatures. Of the ten driest summers (June, July, and August - JJA) since 1895 in Southcentral Wisconsin, 2012 was the hottest, followed by 1988. In this same region 2012 JJA was essentially tied with 1948 as the driest since 1895 (at 6.2") (Figure 1).

The large area, intensity, duration, and high temperatures of the 2012 drought, following on that of the Texas drought of 2011, leads to speculation on the role human-caused climate change in such extreme weather. We are in the midst of the biggest experiment ever, anywhere: how Earth's climate will change as a result of releasing enough stored C from soil, coal, and oil to significantly alter the chemical composition of the atmosphere. From theory and observation we now know that this will raise the average temperature of Earth and cause substantial and expensive increases in sea level (World Bank 2012). But what will this mean for Wisconsin growing seasons, and particularly the frequency, duration, and severity of drought?

Understanding and predicting the temperature and sea level impacts of this huge experiment are somewhat further advanced than for precipitation. We do know that as the atmosphere warms it will hold more water vapor - here again theory and observations are in complete agreement. More water in the atmosphere does appear to lead to greater rainfall over much of Earth, but there is also more energy available for evaporation and longer growing seasons to extract soil moisture. There is continuing debate in the scientific literature over whether or not the area of drought has increased worldwide. The difficulty of quantifying drought is making this a challenging question to resolve.

Our best chance of knowing what the future holds is revealed by global climate models. These huge computer programs simulate Earth's climate system to give us insight into the possible effects of our C experiment. The model results are in general agreement about increasing temperatures, but less clear from them is how patterns of precipitation will change. Most likely for Wisconsin is that we will see slight increases in precipitation, and that more of this will come in large (say > 2" in 24 hours) storms. There seems little reason to think that droughts like 2012 or 1988 will become more common in the state over the coming decades (IPCC 2012).

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Climate change will affect Wisconsin agriculture and life, however. There is widespread agreement that temperatures will increase in all seasons. Perhaps most worrisome for agriculture will be summer heat extremes, experienced as heat waves that reduce crop growth, reduce cow productivity and reproduction, and stress people. For example, the maximum summer daily temperature that we experienced but once every 20 years in recent decades will occur every 2-4 years by 2100 (IPCC 2012). Studies of Wisconsin crop yields have revealed that exceptionally hot summer temperatures depress corn and soybean yields. For 1976 to 2006, climate change reduced the technologically-driven increase in yields by 5-10%. As temperatures like that of 2012 and higher become more common in coming decades, the positive benefits of longer growing seasons and more precipitation may not be enough to prevent reductions in yield (WICCI 2011). Beyond Wisconsin the effects of higher temperature will combine with decreased rainfall to more dramatically impact grain yields (World Bank 2012).

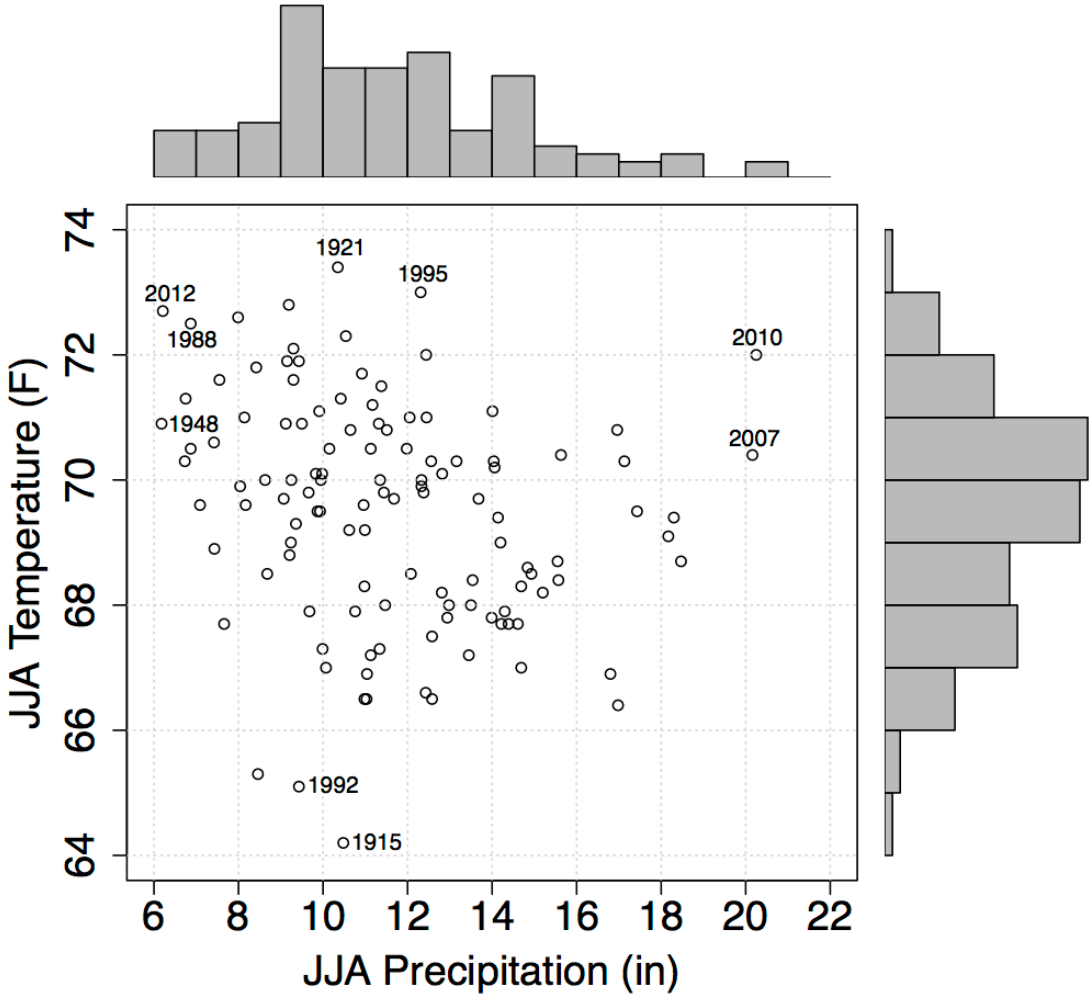

Figure 1. Summer (June-July-August) average air temperature and precipitation for Wisconsin climate district 8, 1895-2012.

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