

Climate Change 11 — Climate Change in Missouri

Climate change is expected to manifest differently depending on location. Local climate predictions are less reliable than average global or continental predictions. Missouri lies in the region predicted to experience a 7.2°F increase in average summer temperatures (less in winter), a 5-10% increase in winter precipitation, and a 5-10% decrease in summer precipitation.ⁱ These changes are predicted to cause significant changes to many aspects of our life.

Three reports attempt to comprehensively predict climate change at a level relevant to Missouri as an individual state.^{ii iii iv} They are 7-10 years old—in a field where the science is changing rapidly, they need updating. The question must be engaged, however, and these are the available comprehensive studies. Their predictions are:

1. Increased winter precipitation might not offset the summer decrease and the extra evaporation resulting from increased temperatures. Soil might be dryer. Dry periods might be hotter, more frequent, and last longer.
2. The precipitation we get might come from fewer, heavier precipitation events. Erosion and chemical runoff from fertilizer and pesticides might increase.
3. Rivers and lakes might shrink. Warmer water temperatures and increased runoff of farm chemicals might increase water quality problems. Hydroelectric output might decline.
4. Cold-water fish might decline, being replaced by warm-water and non-native species.
5. Life-threatening cold snaps might decrease; so might problems and costs related to snowfall and its removal. Winter sports might decline.
6. Life threatening heat spells might increase. Energy demands due to air conditioning might increase. Pollution and heat might combine to worsen air quality, causing related health problems to increase. Heat may cause curtailed activities during summer.
7. The threat from human and plant warm weather diseases might increase. These include St. Louis Encephalitis,^v Lyme Disease,^{vi} West Nile Virus,^{vii} and Malaria.^{viii}
8. The agricultural growing season might lengthen; double cropping might increase.
9. In dry areas, crop yields might decline, but in areas with sufficient moisture, they might increase (due to the fertilizing effects of increased CO₂ levels). (This prediction assumes that other factors remain equal—see #7 and #10)
10. Seasonal timing events may become misaligned, causing extinctions or crop problems.^{ix}
11. Demand for irrigation might increase, putting stress on shrinking water supplies, including underground aquifers.
12. The use of pesticides and insecticides might increase.
13. The susceptibility of forests to pests and diseases might increase. Dry conditions and heat waves might cause an increase in forest fires.
14. Wetlands might disappear, along with species that require them for survival.
15. Air and river transportation systems might be affected by precipitation and river changes. Conflict over water from the Missouri River might increase, even as the river shrinks.

At least one recent report disagrees, arguing that there will be a “hole” of wetter, and therefore less warm, climate centered over Kansas that includes most of Missouri.^x The science is still developing here, and the above predictions may change as more is learned.

ⁱ Christensen, J.H., B. Hewitson, A. Busuioc, A. Chen, X. Gao, I. Held, R. Jones, R.K. Kolli, W.-T. Kwon, R. Laprise, V. Magaña Rueda, L. Mearns, C.G. Menéndez, J. Räisänen, A. Rinke, A. Sarr and P. Whetton, 2007: Regional Climate Projections. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, p. 890. Used by permission.

ⁱⁱ National Assessment Synthesis Team, US Global Change Research Program. (2000). Climate change impacts on the United States, *The potential consequences of climate variability and change*, Overview: Midwest. Retrieved online 4/6/2008 at <http://www.usgcrp.gov/usgcrp/Library/nationalassessment/overviewmidwest.htm>.

ⁱⁱⁱ Office of Policy, Planning and Evaluation, Environmental Protection Agency. (1997) *Climate change and Missouri*. (EPA 230-F-97-008y) Retrieved online 4/6/2008 at [http://yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/SHSU5BUTGH/\\$File/mo_impact.pdf](http://yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/SHSU5BUTGH/$File/mo_impact.pdf).

^{iv} Easterling, David, & Karl, Thomas. (2001). Chapter 6: Potential consequences of climate variability and change for the Midwestern United States. In National Assessment Synthesis Team, US Global Change Research Program. *Climate change impacts on the United States: The potential consequences of climate variability and change*. Retrieved online 4/28/2008 at <http://www.usgcrp.gov/usgcrp/Library/nationalassessment/foundation.htm>.

^v St. Louis Encephalitis is an uncommon viral disease transmitted by mosquitoes. It was first identified from an outbreak that emerged in the St. Louis region in 1933, when over 1,000 cases were reported. Today, it is recognized to occur widely throughout the central part of the U.S. Today, about 128 cases are reported nationally each year. *St. Louis Encephalitis*, Wikipedia. Retrieved 4/6/2008 at http://en.wikipedia.org/wiki/St._Louis_Encephalitis. See also *St. Louis Encephalitis fact sheet*. Centers for Disease Control. Retrieved online 4/6/2008 at http://www.cdc.gov/ncidod/dvbid/sle/Sle_FactSheet.html.

^{vi} Lyme Disease is an illness characterized by distinctive symptoms, including a specific bull's-eye shaped rash. It develops into serious complications over a period of years if not treated. In Missouri, we haven't identified a case of true Lyme Disease yet, but we have had cases with similar symptoms that seem to involve related, bacteria. The true Lyme Disease bacteria has been identified in Missouri ticks, so it is only a matter of time until a case does occur. *Lyme disease position paper*. Missouri Department of Health and Human Services. Retrieved online at <http://www.dhss.mo.gov/TicksCarryDisease/LDPositionPaper.html>.

^{vii} West Nile Virus is a tropical virus first identified in Uganda in 1937. Since then, it has spread, coming to the United States in 1999, and was identified in Missouri in 2001. It is endemic in birds, and transmits to humans when a mosquito feeds on an infected bird, then feeds on a human. It is most dangerous when it causes encephalitis. Sometimes fatal, it can leave the patient with lingering cognitive impairment even when cured. *West Nile Virus*. Centers for Disease Control. Retrieved online at <http://www.cdc.gov/ncidod/dvbid/westnile/Mapsactivity/surv&control02Maps.htm>.

^{viii} We usually think of Malaria as a disease of the tropics. However, it can exist anywhere the Anopheles mosquito can survive. The Midwest was known for its Malaria outbreaks during the 19th Century, and they didn't begin declining in Missouri until 1870 and after. Grob, Gerald. (2002). *The deadly truth: A history of disease in America*. Cambridge, MA: Harvard University Press, p. 130. Retrieved online 4/6/2008 at http://books.google.com/books?id=U1H5rq3IQUAC&pg=PA130&lpq=PA130&dq=Missouri+Malaria+transfusion&source=web&ots=CVj_os97H9&sig=8z7aRF7CA2ctpGGDKqRoZZJwloI&hl=en#PPA130,M1.

^{ix} Plants and animals depend on each other. For instance, plants often need to be pollinated by a specific insect, let's say a moth. Over millions of years, the plant and insect may have synchronized their timing. The plant flowers just when the moths emerge. But the timing of the moths' emergence may depend on the temperature, whereas the timing of the plants' flowering may depend on hours of sunlight. Climate change may cause the moths to emerge and die-off before the plant flowers. The plant would not be pollinated. If it were an ornamental plant, it would simply die-off over time. If it were a food source, however, no fruit or grain would be produced. Seasonal timing changes are already occurring. For

instance, the skipper sachem, a butterfly, used to emerge from mid-April to mid-May. This year, it emerged March 12. Borenstein, Seth. (March 22, 2008) Global warming disturbs seasonal timing changes. *Associated Press*. Retrieved online 4/19/08 at www.kansascity.com.

× Pan, Azitao, Arritt, Raymond, Takle, Eugene, Gutowski, William Jr., Anderson, Christopher, & Segal, Moti. (2004). Altered hydrologic feedback in a warming climate introduces a “warming hole.” *Geophysical research letters*, 31, L17109, doi: 1029/2004GL020528.