Impact of extreme weather events on the risk from West Nile virus in Illinois

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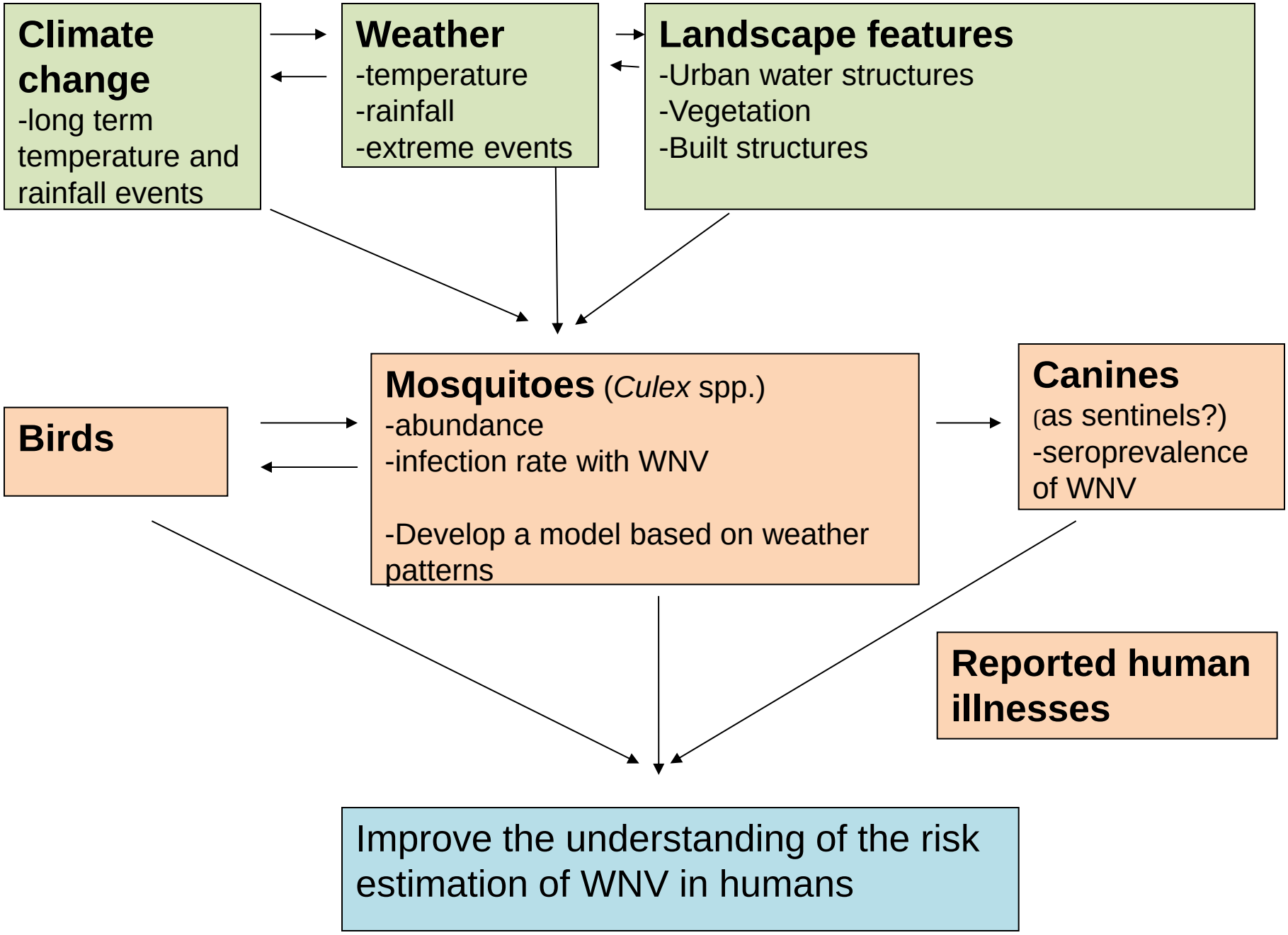
Climate change and Public health

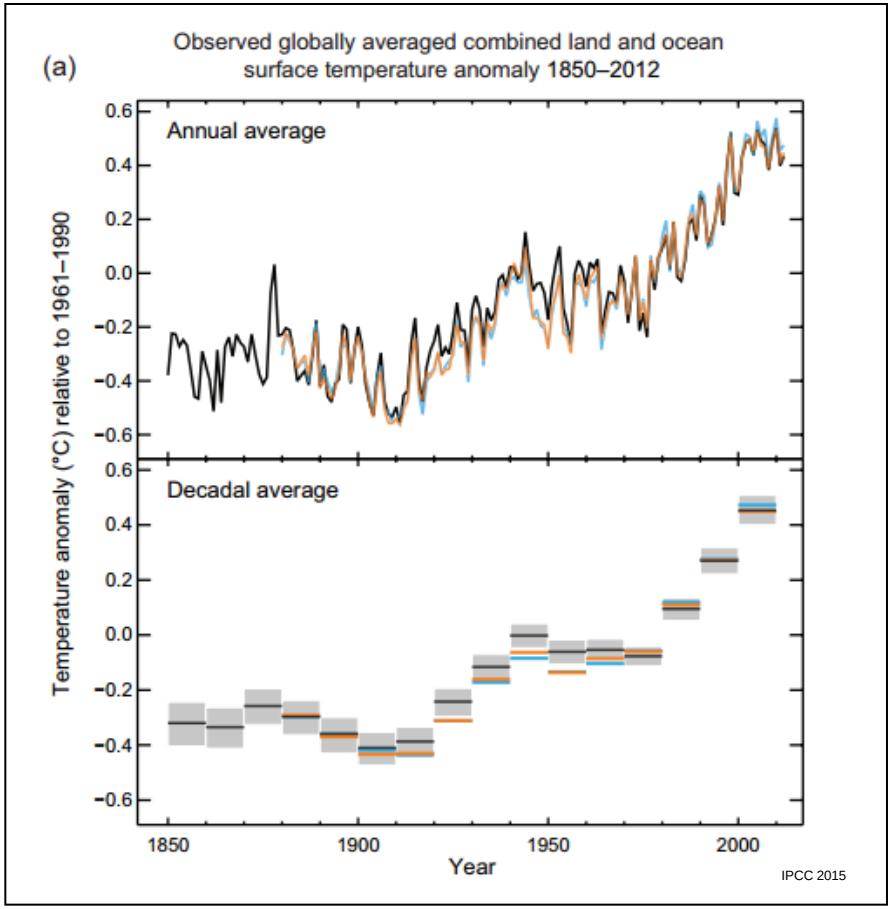
WHO facts

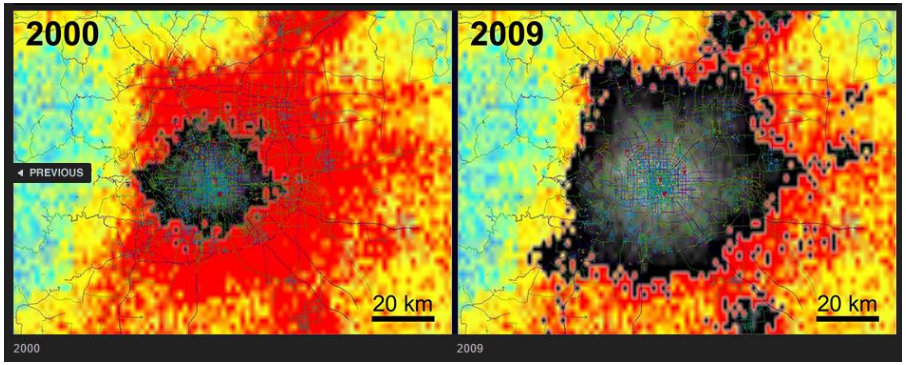
- Vector-borne diseases account for more than 17% of all infectious diseases, causing more than 1 million deaths annually.
- More than 2.5 billion people in over 100 countries are at risk of contracting dengue alone.
- Malaria causes more than 600 000 deaths every year globally, most of them children under 5 years of age.
- Other diseases such as West Nile fever, Chagas disease, Leishmaniasis and Schistosomiasis affect hundreds of millions of people worldwide.


Climate change
-long term temperature and rainfall events
Weather
-temperature
-rainfall
-extreme events
Landscape features
-Urban water structures
-Vegetation
-Built structures
Birds
Mosquitoes (Culex spp.)
-abundance
-infection rate with WNV
-Develop a model based on weather patterns
Canines
(as sentinels?)
-seroprevalence of WNV
Reported human illnesses
Improve the understanding of the risk estimation of WNV in humans

Global climate change- Temperature

- The atmosphere and ocean have warmed, and the concentrations of greenhouse gases have increased
- The globally averaged combined land and ocean surface temperature show a warming of 0.85 [0.65 to 1.06] ° C , over the period 1880 to 2012 (IPCC 2015).
- It is very likely that the number of cold days and nights has decreased and the number of warm days and nights has increased on the global scale.

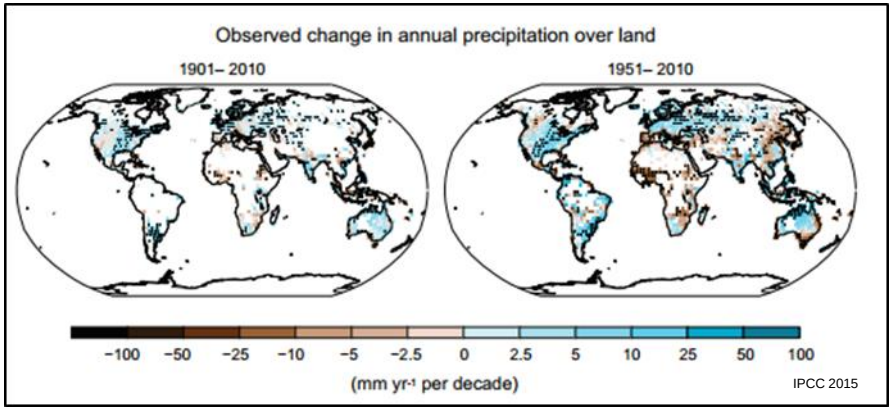


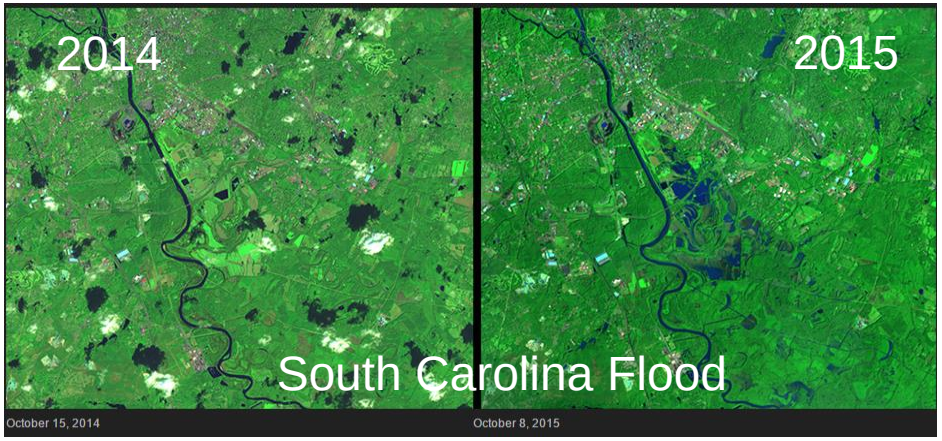


http://climate.nasa.gov/

Global climate change- Precipitation

- The amounts of snow and ice have diminished, and sea level has risen.
- Increases in many extreme weather and climate events have been observed since about 1950 (IPCC 2015).





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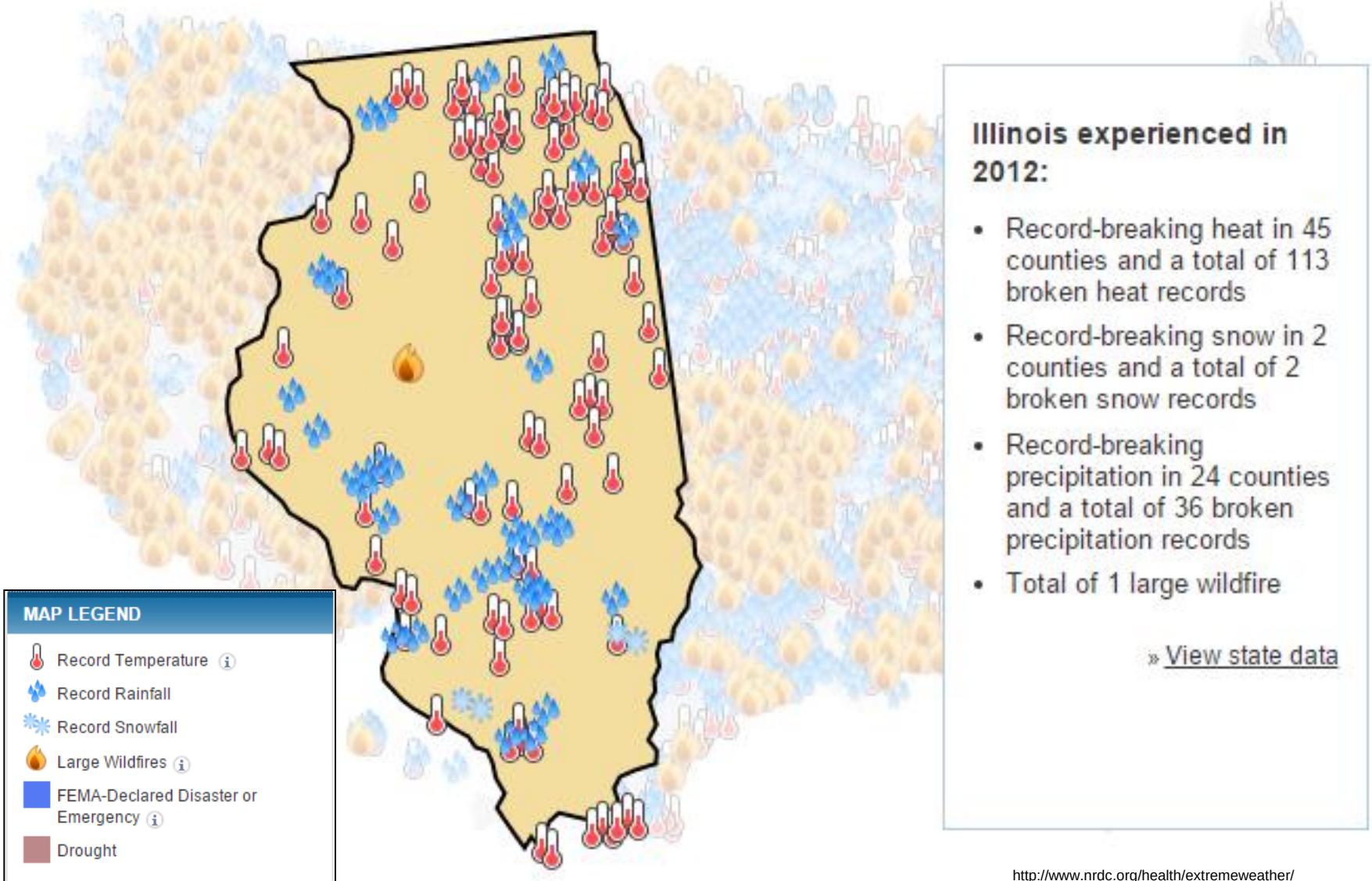
Weather extremes in Illinois



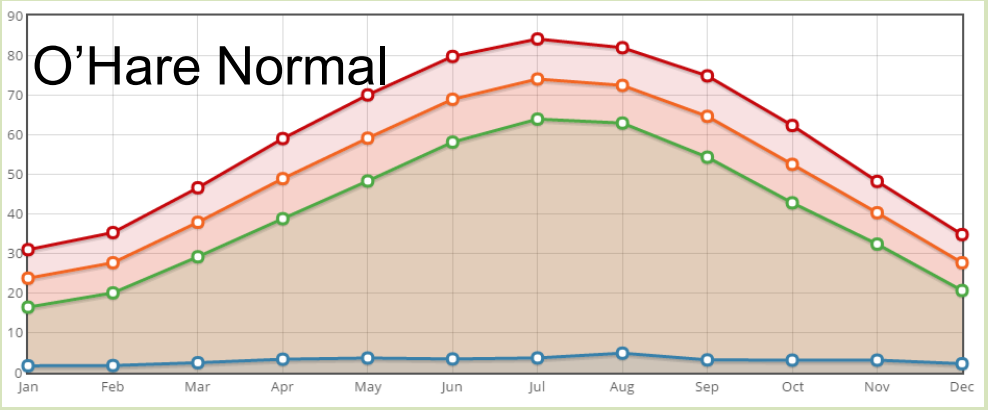
Illinois experienced in 2012:

- Record-breaking heat in 45 counties and a total of 113 broken heat records
- Record-breaking snow in 2 counties and a total of 2 broken snow records
- Record-breaking precipitation in 24 counties and a total of 36 broken precipitation records
- Total of 1 large wildfire

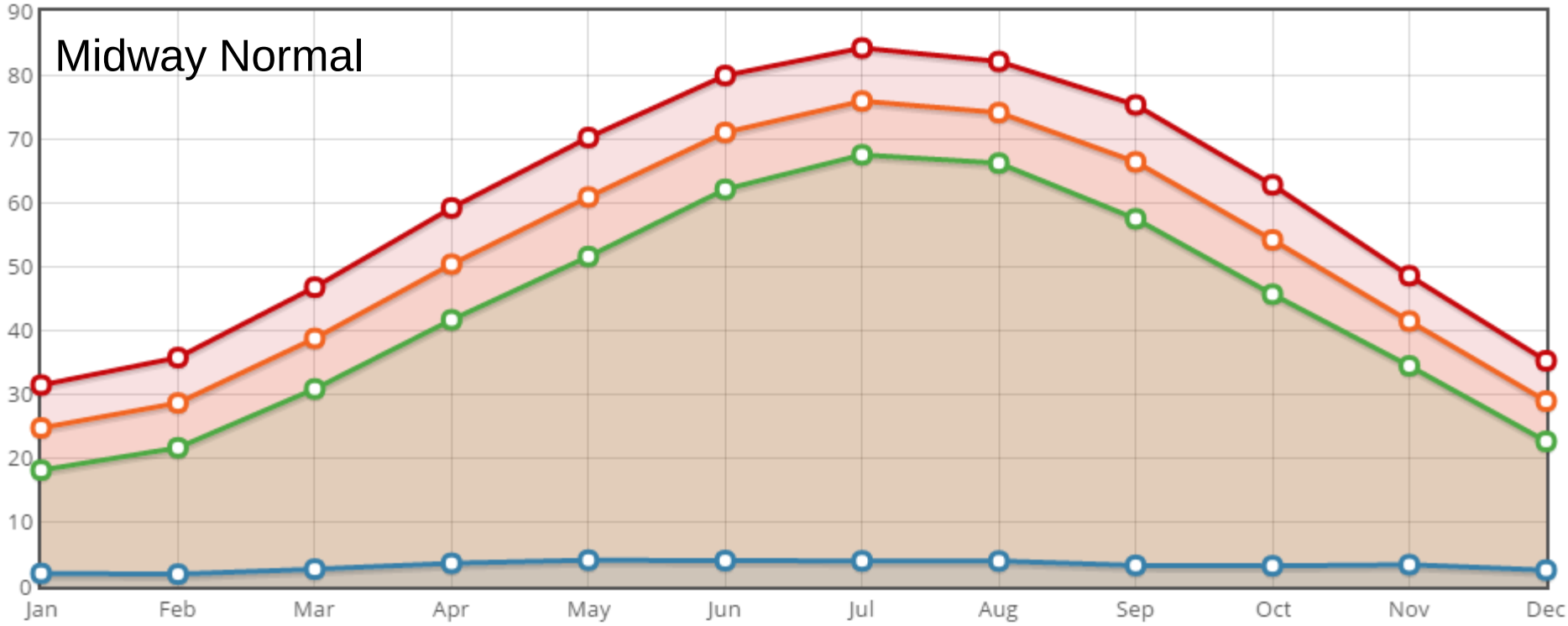
» View state data

http://www.nrdc.org/health/extremeweather/

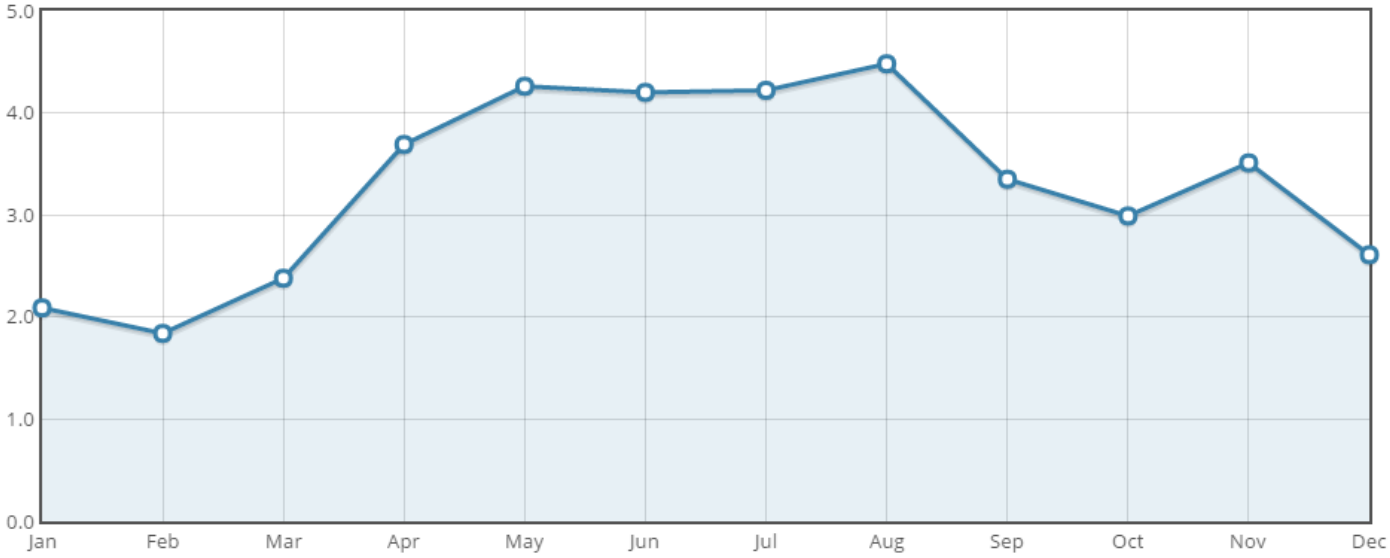
Climate change in Chicago



- Since 1980, Chicago's average temperature has increased approximately 2.6 degrees F.
- The most obvious change to come could be hotter summers and more frequent and intense heat waves.
- Heavy rains and snow could become more frequent in winter and spring.
- During summer, rains may fall more heavily but less frequently, translating to more dry spells as well.



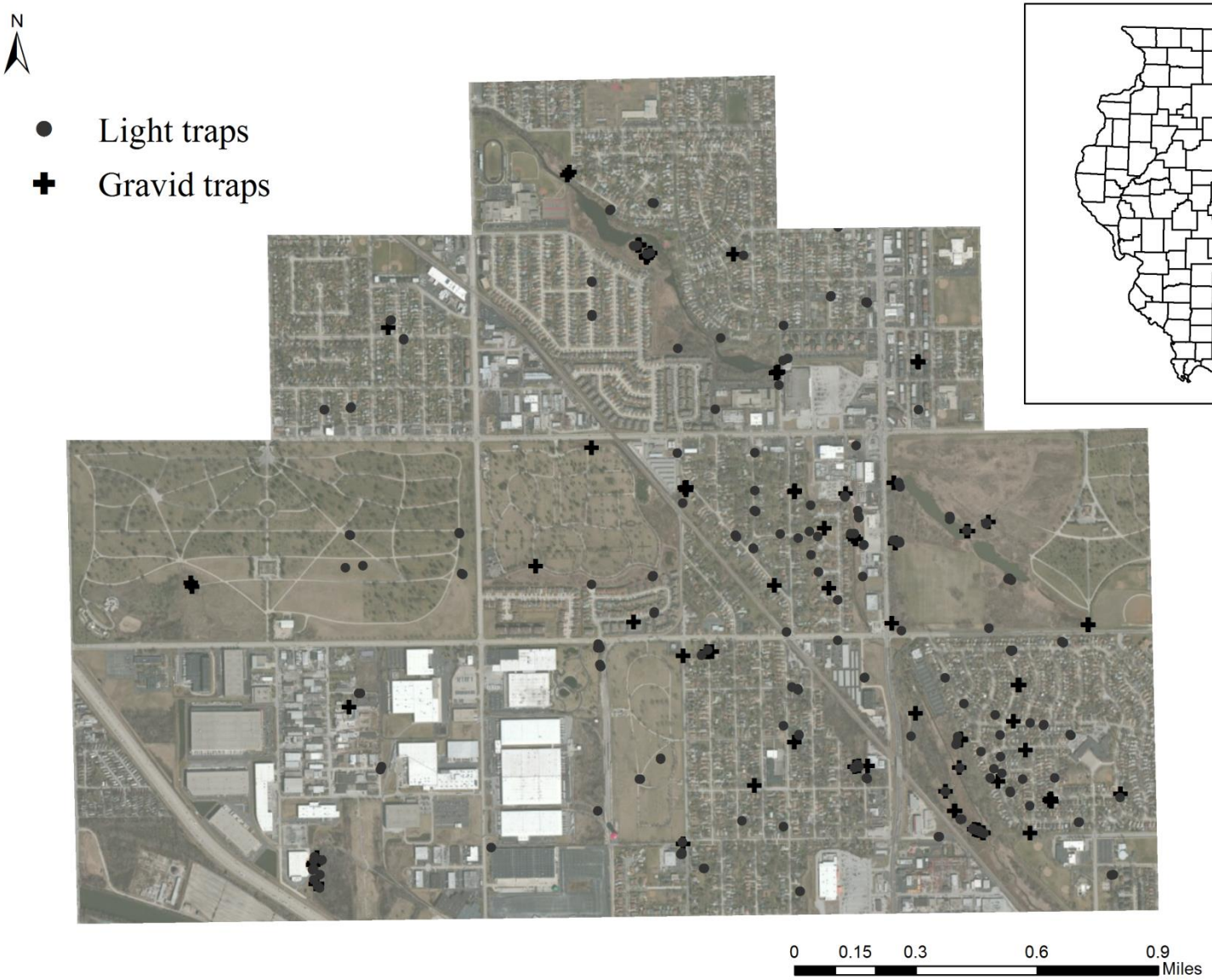
Little Red School Precipitation normal



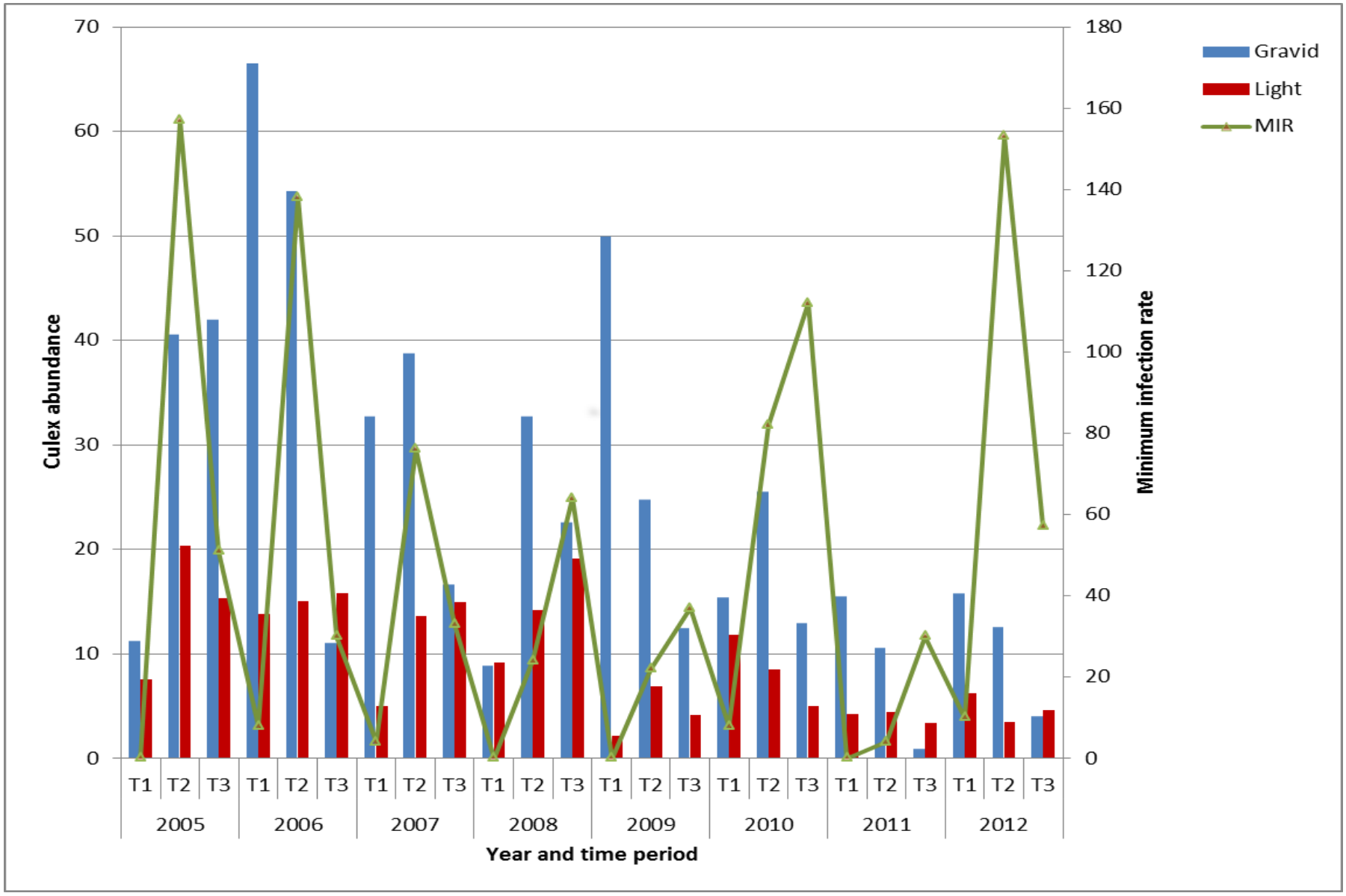
General approach

- Mosquito data: Abundance data collected over 2005 to 2012 as well as mosquito testing data
- Weather data: Obtained from nearby weather station (Midway airport)
- Statistical analyses
  - First using: mosquito abundance per trap night as the outcome variable and with weather variables as the predictor variables
  - Secondly, vector index as the outcome variable and weather variables as predictors.
  - Develop a predictive model using data from statistical analyses

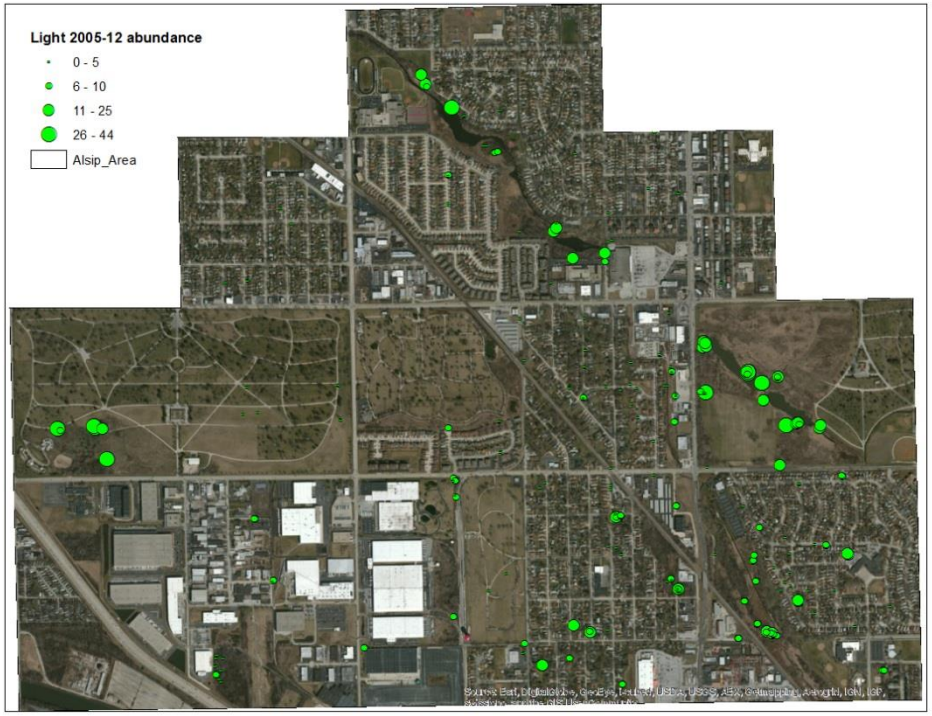
Study area: Oak Lawn / Alsip, Illinois



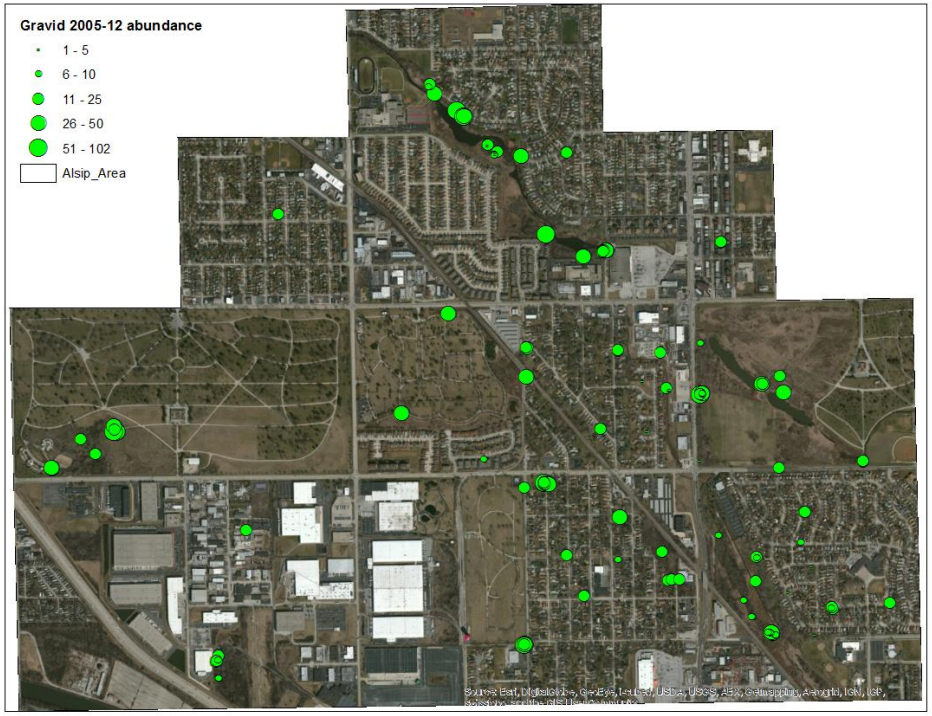
Temporal distribution of *Culex* mosquito abundance and Minimum Infection Rate



Trap locations and *Culex* mosquito abundance
Average mosquitoes per trap 2005-2012



Light Traps



Gravid Traps

Specific research objectives relative to climate change

1. What was the magnitude and timing of weekly or daily rainfall events in northeastern Illinois over the past 10 years during peak mosquito season?

2. How do average weekly temperature and rainfall affect mosquito **abundance** based on historic data?

3. How and when do large rainfall events affect the adult mosquito population?

4. What is the net effect of both average weather and large rainfall events on the risk of WNV, taking into account both mosquito **abundance and infection**?

Timeline and dissemination

- Will continue work during the Spring semester 2016
- Will present the findings in Illinois mosquito vector control associations meeting 2016 or some other suitable conference

THANK YOU