Modeling the potential impacts of climate change on the summer distribution of Illinois' nongame birds

by Jeff Price

Most birders have firsthand experience of the greenhouse effect. Imagine returning to your car after a hot summer's day birding. Unlocking and opening the door, a wave of superheated air blasts out. If the greenhouse effect didn't exist then the temperature inside your car would be the same as the outside temperature. The windows of your car act very much like the glass in a greenhouse, allowing in various wavelengths of light but trapping some of the infrared and heating up the inside of the car.

Water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and other trace gases in the Earth's atmosphere act much like the glass in a greenhouse (or your car), helping to retain heat by trapping and absorbing infrared radiation. This "greenhouse effect" acts to keep the Earth's surface temperature significantly warmer than it would otherwise be – allowing life, as we know it, to exist.

Dickcissels are common summer residents in central and southern Illinois. If future climate models are right they may be come increasingly more common statewide. Kanae Hirabayashi took this photo of a male Dickcissel singing at Middlefork Savannah, Lake County, 27 July 2003.

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However, since pre-industrial times, there have been significant increases in the amount of these greenhouse gases in the atmosphere. The current levels of the two primary greenhouse gases are now greater than at any time during at least the past 420,000 years (likely much longer) and are well outside of the bounds of natural variability (Intergovernmental Panel on Climate Change [IPCC] 2001).

Accompanying the increases in greenhouse gases has been an increase in temperature. The 1990s was the warmest decade and the 1900s the warmest century of the last 1,000 years. Of the more than 100 years for which instrumental records are available, 1998 was the warmest year on record and seven of the top 10 years all occurred in the 1990s. The annual global mean temperature is now 1.1°F (0.6°C) above that recorded at the beginning of the century. Limited data from other sources indicate that the global mean temperature for the 20th century is at least as warm as any other period since approximately 1400 AD (IPCC 1996, 2001). "There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities" (IPCC 2001). These activities include the burning of fossil fuels as well as land-use changes such as deforestation. Increases in greenhouse gases (past and projected), coupled with the length of time these gasses remain in the atmosphere are expected to cause a continued increase in global temperatures. Models estimate that the average global temperature, relative to 1990 values, will rise by between 2.5°F and 10.4°F (1.4°C – 5.8°C) by the year 2100 (IPCC 2001). Warming due to increases in greenhouse gases is expected to be even greater in some areas, especially Northern Hemisphere land areas.