How might these changes impact the summer distributions of Illinois' nongame birds?

"Recent regional changes in climate, particularly increases in temperature, have already affected hydrological systems and terrestrial and marine ecosystems in many parts of the world" (IPCC 2001). If these changes have been observed with only a small change (1°F) in the global average temperature what might happen if the temperature continues to rise? Recent models project an average temperature increase for Illinois of between 7-13°F in winter and between 9-18°F in summer by 2100 (Kling et al. 2003) This change will make the summer climate in Illinois similar to that of eastern Texas. Not only will there be temperature changes but many climate models also project an overall increase in evaporation leading to increases in precipitation (mostly in storms) and also to overall declines in soil moisture. These climatic changes will likely impact not only the birds of Illinois but their habitats as well. For example, models estimate possible changes in species composition including a complete loss of maple-beech-birch forests, some oak-hickory forests becoming oak-pine forests, a reduction in the amount of elm-ash-cottonwood forests with possibly some loblolly-shortleaf pine forests moving into the southern part of the state (NAST 2000).

Summer bird ranges are often assumed to be tightly linked to particular habitats. This is only partially true. While certain species are usually only found in specific habitats (e.g., Kirtland's Warbler breeding in jack pines), others are more flexible in their habitat use. Species found in a particular habitat type throughout their summer range may not be found in apparently equivalent habitat north or south of their current distribution. Birds are also limited in their distributions by their physiology and food availability. The link between physiology and the winter distributions of many species is well known (Kendeigh 1934, Root 1988a, 1988b), and recent research shows that physiology plays a role in limiting summer distributions as well (Dawson 1992, pers. comm. T. Martin). Often, the choice of a specific habitat may be to provide a microclimate suitable for a species' physiology. While habitat selection, food availability, and competition may all play a role in influencing *local* distributions of a given bird species, looking at a species' overall distribution often yields different results. Building on earlier work that found that many winter bird distributions were associated with climate (Root 1988a, 1988b), this study examined the association between summer bird distributions and climate and how these distributions may change with climate change.

Methods

To determine how summer distributions of birds might change, it is first necessary to look at whether there is any association between distributions and climate. If an association exists, then an examination of projected future climates can be used to see how the climatic ranges of birds might change. I used logistic regression to develop models of the association between bird distributions (from Breeding Bird Survey data) and 18 climate variables. The climate variables used in these models act as surrogates for many factors possibly limiting a species distribution – including physiology, habitat, and food availability – and are similar to those used in other bioclimatic studies. Models developed for this study were then statistically validated to see how well they predicted species occurrence at independent locations and checked to see how well the predicted species distribution map (fig. 1b) matched a map of the actual distribution (fig. 1a) based on similar bird data (Price et al. 1995). The results indicated that at least a portion of the summer distributions of many North American birds can be modeled quite well based on climate alone.

The next step was to examine how bird distributions might change in response to a changing climate. For this study I used climate projections from the Canadian Climate Center's General Circulation Model (CCC), one of the standard models used in impact analyses. This model projects what average climate conditions may be once CO_2 has doubled from pre-industrial levels, sometime in the next 50 to 100 years. Differences between modeled current climate and modeled future

If climatic models are right, the Yellow-headed Blackbird, already endangered in Illinois, may disappear completely as a summer resident here. Kanae Hirabayashi took this photo of a male Yellow-headed Blackbird at Montrose in Chicago, Cook County, 1 July 2003.