Confronting Climate Change in the Great Lakes Region

Technical Appendix
Climate Change Projections

MIGRATING CLIMATES

A helpful indicator of the projected climate effects is to estimate where selected states will have 'migrated' over the next century relative to current temperature and precipitation characteristics (see state- and province-specific projections). These estimates were obtained by comparing projected average winter and summer temperature and precipitation for each state in 2095 and 2030 with current seasonal means across the North American continent[1].

In terms of temperature and precipitation data, the change in winter climate over the next few decades is ambiguous. However, by 2095 a typical winter climate in Illinois can be expected to resemble current-day Oklahoma or Arkansas, while Michigan will have virtually moved to Ohio, and southern Ontario to New York State. In terms of summer climate, by the end of the century an Illinois summer climate may be closer to that of east Texas, not considering other climate characteristics of the region such as severe weather patterns. Michigan summer weather could be similar to that of southern Missouri or northern Arkansas today, while a southern Ontario summer may be more like that of Virginia.

While highly illustrative, it is important to recognize that such analyses are limited to average conditions and do not consider the extent of variability in the projected climate changes. Nor do they consider the differences in topographical features from state to state such as the Appalachians, the Ozarks, or the Great Lakes. For example, even if the climate of Michigan does become more like that of Arkansas, it will still be surrounded by the Great Lakes, use of which may increase under a warmer climate. Conversely, if Illinois were to virtually move to NE Texas, it is unlikely that it would experience the severe weather patterns typical of that region, as these are determined largely by the geographical position of Texas in the North American continent. However, it is likely that by the end of the next century Ontario will experience the hot and humid weather typical of Virginia summers.

For further details, see table and figures below.

[1] In the report, temperature and precipitation projections for the Great Lakes region as a whole were used to estimate migrating climates for Michigan and Illinois (Figure 16 and associated text). However, when Michigan-specific temperature projections are used, these indicate that Michigan winters may be closer to those of Ohio, as indicated in the figure below and in the Michigan state summary document.

Table 1. Summary of where the average winter and summer climate of various states and provinces may 'migrate' to by 2030 and 2095.

State/Prov	2030		2095	
	Winter	Summer	Winter	Summer
Illinois	Missouri	Arkansas	Oklahoma	East Texas
Michigan	X	Ohio	Ohio	Southern Missouri/ Northern Arkansas
Minnesota	X	Wisconsin	Wisconsin	Kansas
Southern Ontario	X	Upper-State New York	New York State	Northern Virginia
Northern Ontario	X	X	Minnesota	Minnesota
Wisconsin	X	Illinois	Iowa	Arkansas

X = some change, but insufficient for 'migration'.

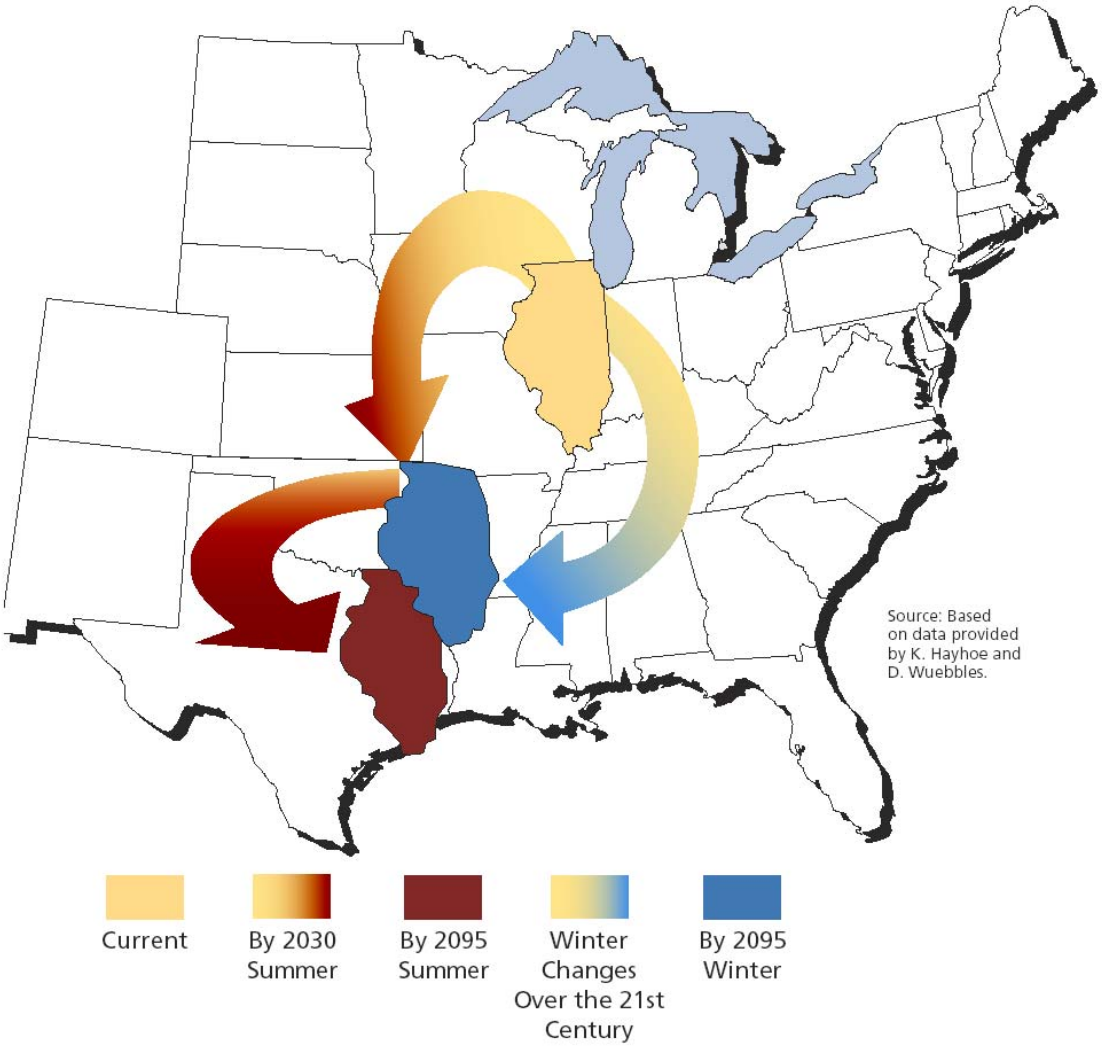
Notes:

1. Due to its size, the province of Ontario was separated into Southern Ontario (south of 46°N) and Northern Ontario (46°N to 53°N).

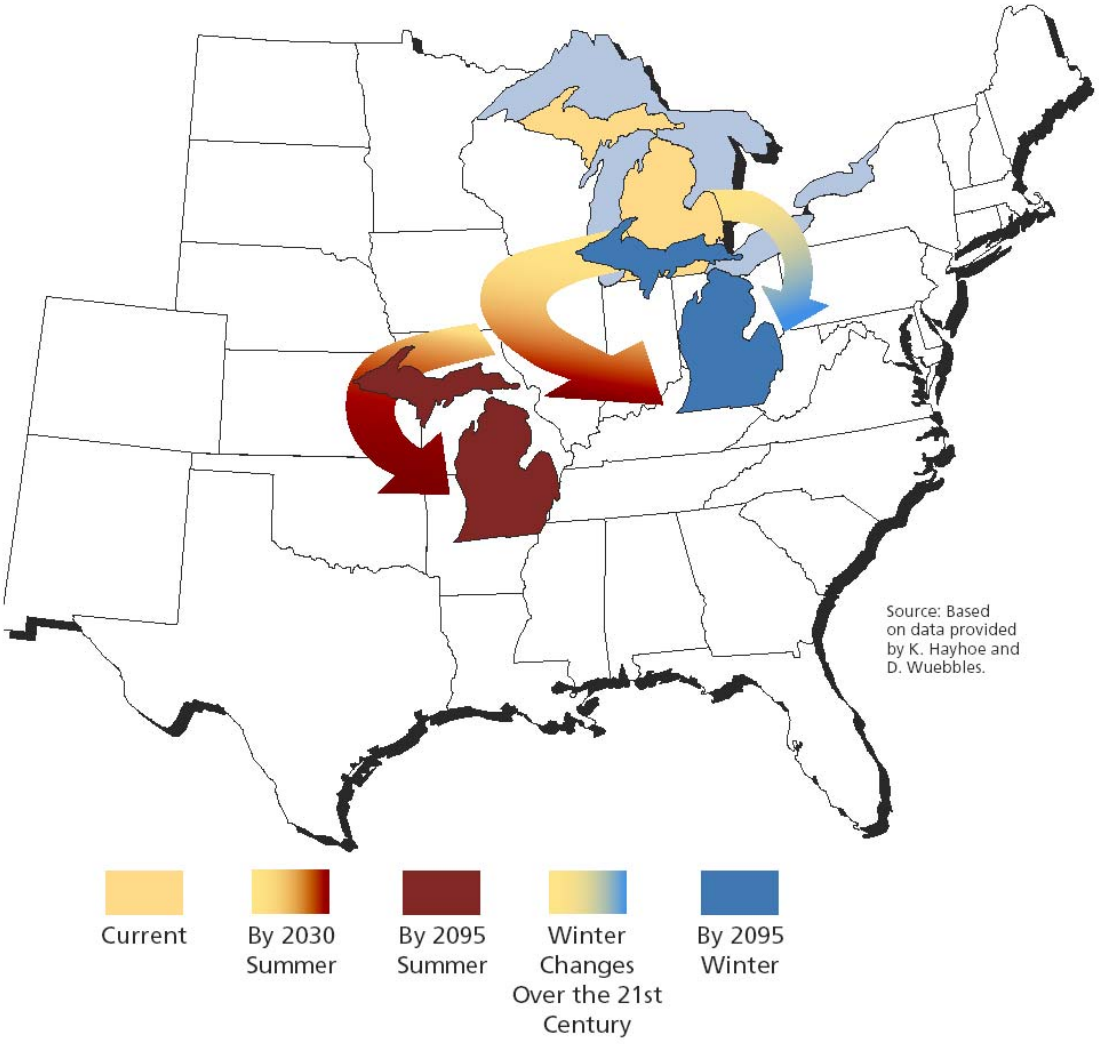
2. Historical data for all states in the Great Lakes region already show significant upward trends in winter temperatures over the last few decades, as indicated in the state-specific temperature plots. This trend, falling within the 1961-1990 'baseline' used to calculate temperature anomalies, contribute to little winter migration being evident over the next few decades.

3. No graphics are available for Northern Ontario.

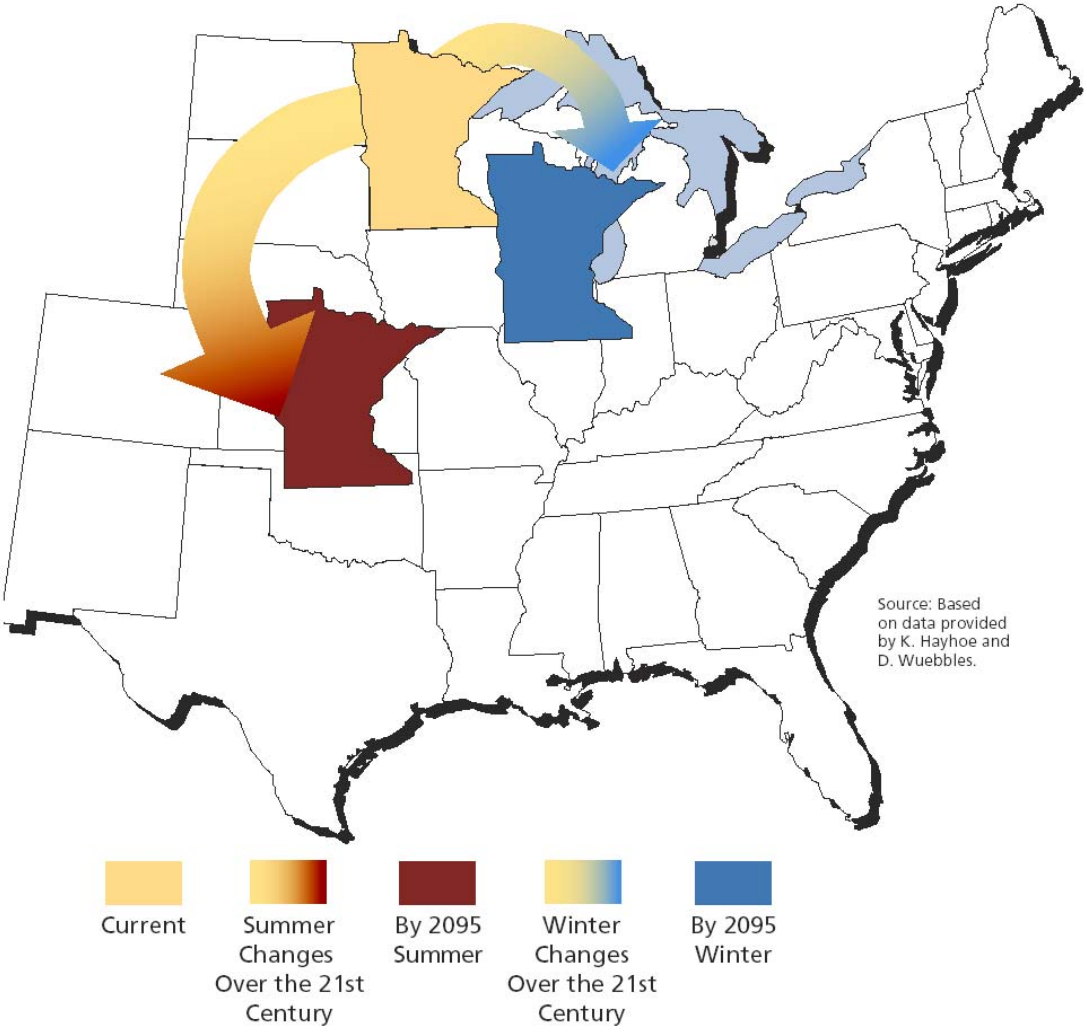
ILLINOIS


Source: Based on data provided by K. Hayhoe and D. Wuebbles.
Current
By 2030 Summer
By 2095 Summer
Winter Changes Over the 21st Century
By 2095 Winter

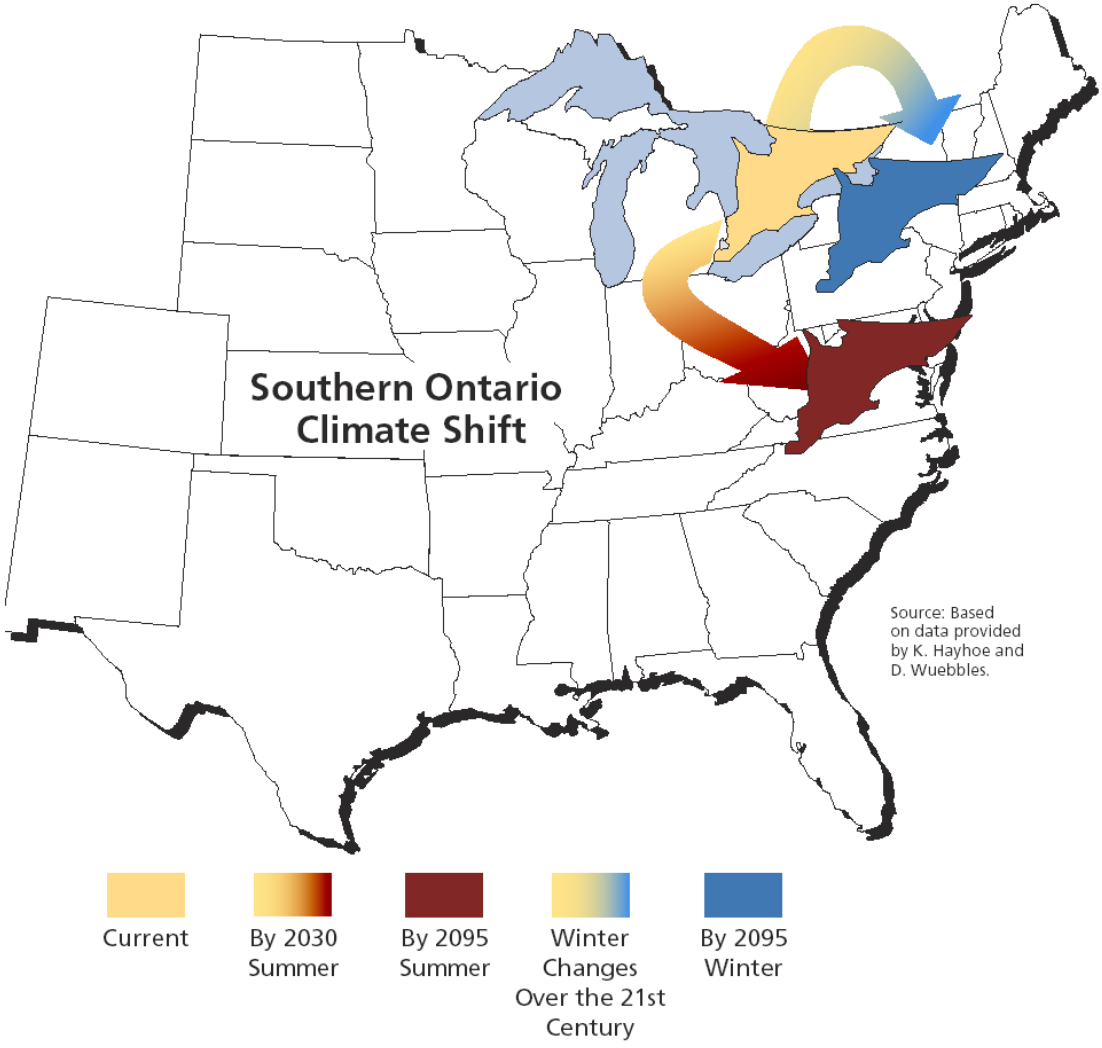
MICHIGAN


Source: Based on data provided by K. Hayhoe and D. Wuebbles.
Current
By 2030 Summer
By 2095 Summer
Winter Changes Over the 21st Century
By 2095 Winter

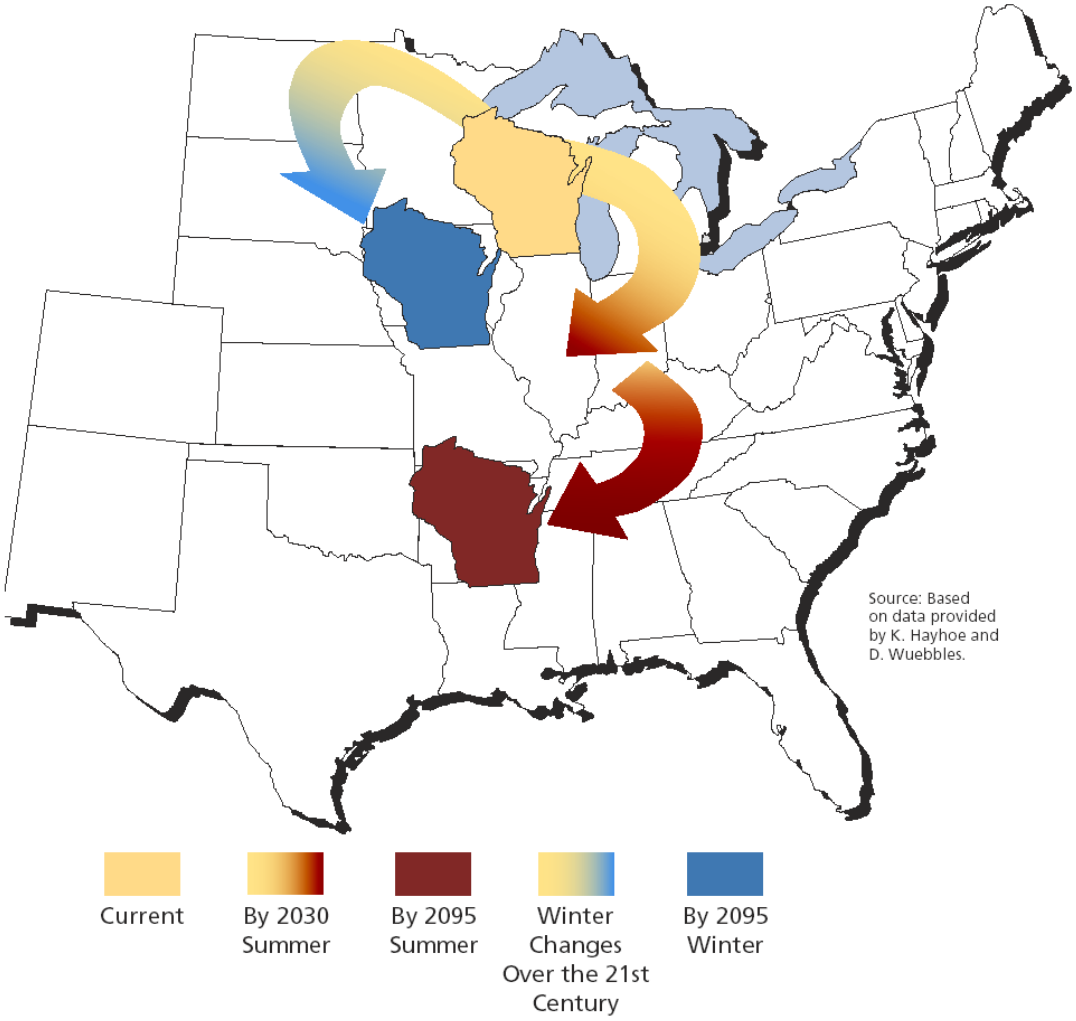
MINNESOTA


Source: Based on data provided by K. Hayhoe and D. Wuebbles.
Current
Summer Changes Over the 21st Century
By 2095 Summer
Winter Changes Over the 21st Century
By 2095 Winter

SOUTHERN ONTARIO



WISCONSIN


Source: Based on data provided by K. Hayhoe and D. Wuebbles.
Current
By 2030 Summer
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Winter Changes Over the 21st Century
By 2095 Winter