Climate change effects on fisheries in the Great Lakes

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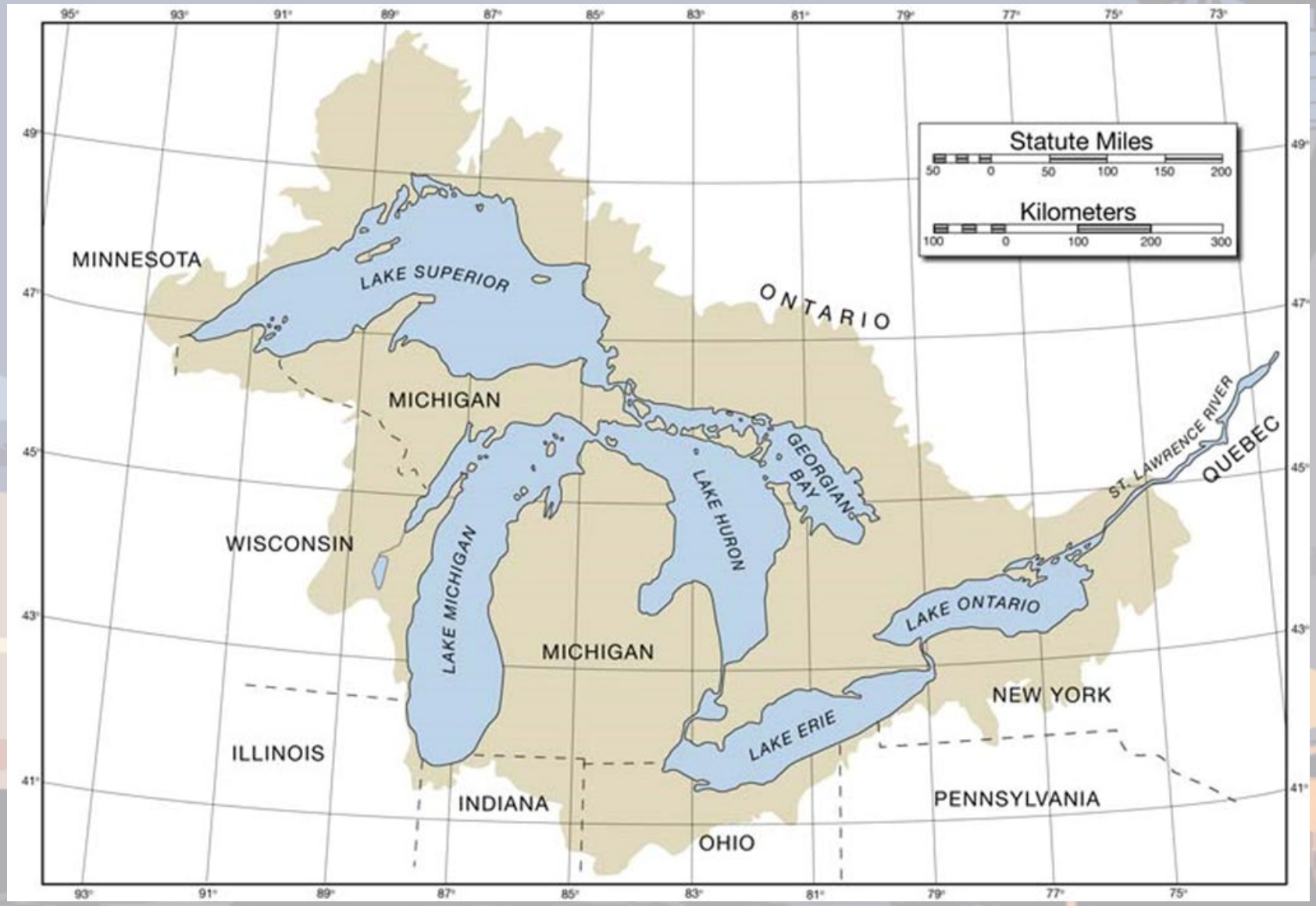
Laurentian Great Lakes

Hold approximately 20% of the Earth’s freshwater

Laurentian Great Lakes



- Home to more than 30 million US and Canadian citizens

Laurentian Great Lakes

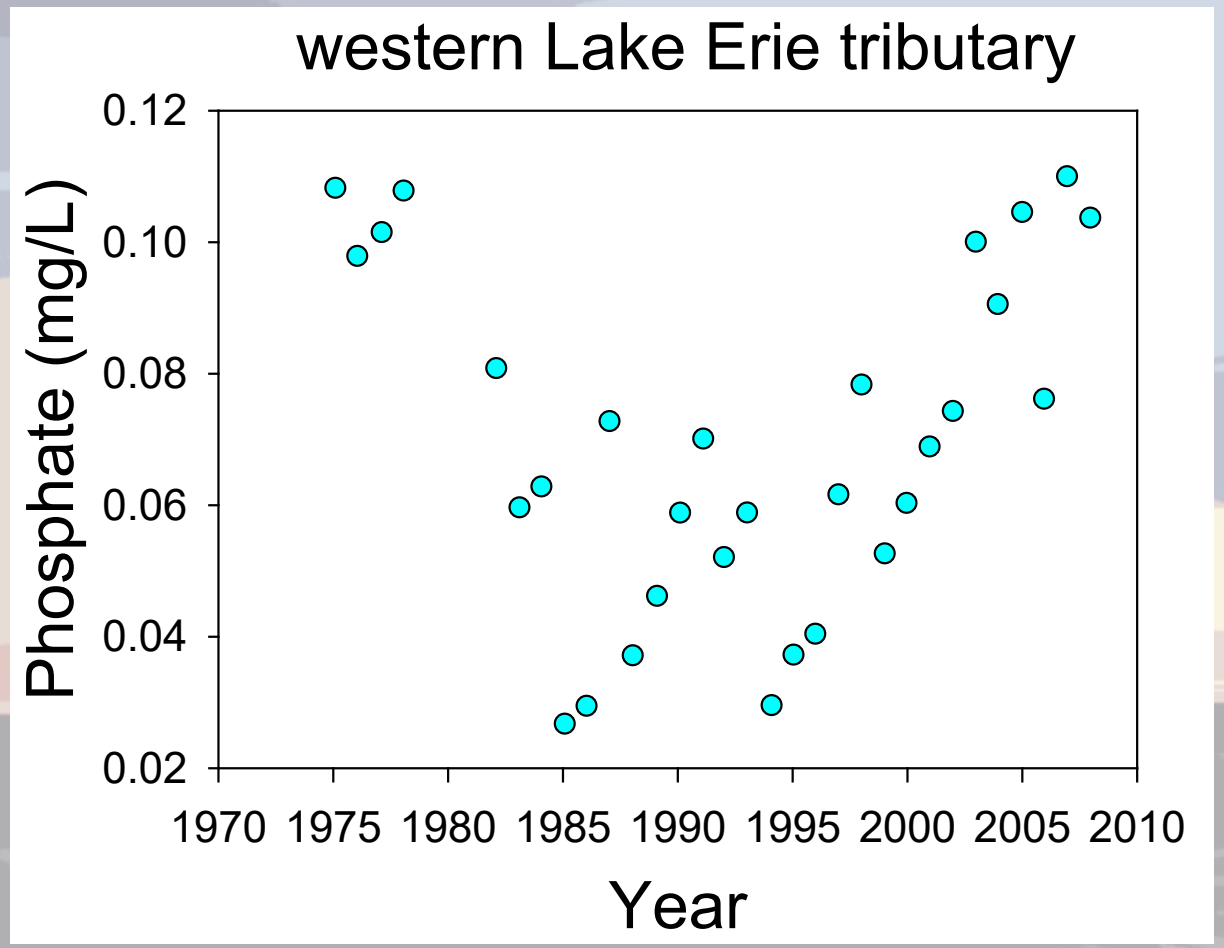
- Fisheries support local economies
  - 2.6 Billion dollars in 2016
  - Multiplicative effects

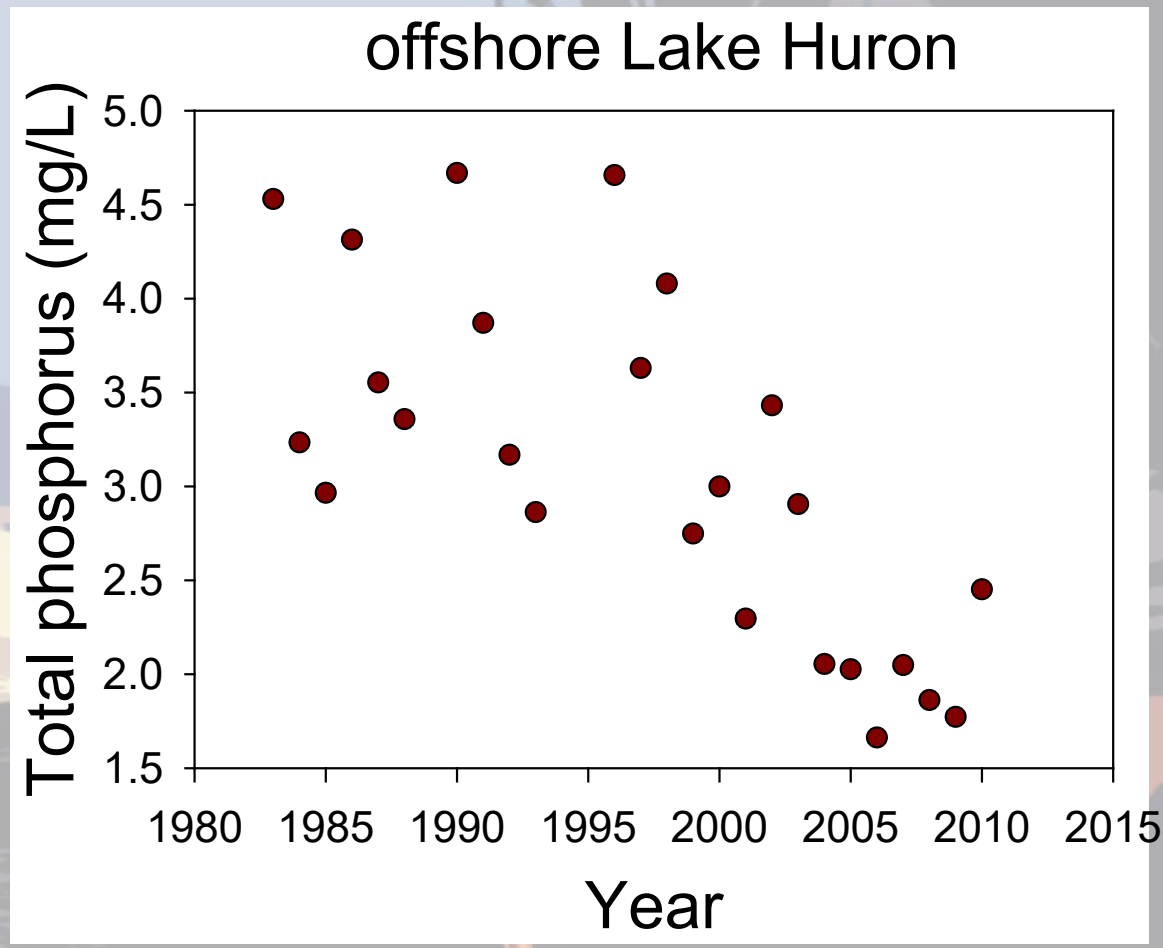
Existing stressors of the Great Lakes fisheries

Invasive species

Stressors of the Great Lakes fisheries

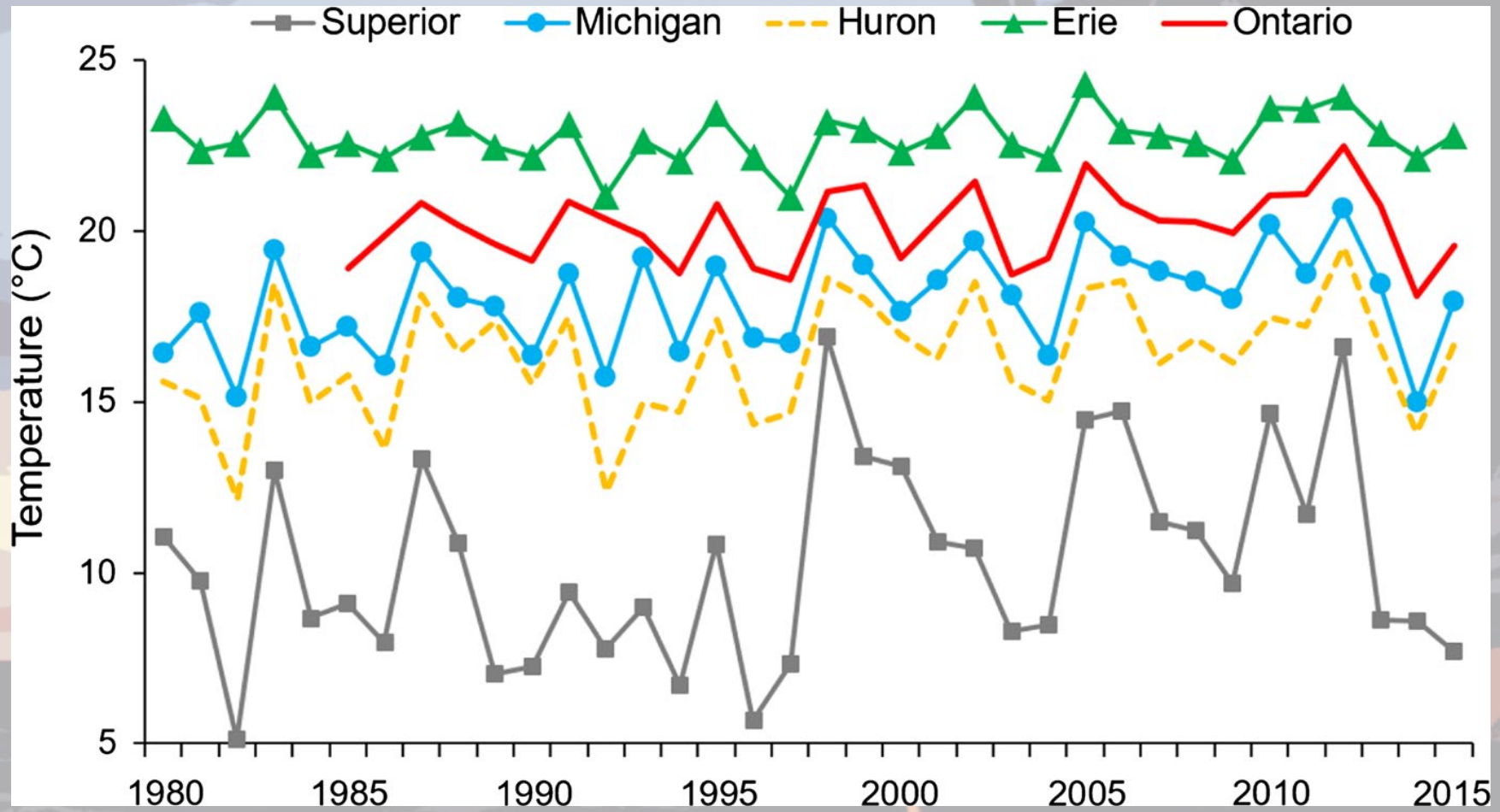
Nutrient inputs and concentrations





Stressors of the Great Lakes fisheries

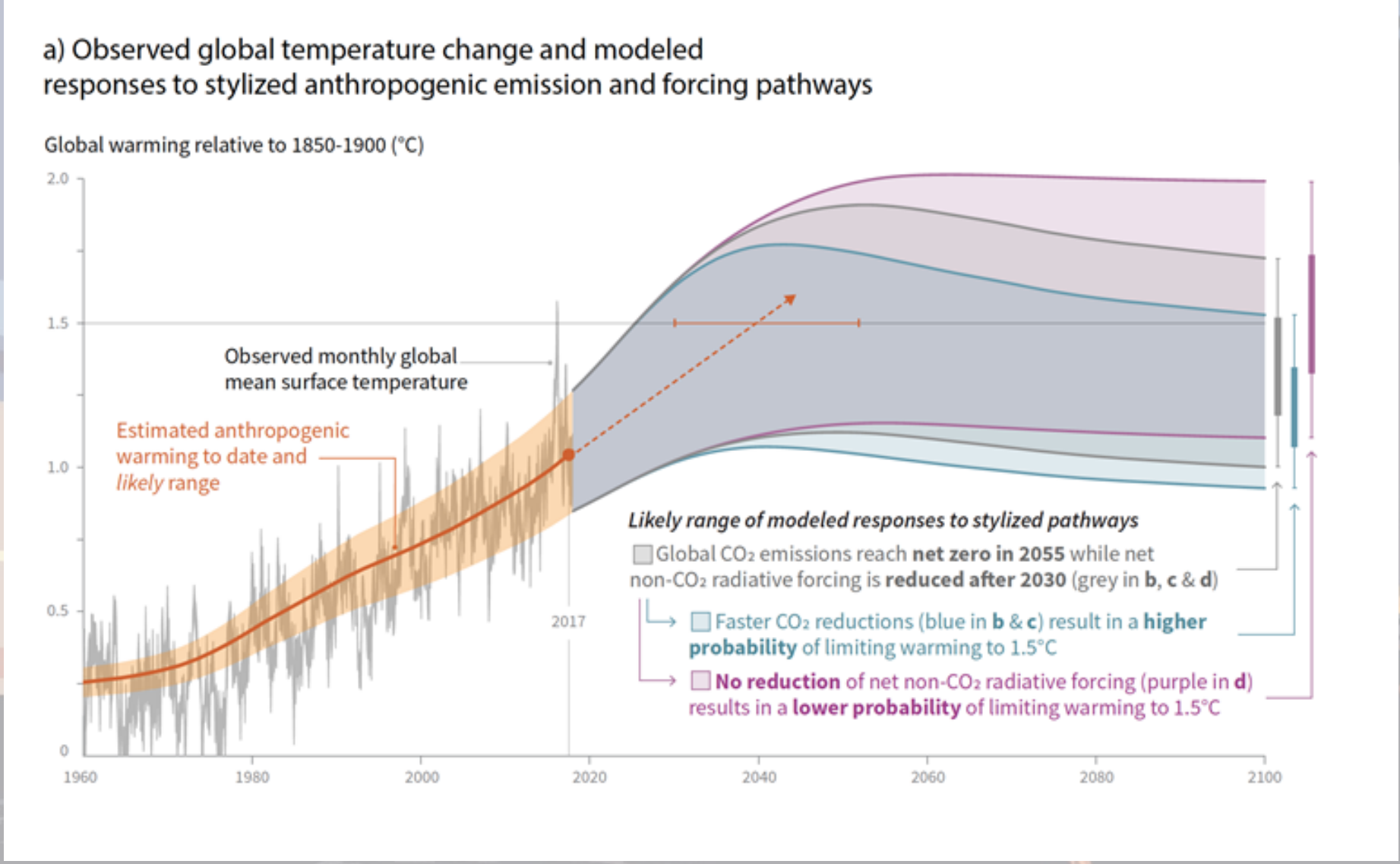
- Climate Change



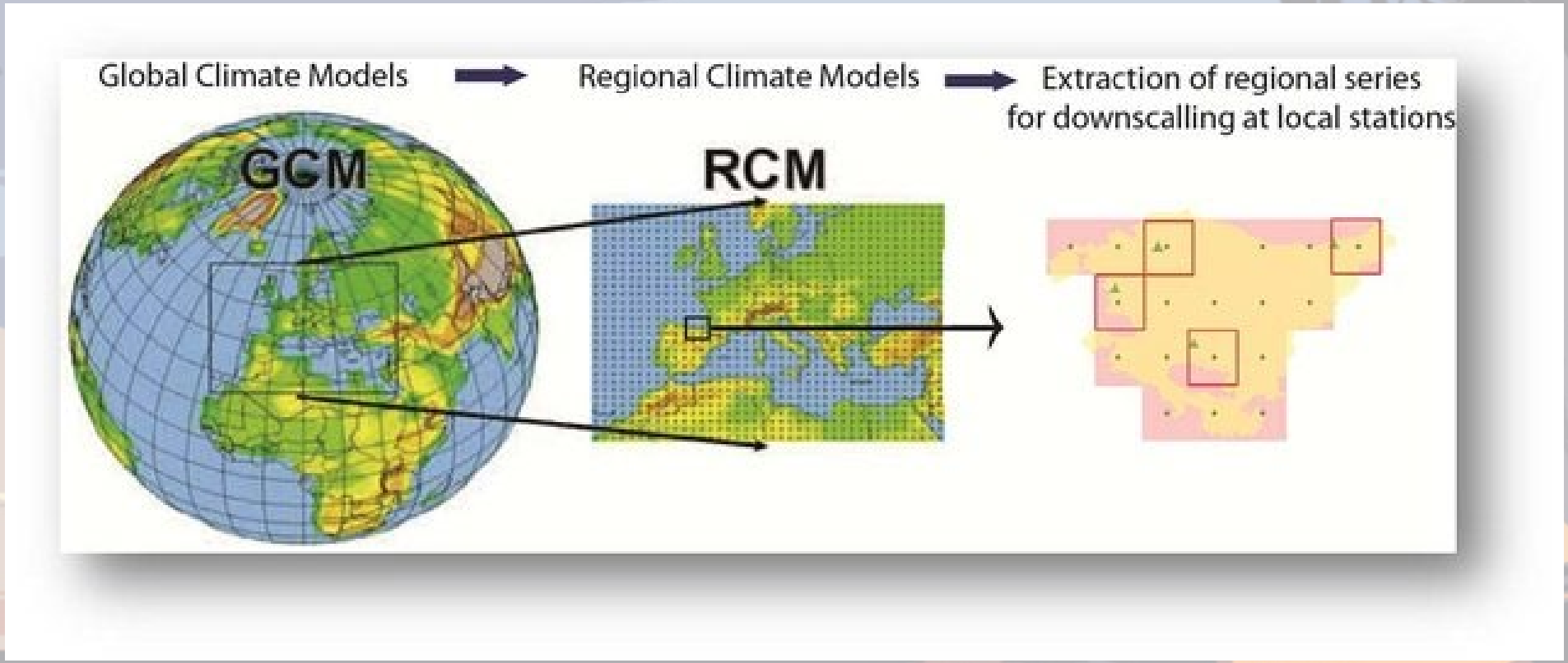
How will climate change affect Great Lakes fisheries?

- Not a novel stressor
- Interaction with existing stressors
  - Invasive species
  - Nutrient dynamics
- How do we forecast climate change

Climate projections



Regional downscaling

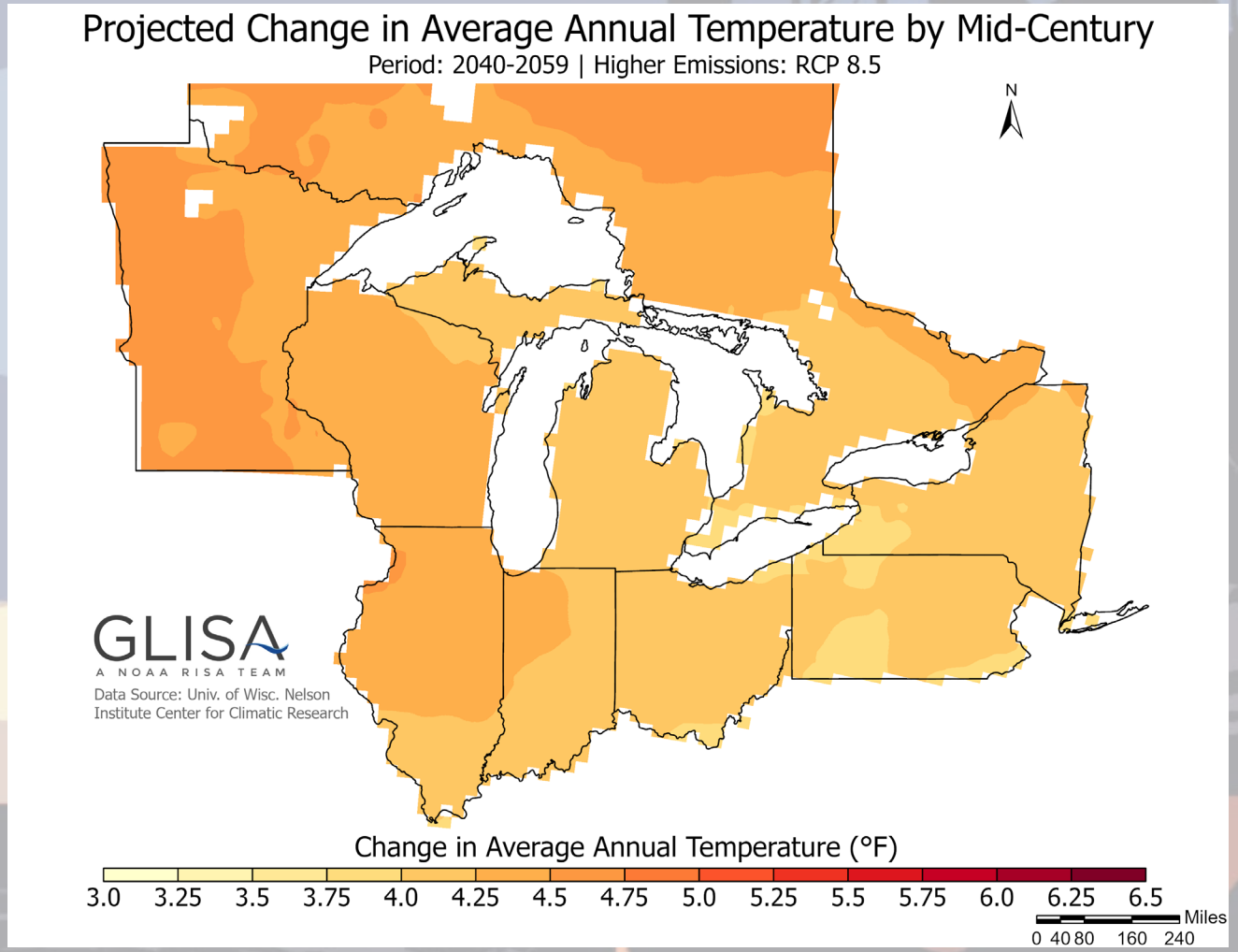


How will climate change affect Great Lakes fisheries?

- Not a novel stressor
- Interaction with existing stressors
  - Invasive species
  - Nutrient dynamics
- How do we forecast climate change
- What are the most robust predicted changes

What do climate models tell us?

- Temperatures will increase



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Winter (Dec-Feb)

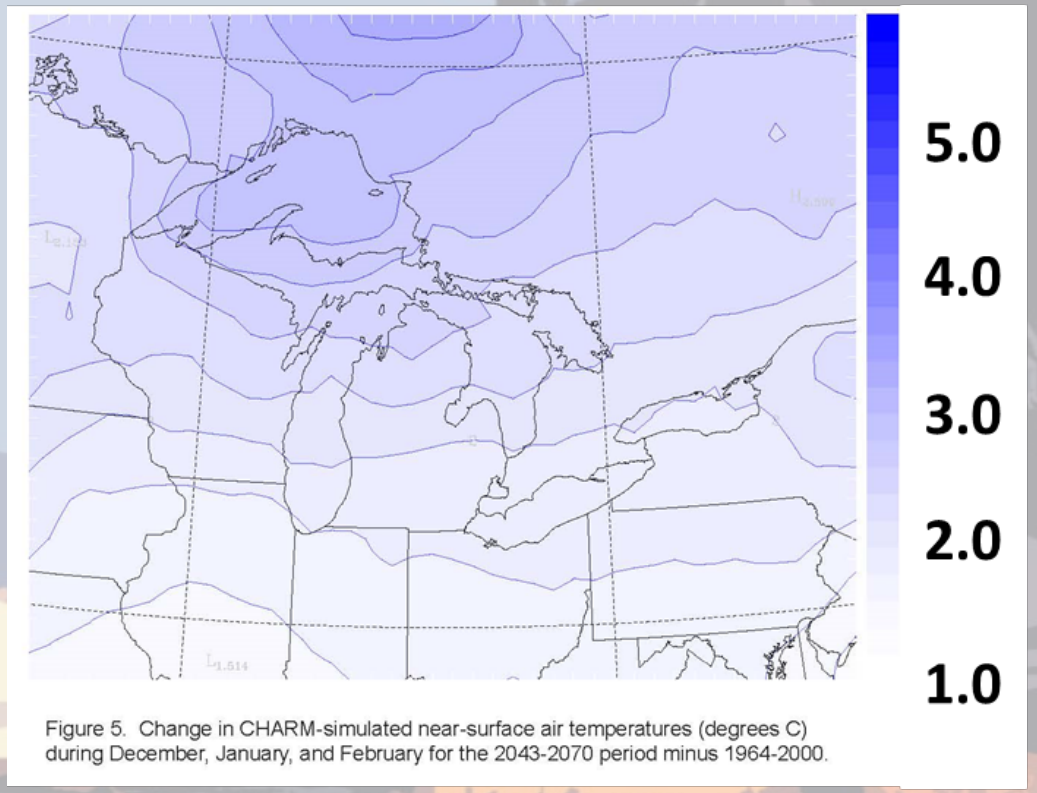

Figure 5. Change in CHARM-simulated near-surface air temperatures (degrees C) during December, January, and February for the 2043-2070 period minus 1964-2000.

~ 2 °C increase

Downscaled climate projections: Lofgren 2014

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Summer (Jun-Aug)

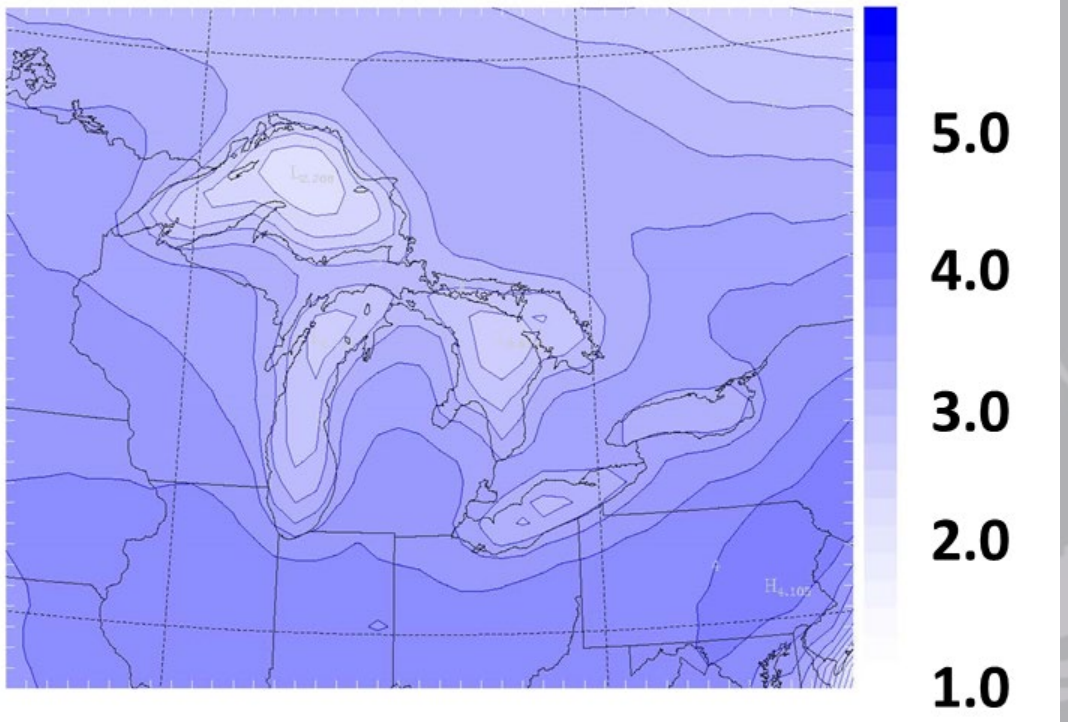

Figure 3. Change in CHARM-simulated near-surface air temperatures (degrees C) during June, July, and August for the 2043-2070 period minus 1964-2000.

~ 3 °C increase

Downscaled climate projections: Lofgren 2014

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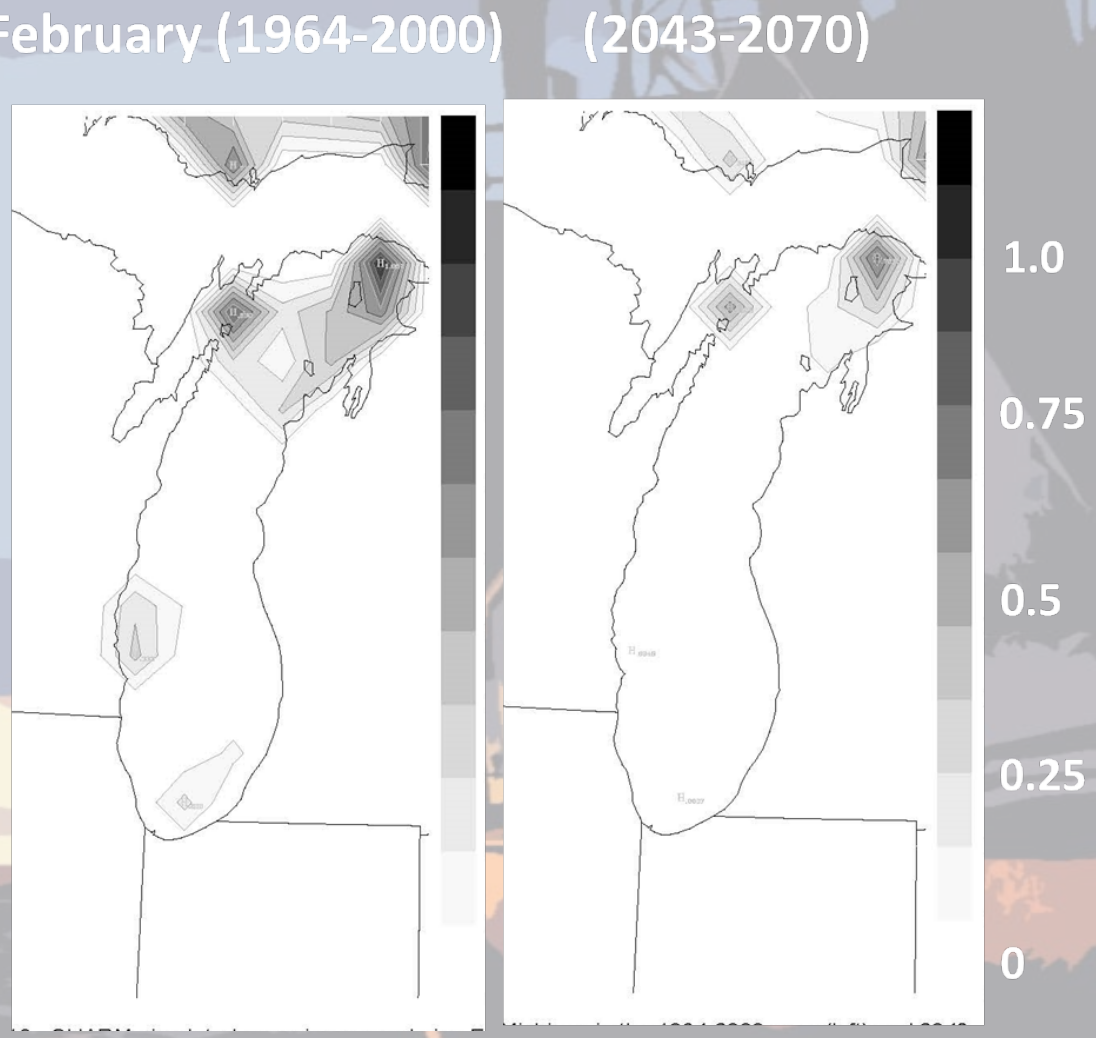

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- Temperatures will increase
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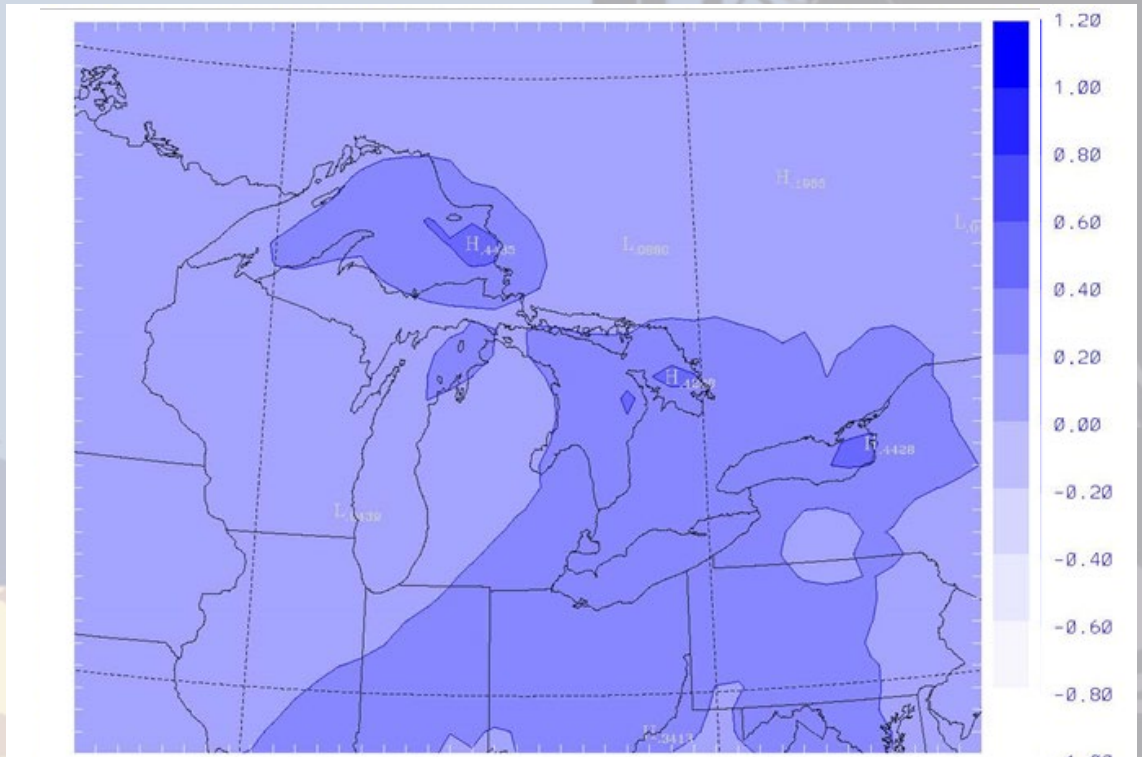

Figure 9. Change in CHARM-simulated precipitation rate (mm/day) during December, January, and February for the 2043-2070 period minus 1964-2000.

~ 0.2 mm/d increase

Downscaled climate projections: Lofgren 2014

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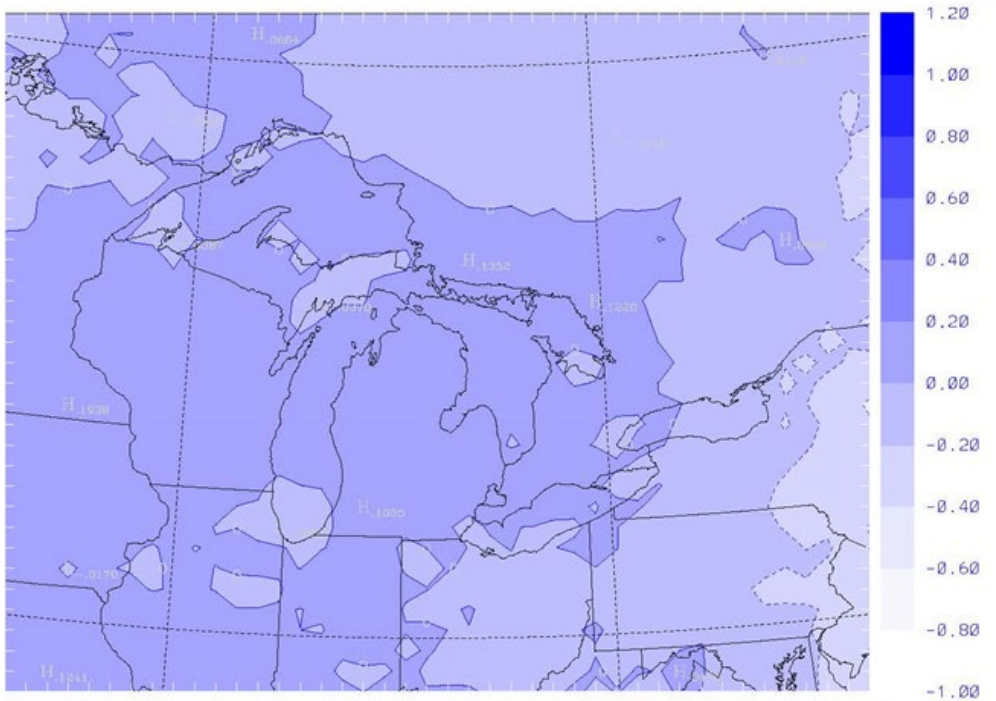

Figure 8. Change in CHARM-simulated precipitation rate (mm/day) during June, July, and August for the 2043-2070 period minus 1964-2000.

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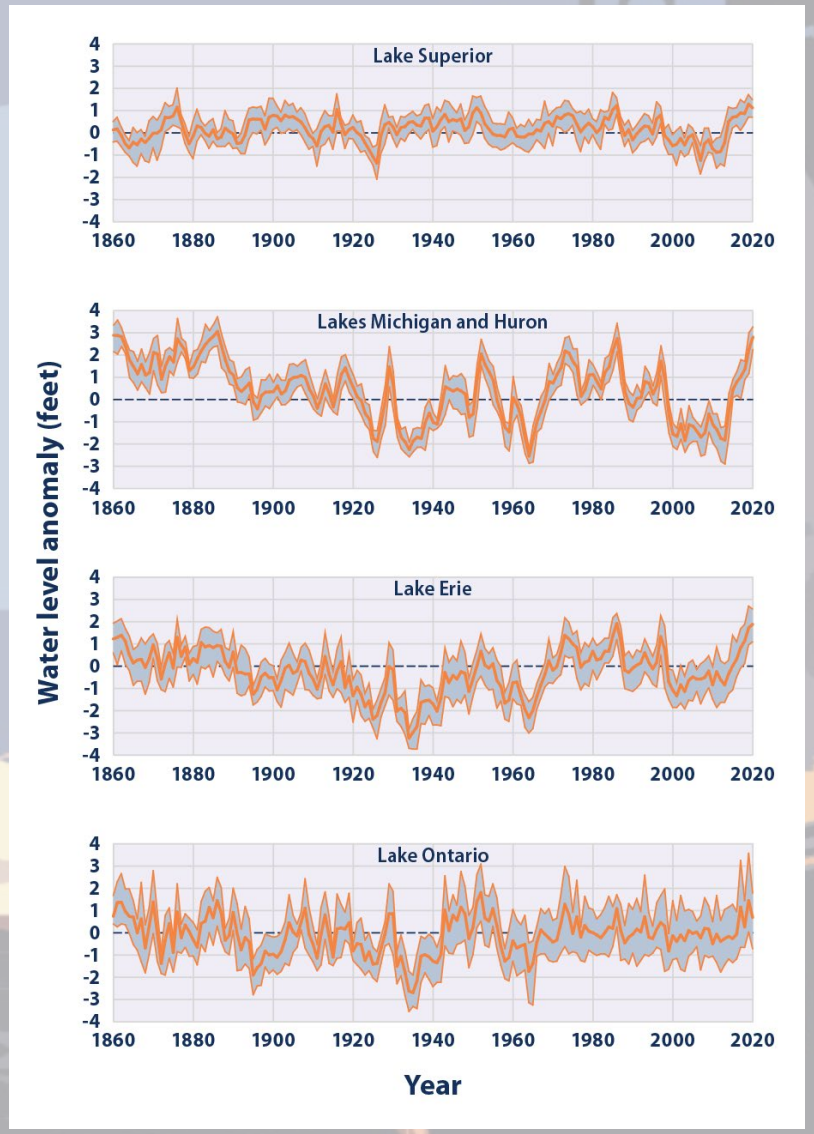
Downscaled climate projections: Lofgren 2014

What do climate models tell us?

- Temperatures will increase
- Precipitation patterns will change
- Changing lake levels



NOAA

Climate change impacts on fisheries

What is changing	Direction of effect	Fishery outcome

Climate change impacts on fisheries

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Water temperature	Increasing	Invasive species, vital rates, species distribution

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Thank you

- Slides provided by Bo Bunnell – USGS
- Contact email: pcolling@purdue.edu

PURDUE UNIVERSITY

Sea Grant ILLINOIS-INDIANA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY