Climate Change, Prairie Wetlands, and Ducks

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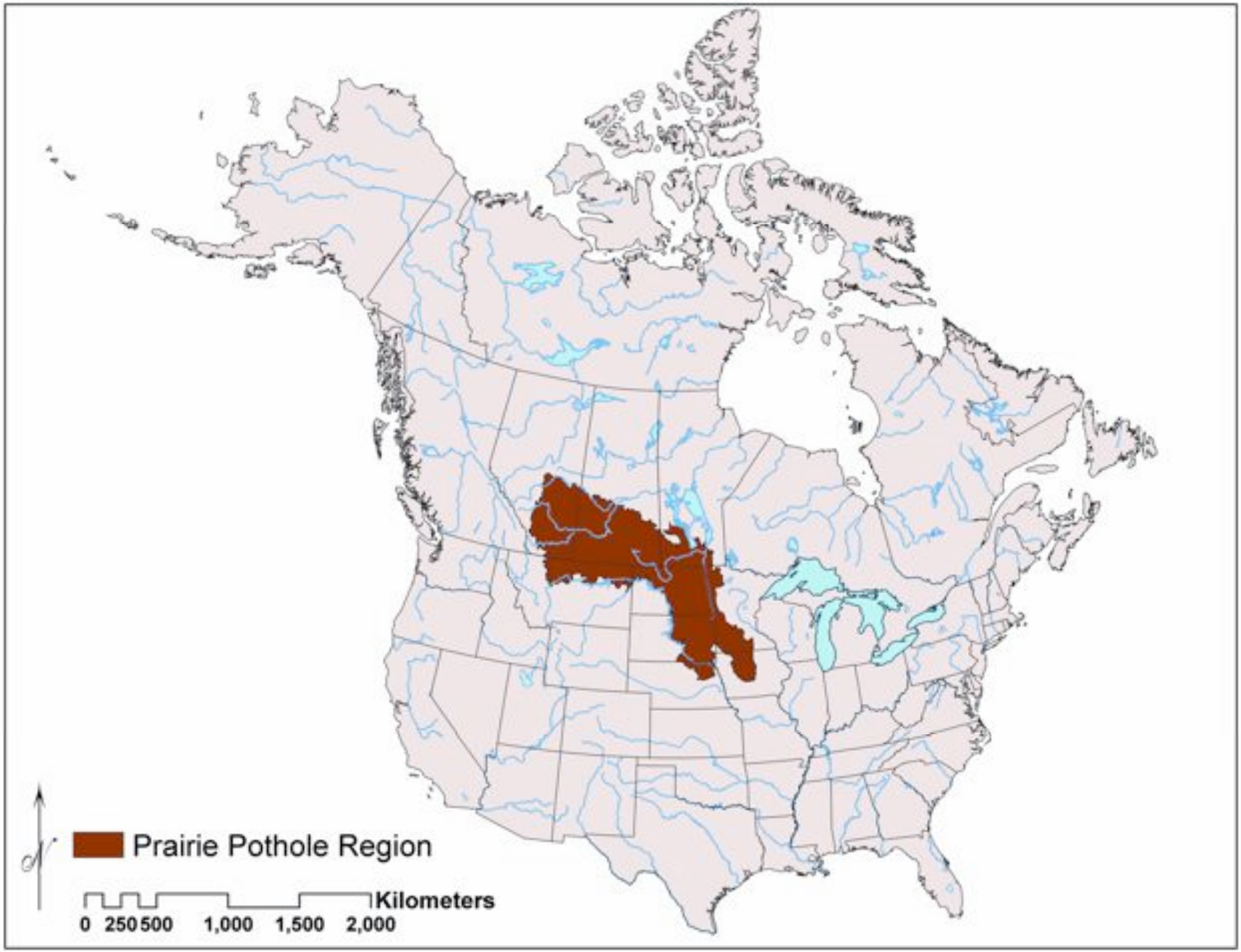
This project was funded by:
U.S. Global Change Science Program
and a U. S. EPA STAR Grant

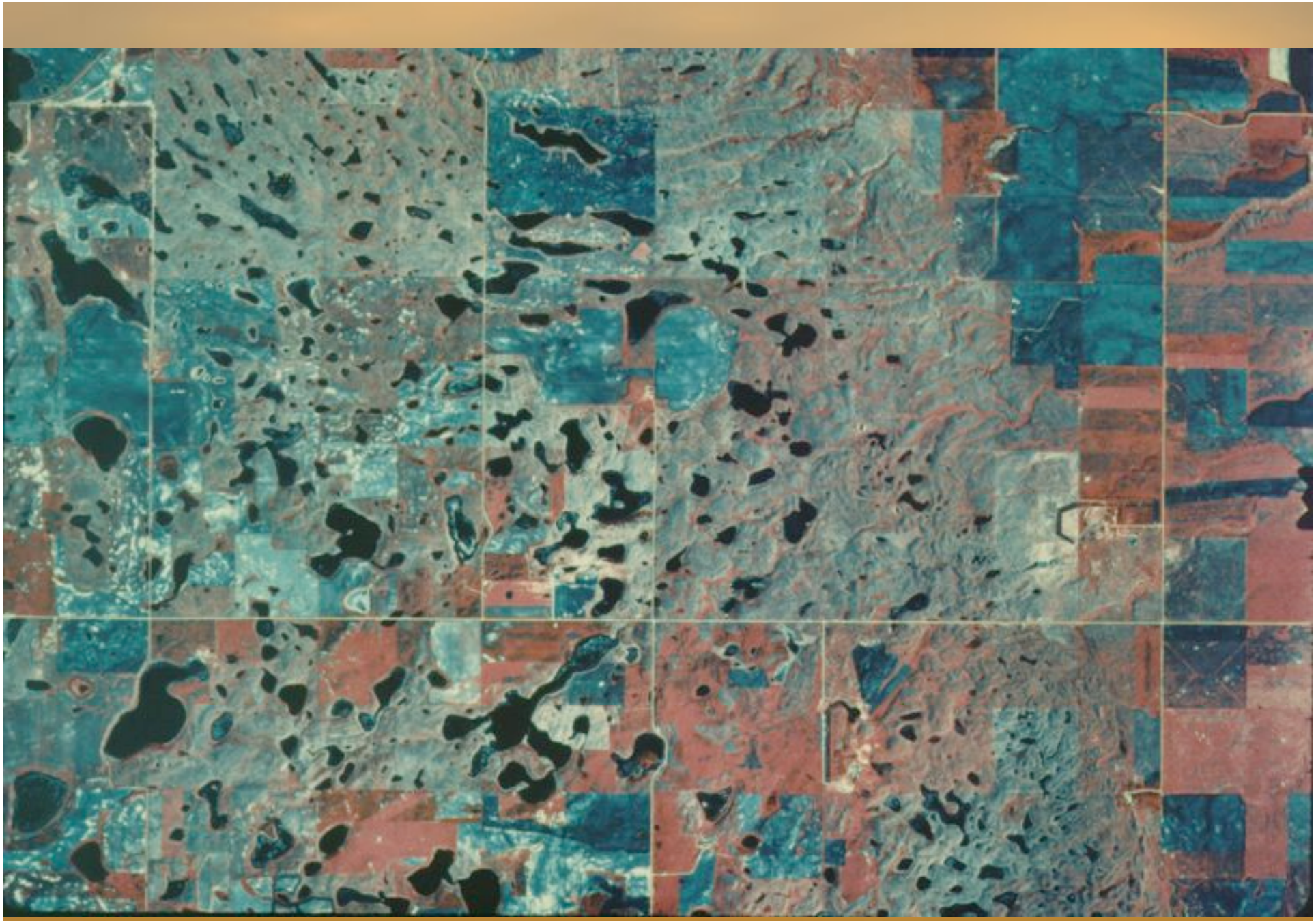
Climate Projections

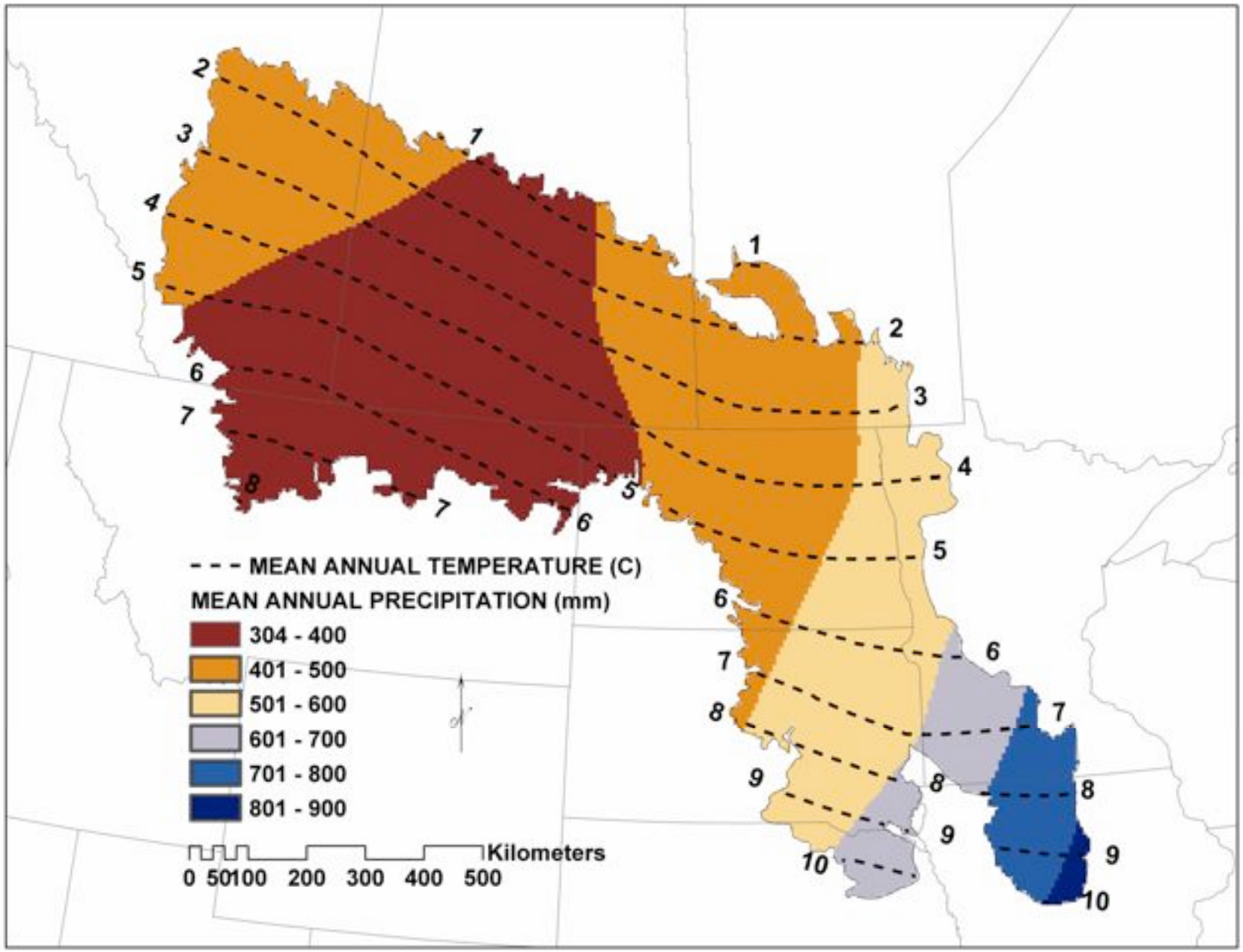
- 1.8-4.0^{o}C increase globally by 2100 (IPCC 2007)
- 3.0-4.0^{o}C increase; -5% to +10% change in precipitation for Prairie Pothole Region (IPCC 2007)

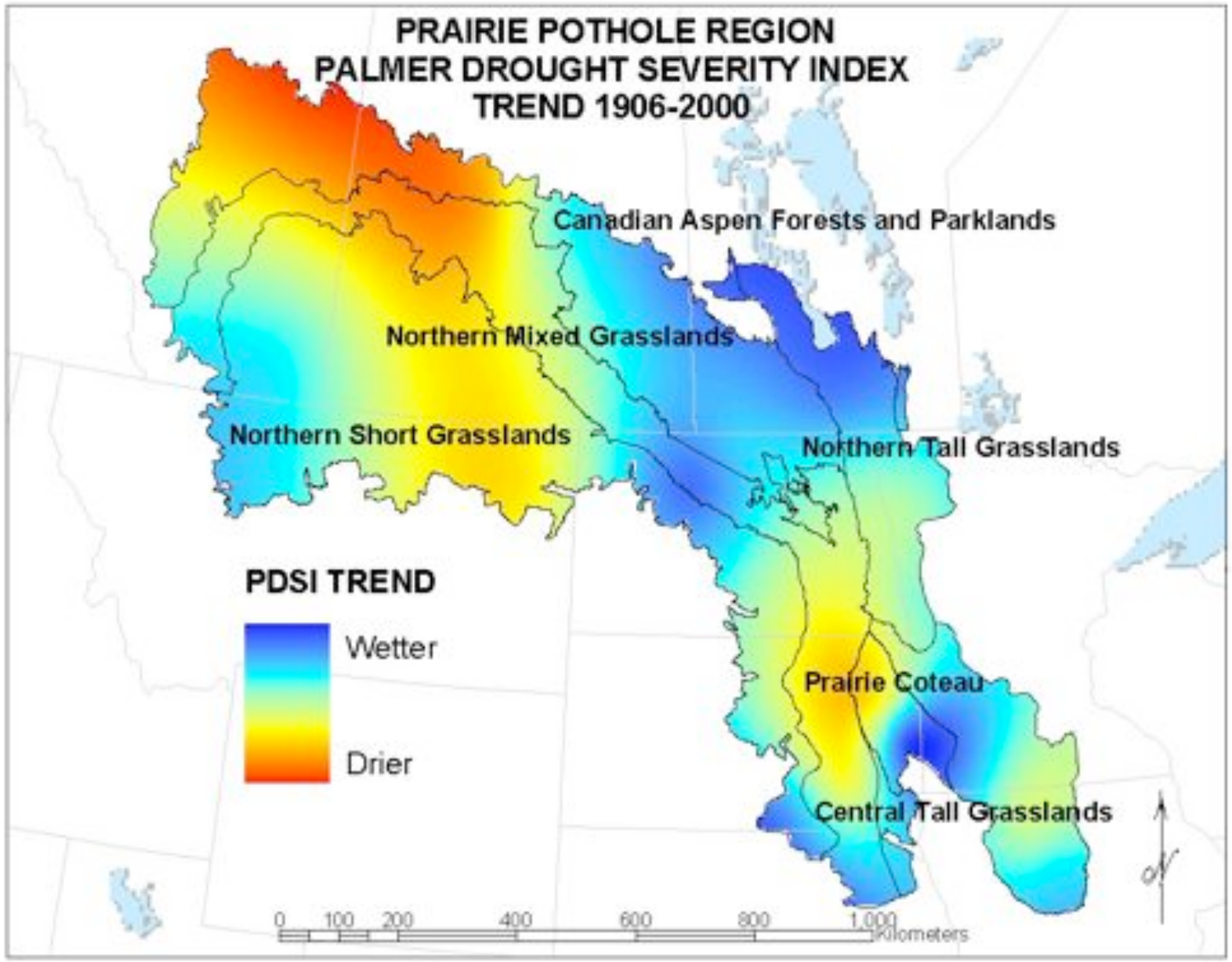
Climate Projections continued

- Greater warming in winter than in summer
- Greater warming at night than in daytime
- Increased climatic variability
- Greater precipitation globally

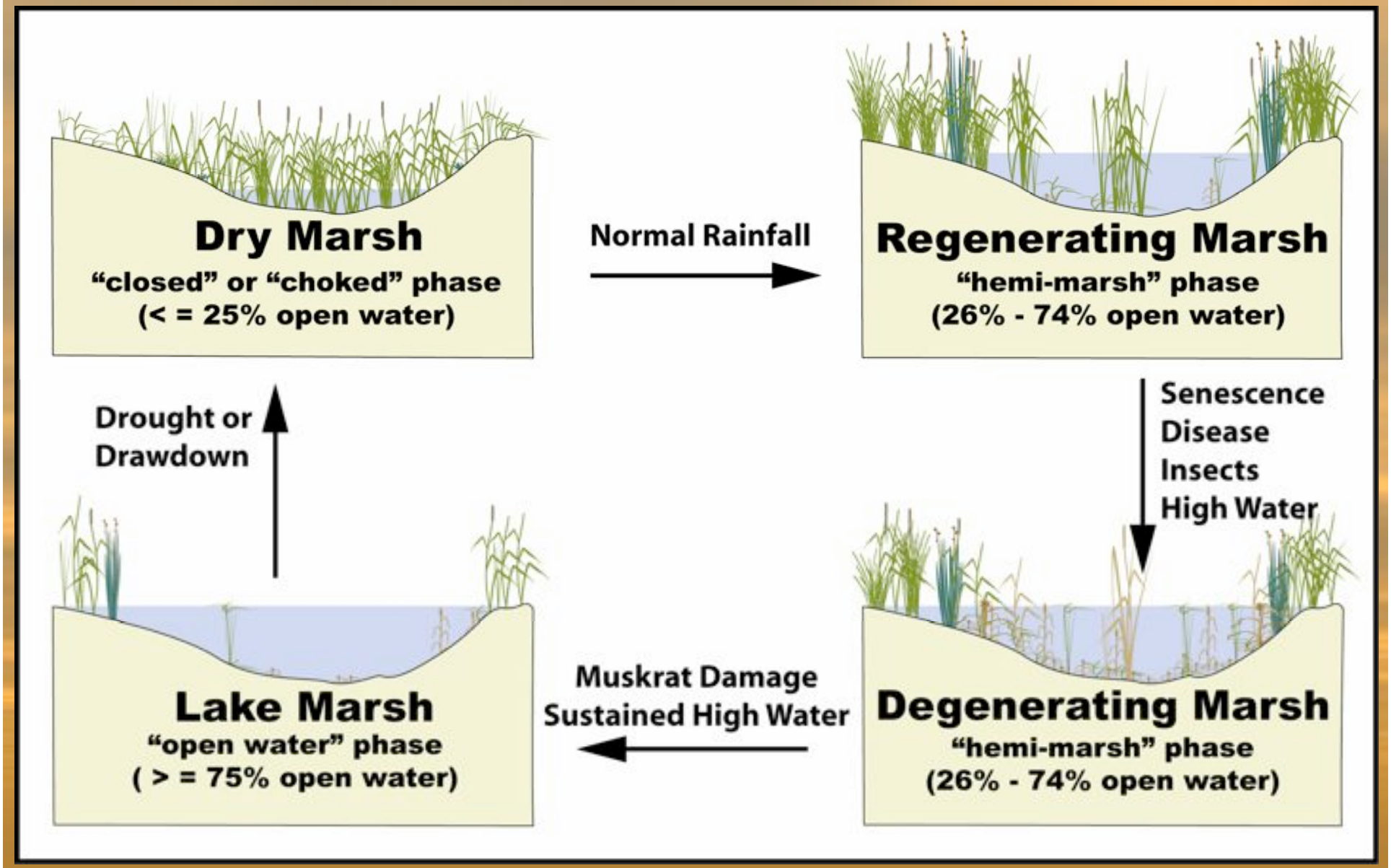

Prairie Pothole Region
Kilometers
0 250 500 1,000 1,500 2,000

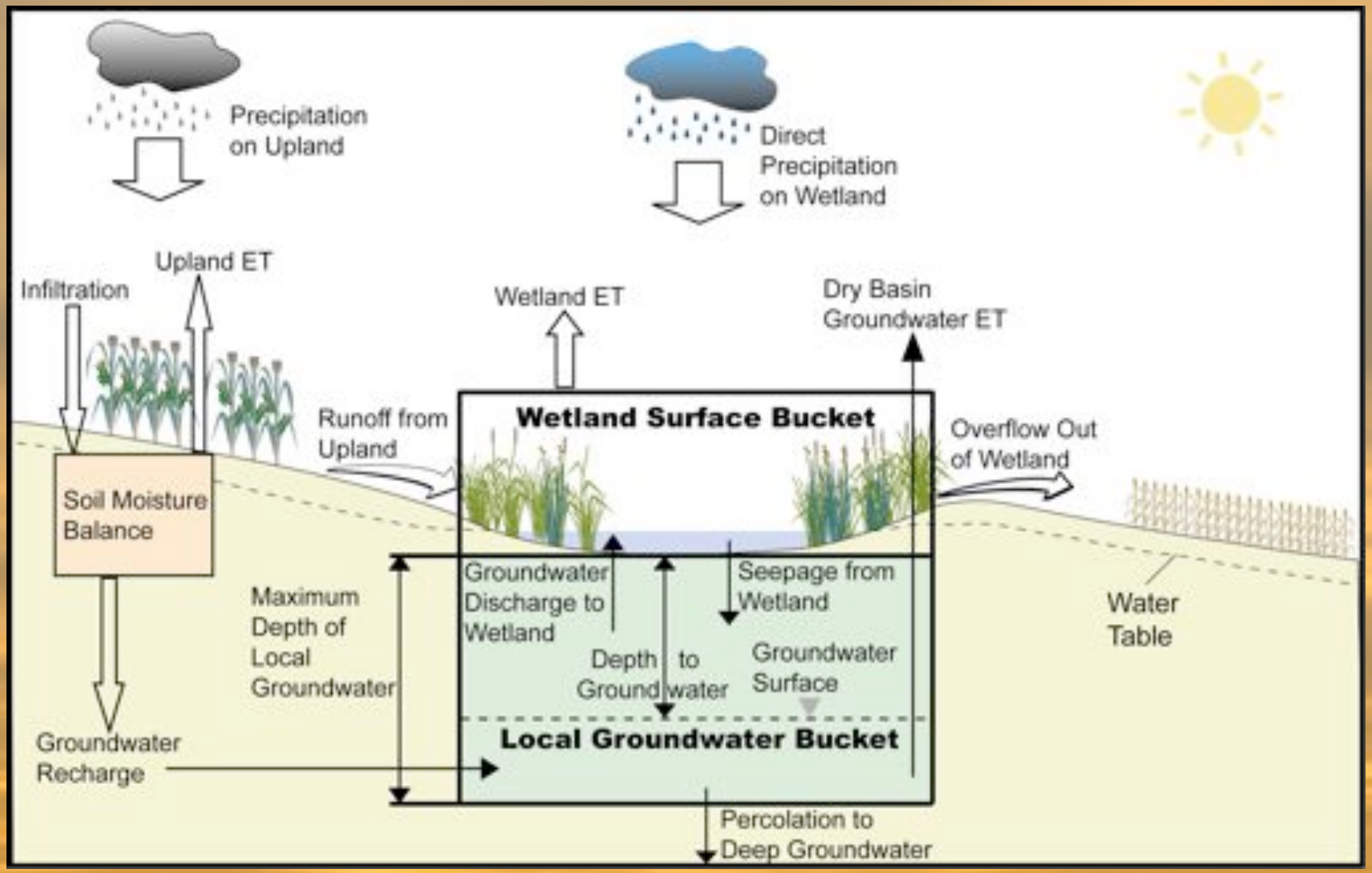



MEAN ANNUAL TEMPERATURE (C)
MEAN ANNUAL PRECIPITATION (mm)
304 - 400
401 - 500
501 - 600
601 - 700
701 - 800
801 - 900
Kilometers
0 50100 200 300 400 500

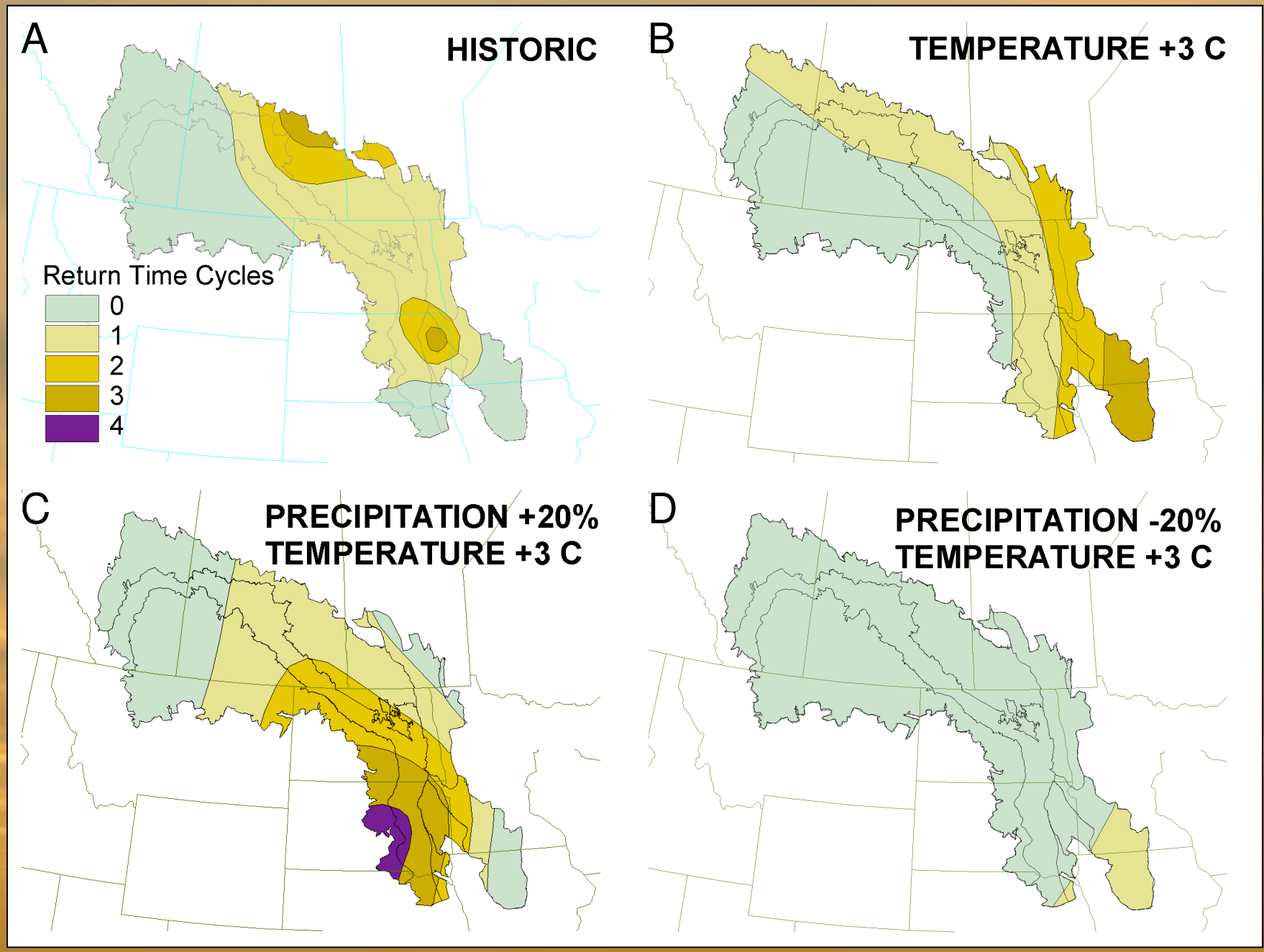

PRAIRIE POTHOLE REGION
PALMER DROUGHT SEVERITY INDEX
TREND 1906-2000
Canadian Aspen Forests and Parklands
Northern Mixed Grasslands
Northern Short Grasslands
Northern Tall Grasslands
Prairie Coteau
Central Tall Grasslands
PDSI TREND
Wetter
Drier
0 100 200 400 600 800 1,000
Kilometers

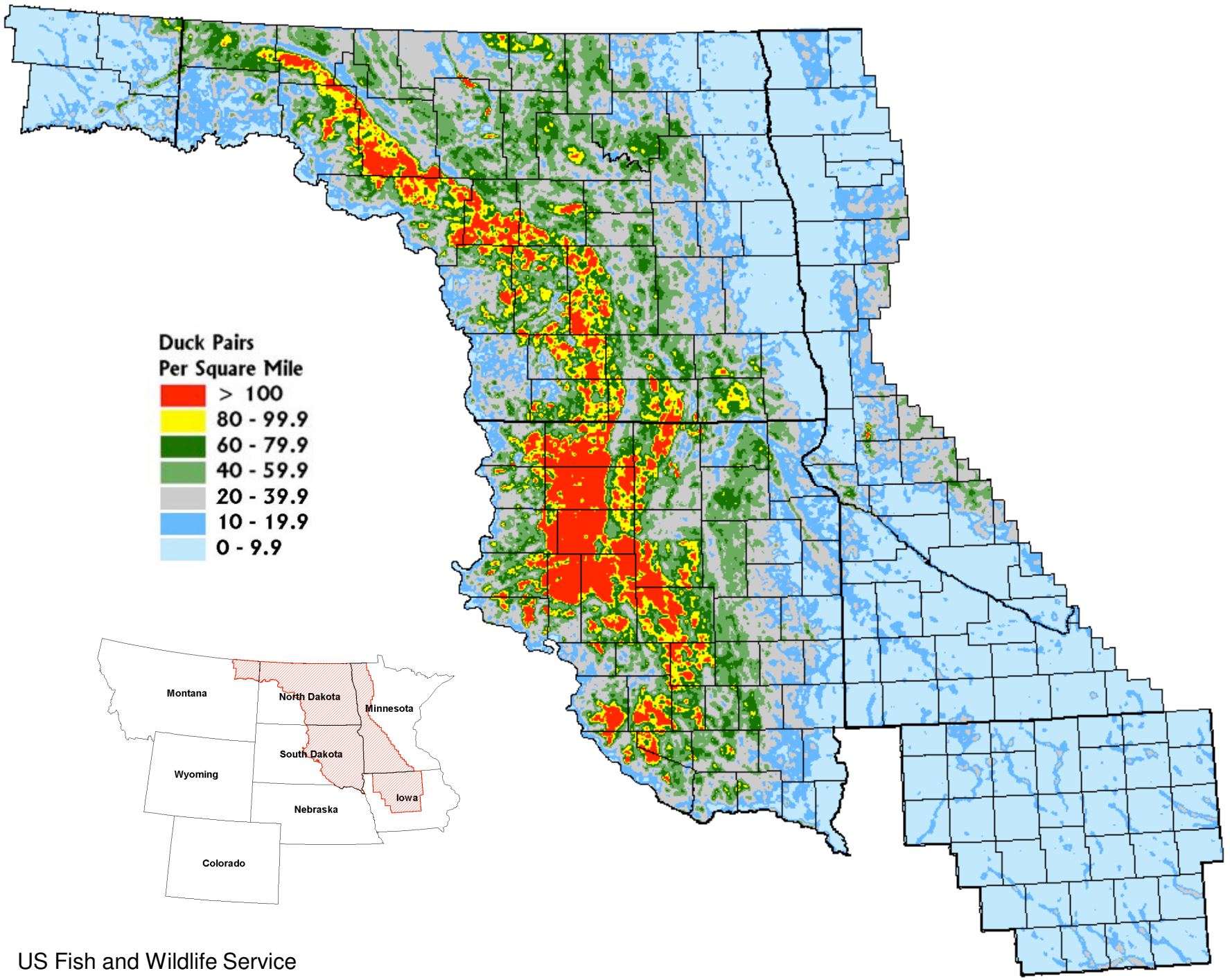
Wetland Vegetation Cover Cycle



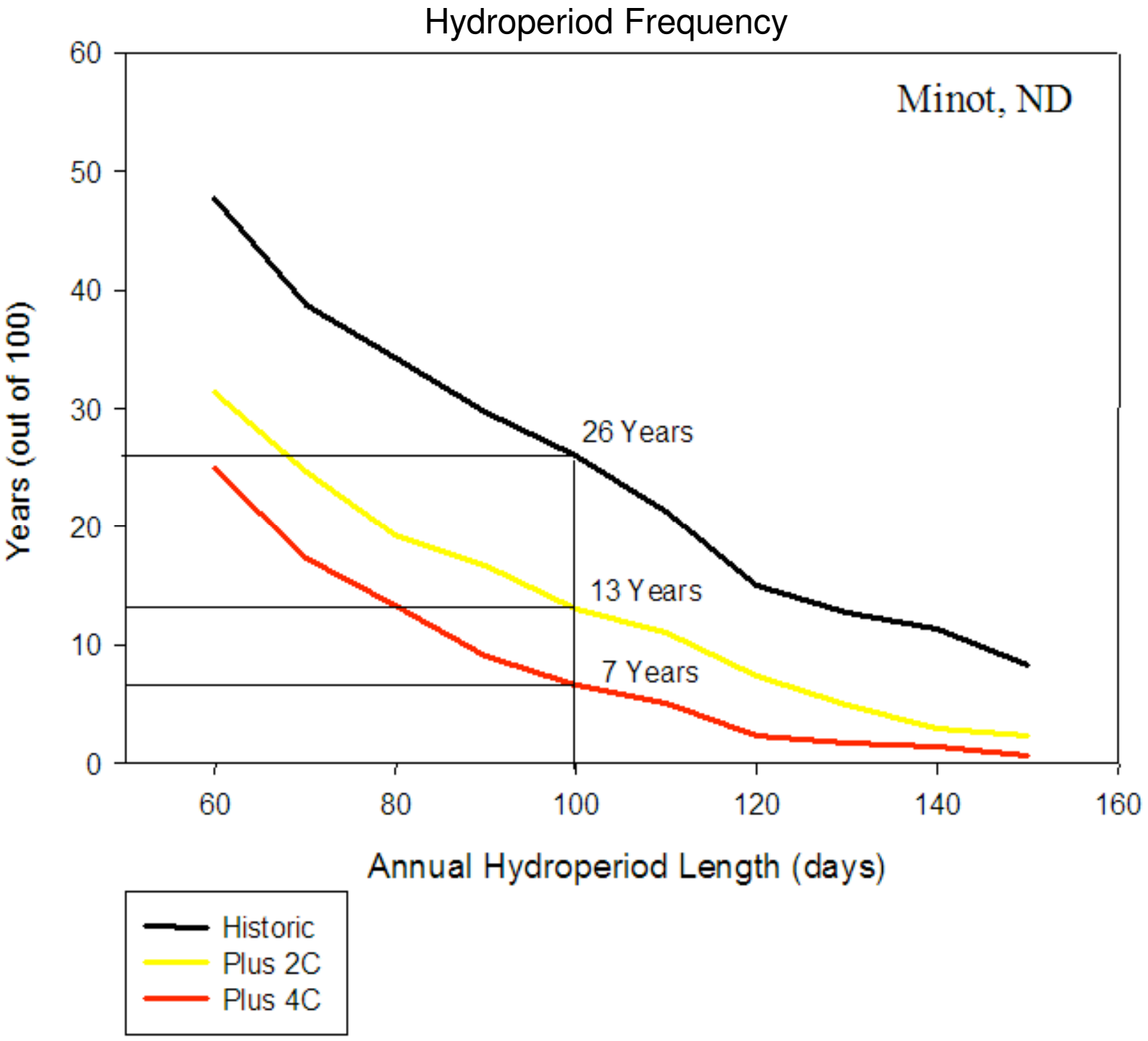


Generalized wetland water budget and double-bucket conceptual model.


A
HISTORIC
Return Time Cycles
0
1
2
3
4
B
TEMPERATURE +3 C
C
PRECIPITATION +20%
TEMPERATURE +3 C
D
PRECIPITATION -20%
TEMPERATURE +3 C



US Fish and Wildlife Service


Hydroperiod Frequency
Minot, ND
Years (out of 100)
60
50
40
30
20
10
0
26 Years
13 Years
7 Years
60
80
100
120
140
160
Annual Hydroperiod Length (days)
Historic
Plus 2C
Plus 4C

Conclusions-Science

- Air temperature really matters to wetland dynamics
- Western PPR wetlands most vulnerable to climate change
- Seasonal and semi-permanent (especially) wetlands most susceptible
- Climate change poses a conservation challenge because the highest wetland densities and best grass for nesting occur where the effects of climate change are projected to be the most severe.
- Under a warmer and drier climate, the PPR's historic duck factory would shift eastward

Conclusions-Science continued

- Eastern PPR wetlands may become more productive under a warmer climate except that most have been drained

- While highly mobile duck populations may be greatly diminished under the projected future climate, resident wetland species with limited mobility (i.e., amphibians) may be even more vulnerable to climate change

Conclusions-Management

- Monitoring: Expand weather and water level monitoring and analysis needed for early detection of climate change effects
- Remediation: stop wetland drainage and intensify wetland restoration and management across the PPR
- Restoration: Re-double wetland restoration efforts in eastern PPR (MN-Dakota border area and Iowa)

For more information

- Website: wetlandscape.sdstate.org
- New Article on Prairie wetland complexes and climate change: February 2010 issue of BioScience

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