

Potential effects of climate change on wildlife in northern Minnesota



Michael A. Larson, Research Scientist
Minnesota Dept. of Natural Resources

Overview

- DNR working group
- Wildlife impacts
 - observed, anticipated
- Mitigation & adaptation
 - context, options
- Final thoughts

Wildlife Climate Change Working Group

- **Guide the
Div. of Fish & Wildlife in...**
 - describing climate change,
 - its effects on wildlife, and
 - developing actions

Wildlife Climate Change Working Group

- **Michelle Carstensen**
- **Emily Dunbar**
- **John Fieberg**
- **Mike Larson**
- **Jeff Lightfoot**
- **Cynthia Osmundson**
- **Charlotte Roy Nielsen**
- **Bob Wright**
- **Kathy DonCarlos**
- **Mike DonCarlos**
- **Dick Kimmel**
- **Don Pereira**

Wildlife Impacts

Observed & Anticipated

Observed impacts

CC prediction	As predicted	Opposite of prediction	<i>P</i> -value
Earlier spring events	0.87	0.13	$<1 \times 10^{-13}$
Range shift (polar, up)	0.81	0.19	$<1 \times 10^{-13}$
Rel. abundance in community	0.85	0.15	$<1 \times 10^{-13}$

Parmesan & Galbraith (2004)

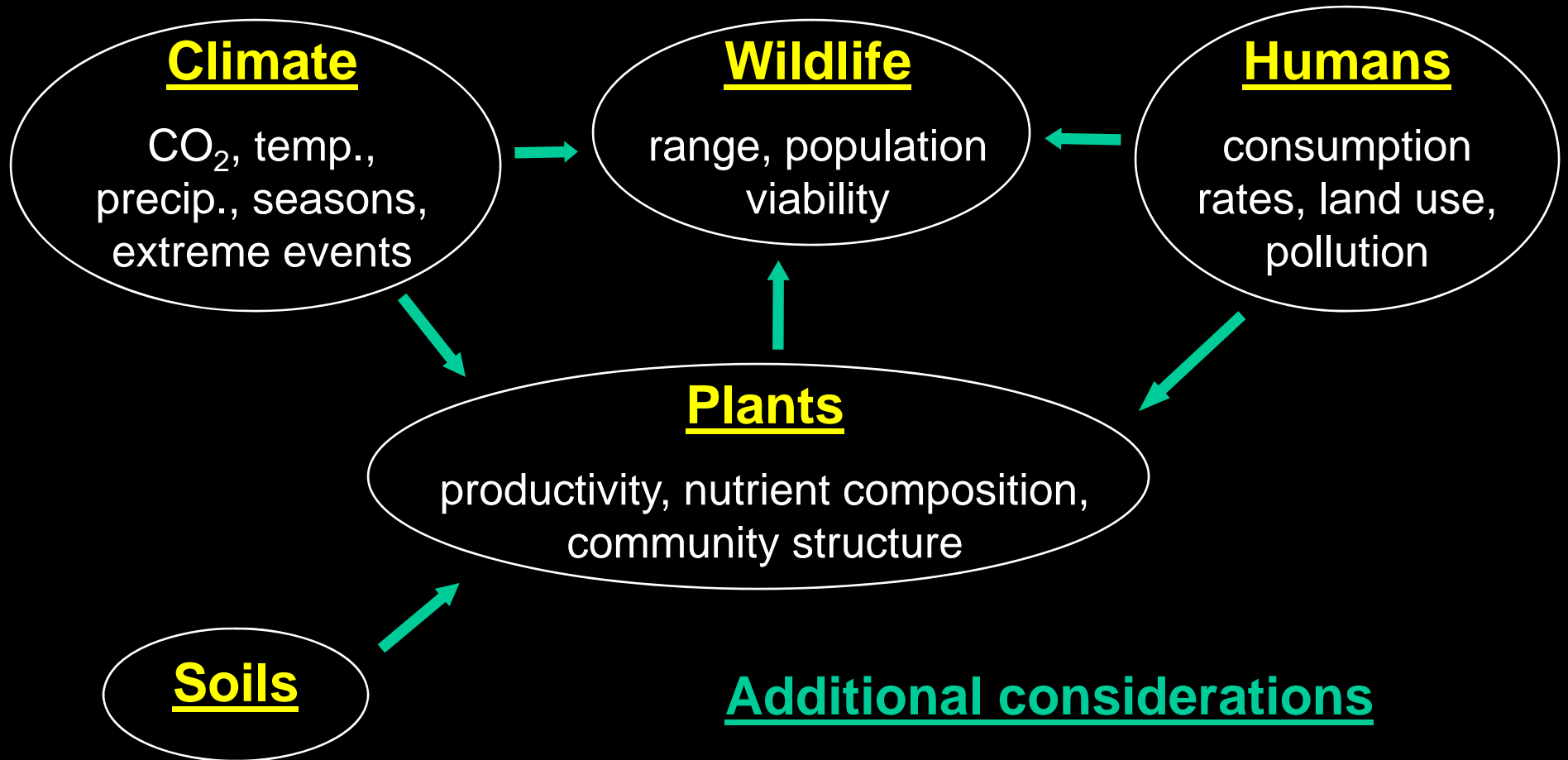
Observed impacts

- **Earlier spring calling of frogs, arrival & breeding of migrant birds**
- **Higher latitude of breeding warblers**
- **Northward expansion of red fox, porcupines**
- **Diverging seasonal plant development & bird breeding**

Anticipated impacts

- “Extreme complexities”
–(TWS Tech. Review)

Extreme complexities



Additional considerations

invasive exotics, pathogens,
ecological relationships, corridors

Anticipated impacts

- **Change in range**
 - **location shifting**
 - **size, mostly smaller**
- **Change in abundance,
population viability**

Seasonal climate by 2095



Johnson &
Polasky (2003)

Anticipated impacts

- **Boreal, other northern species moving out**
 - moose, spruce grouse
- **Southern species moving in**
 - opossum
- **Grassland & wetland species ???**
 - precip., land use (e.g., agriculture)

Anticipated impacts

- **Amphibians & Reptiles**
 - temp. & precip. both important
 - snow cover, winter kill
 - altered sex ratios
- **Mammals**
 - growth rates, body size, reprod

Anticipated impacts

- **Migrant birds**
 - **timing & routes of migration**
 - **breeding vs. nonbreeding ranges**
 - **lose ~50% of species in Great Lakes region (net ~30%)**

Mitigation & Adaptation

Climate change in context

- **Land use**
 - **habitat loss, fragmentation, and degradation**
 - **influences on climate change**
- **Human demographics**
 - **direct impacts on environment**
 - **indirect impacts (e.g., public policy)**

Climate change in context

- **Energy policy & availability**
 - choices among sources & technologies
 - how we do our jobs

Options / recommendations

- **Address climate change directly**
- **Address unavoidable impacts**
- **Address institutional issues**

Options / recommendations

- **Address climate change directly**
 - **reduce carbon emissions**
 - **public outreach**
 - **policy advocacy**

Options / recommendations

- **Address unavoidable impacts**
 - Reduce nonclimate stressors
 - Manage for diverse conditions
 - Maintain connected, diverse populations
 - Select refuges carefully

Options / recommendations

- **Address unavoidable impacts**
 - **Reassess species vulnerability classifications, priorities**
 - **Reduce risk of catastrophic fires**
 - **Prevent & control invasive species**

Options / recommendations

- **Address institutional issues**
 - **Plan long-term & incorporate climate change**
 - **Coordinate: disciplines, experts**
 - **Employ adaptive management, risk analysis**
 - **Look for opportunities**

Final thoughts

- **Monitoring**

- **science**

- learn something specific
 - evaluating falsifiable hypotheses

- **management**

- inform specific decisions

Sources of information

- **Inkley et al. 2004. Global climate change and wildlife in North America. Tech. Review 04-2. The Wildlife Society, Bethesda, MD.**
- **Parmesan & Galbraith. 2004. Observed impacts of global climate change in the US. Pew Center on Global Climate Change, Arlington, VA.**