Changing Climate, Changing Forests

The Impacts of Climate Change
on Forests of the Northeastern US and Eastern Canada

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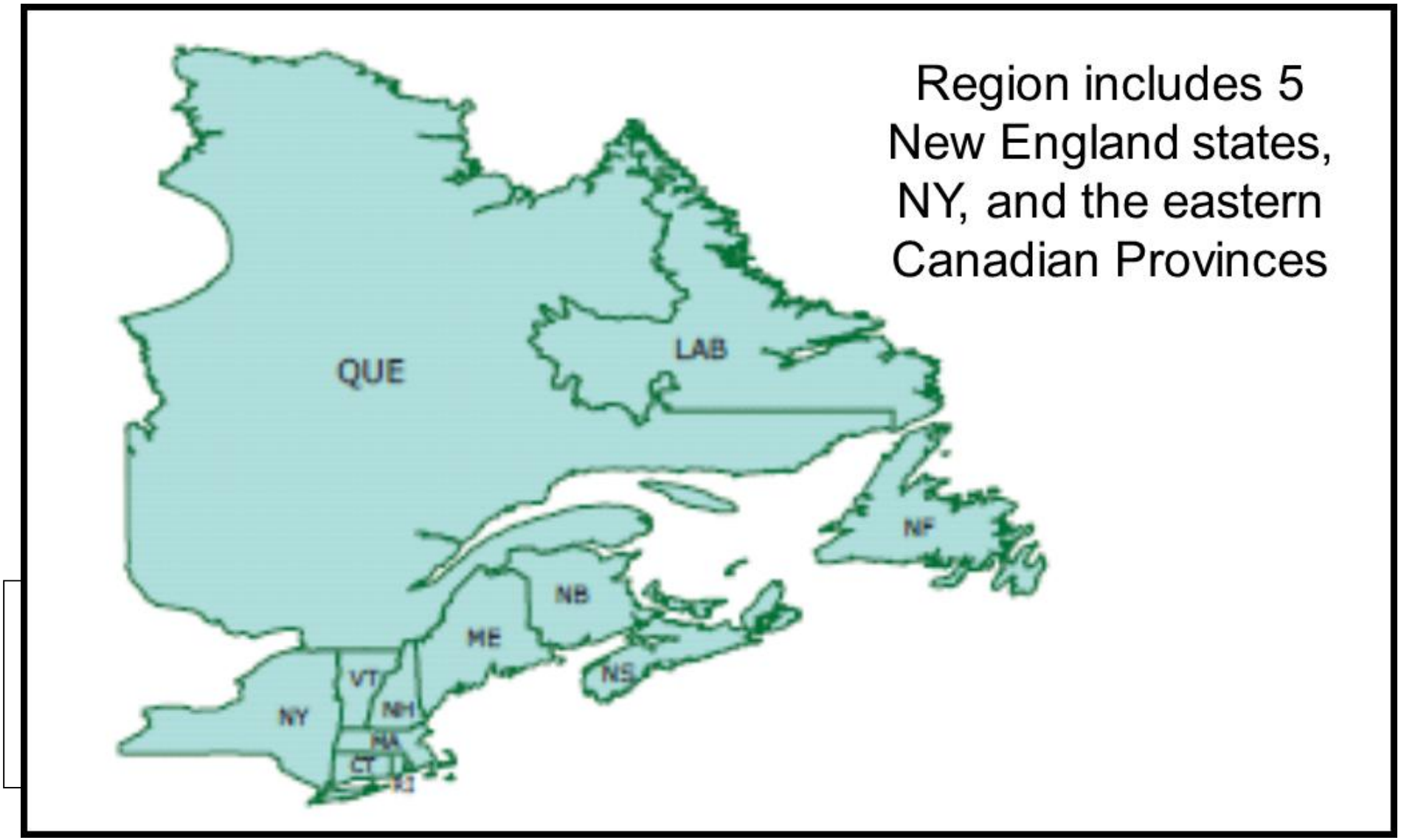
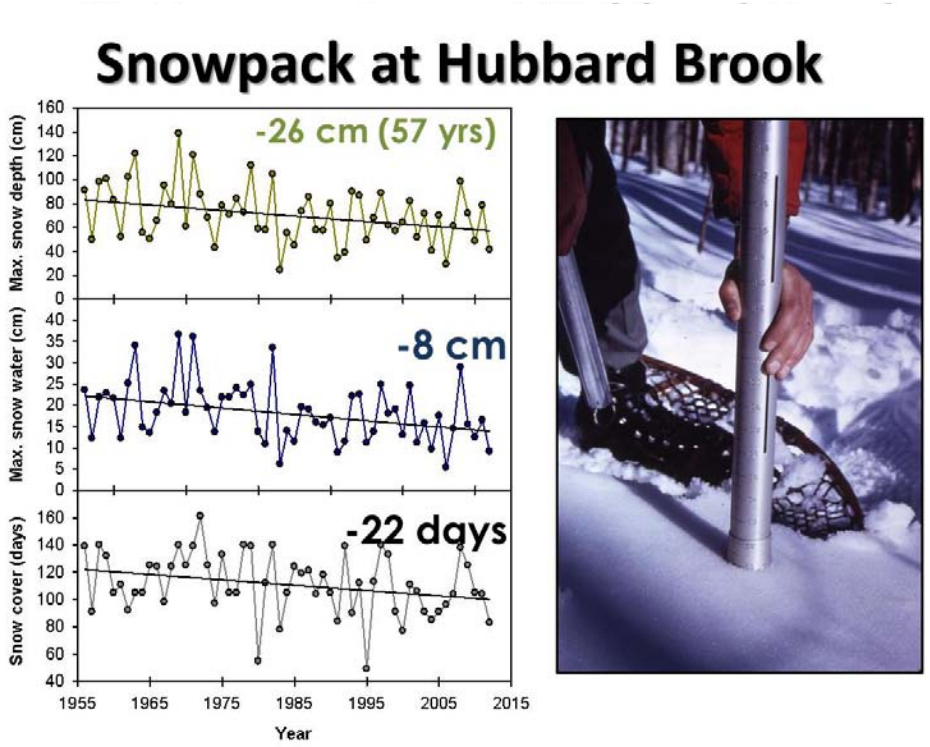


Climate

Observed:

- +1.4°F (0.8 °C) temperature
- + 9% precipitation
- Longer growing seasons
- Less snow and ice



Climate

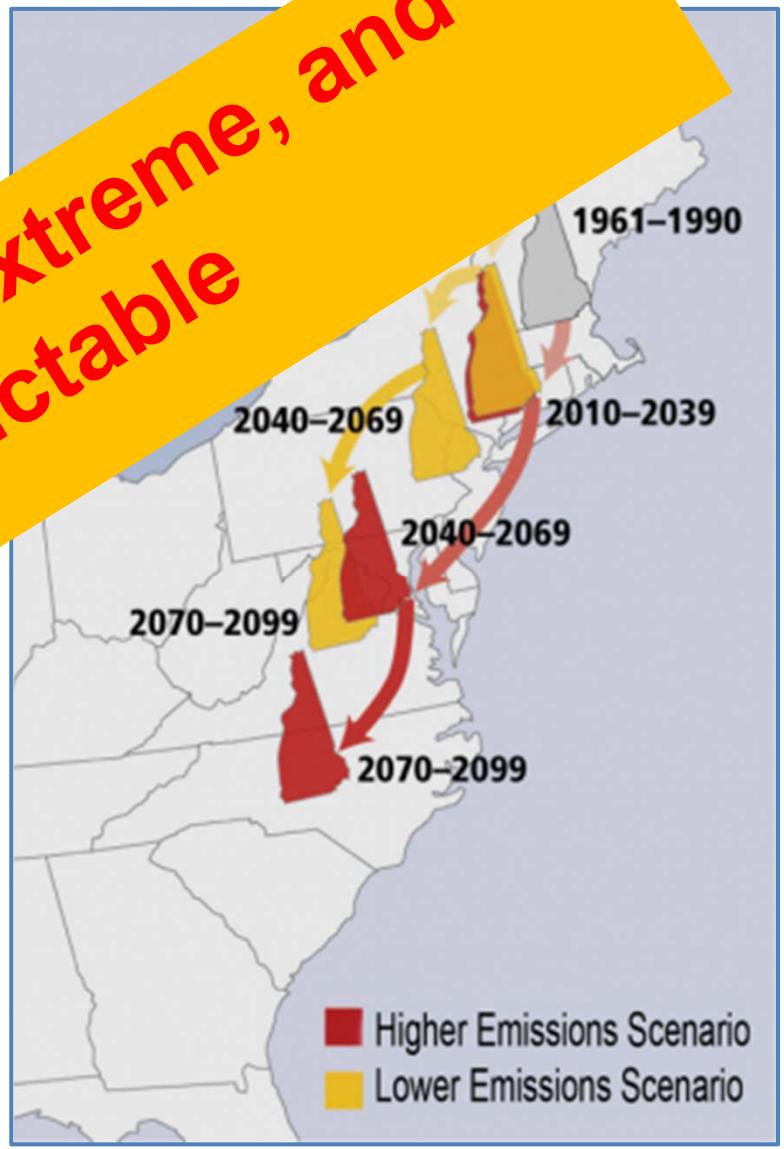
Observed:

- +1.4°F (0.8 °C) temperature
- + 9% precipitation
- Longer growing seasons
- Less snow and ice

Projected:

- + 5.2° to
  temp
- + 7
- Longe seasons (9 -43 days)
- Decrease or elimination of snowpack

More Variable, Extreme, and Unpredictable



NECIA 2007

River and Stream Hydrology

Observed:

- Increases in average stream flow
- Earlier spring high flows
- Higher flood flows

Projected:

- Continuation of observed trends
- Decreases in summer & fall stream flows

Northeast Forests

- Forest composition shifts in response to slowly changing climate
- *"Suitable habitat"* to move up and north
- Species have trouble keeping pace
  - Reproduction
  - Dispersal
  - Migration

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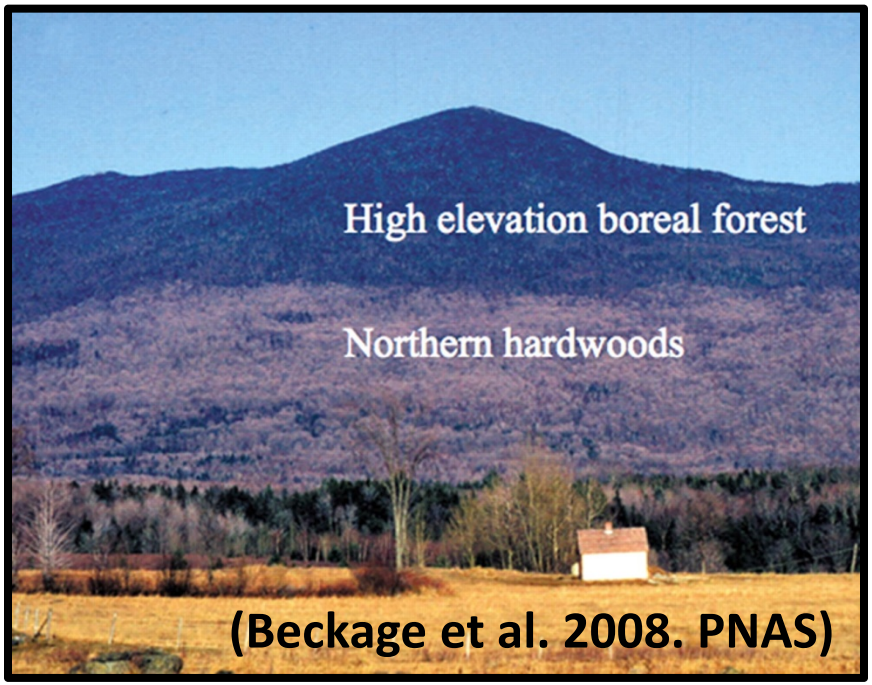
In search of change?



upslope shift in northern hardwood – boreal forest ecotone by ~100 m (1964 – 2004)

Northeast Forests

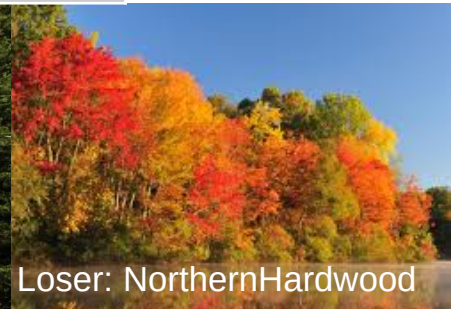
In the future, expect winners and losers for species

Expected "Winners"	Expected "Losers"
Black Oak	Red Spruce
White Oak	Balsam Fir
Shortleaf Pine	Sugar Maple
Loblolly Pine	White Birch
Bitternut Hickory	Northern White Cedar


Winner: Oak-Hickory

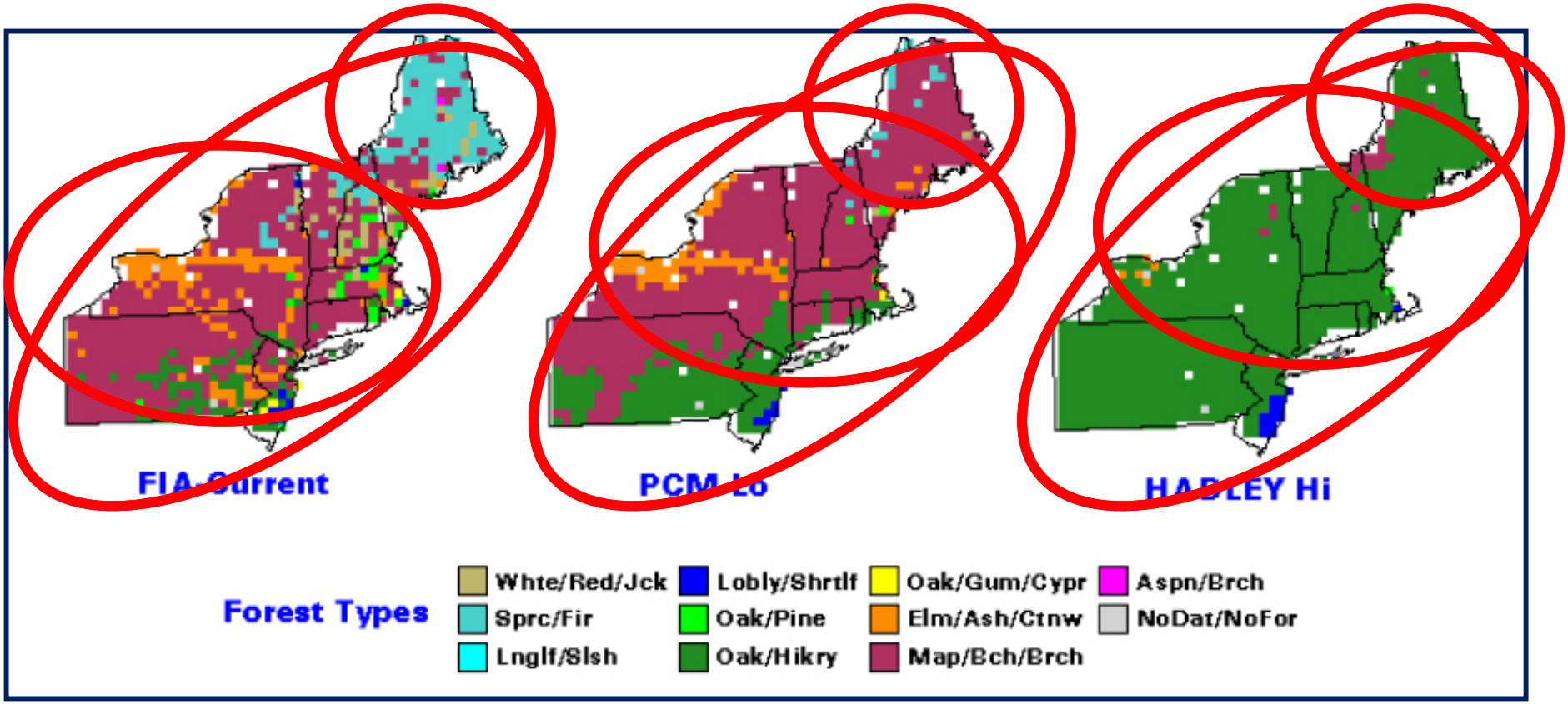

Winner: Loblolly Pine


Loser: Spruce-Fir


Loser: NorthernHardwood

Northeast Forests

In the future, expect winners and losers, for forest types



Northeast Forests

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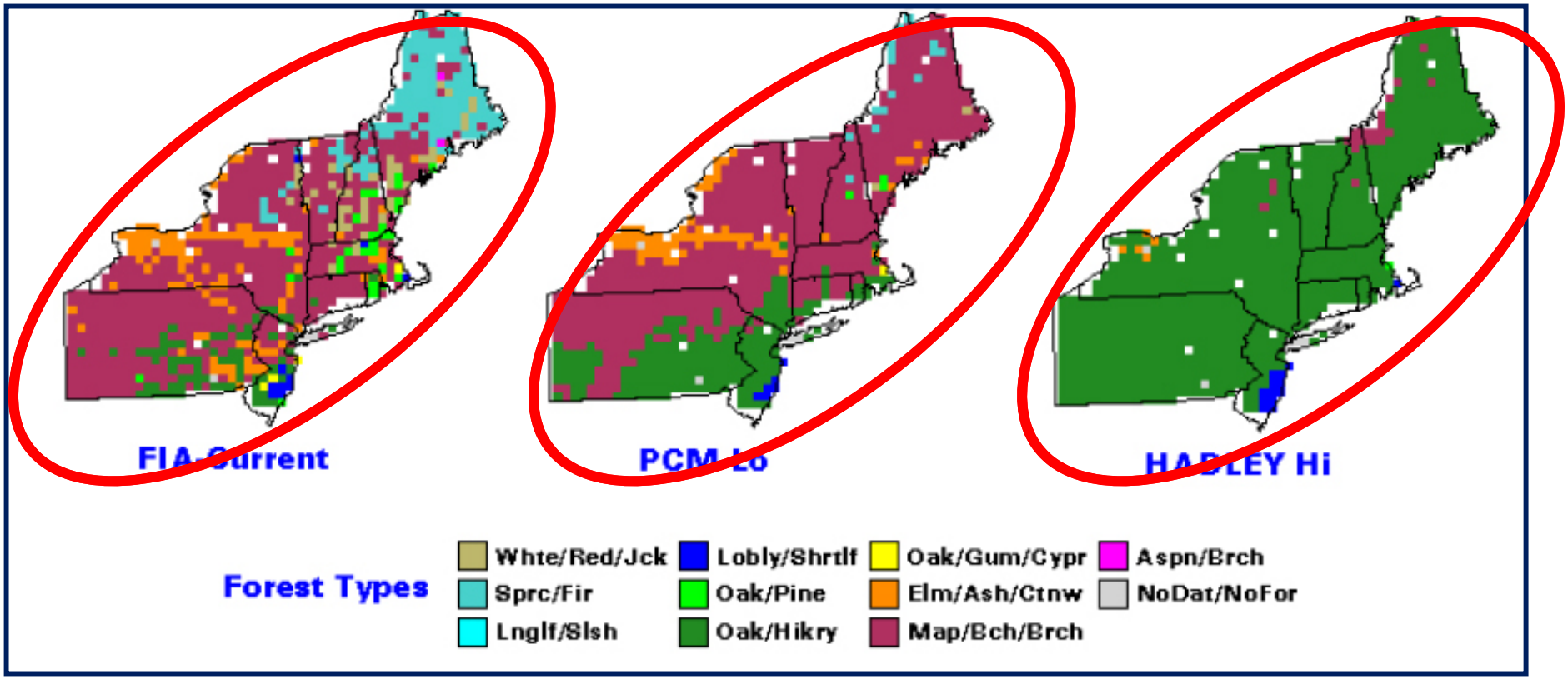

Pests, Pathogens, and Invasive Species

- Leading cause of disturbance in forest ecosystems.
- Likely to become more abundant, widespread, and virulent under climate change.

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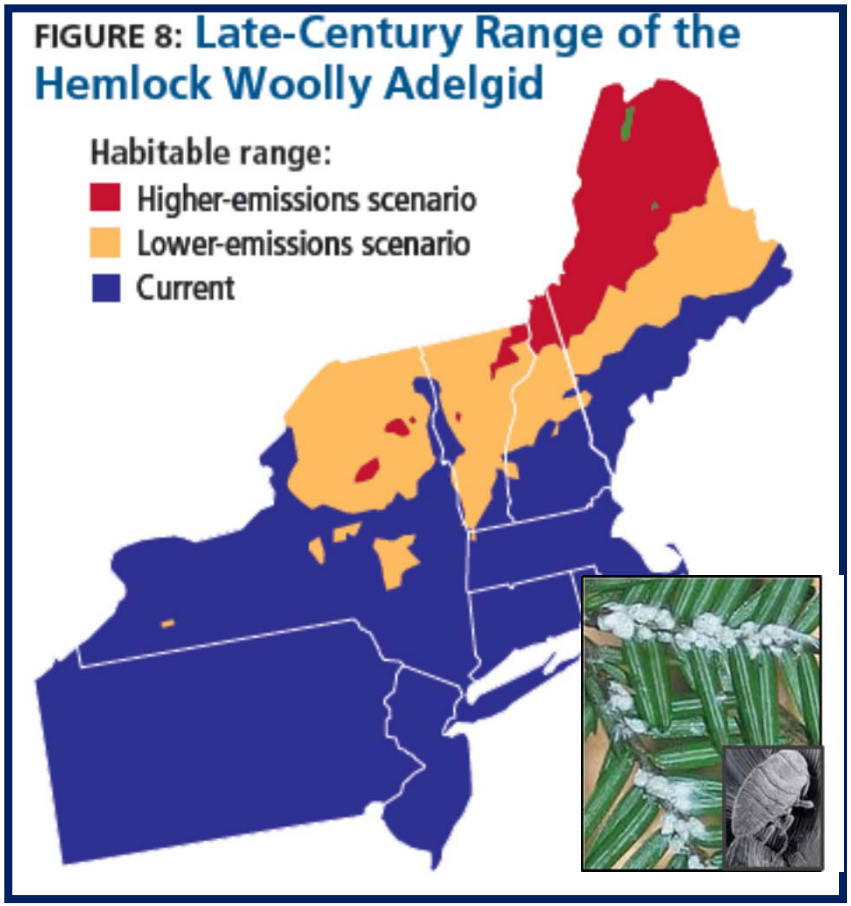
- Likely to become more abundant, widespread, and virulent under climate change.
- Range is often limited by low temperature extremes

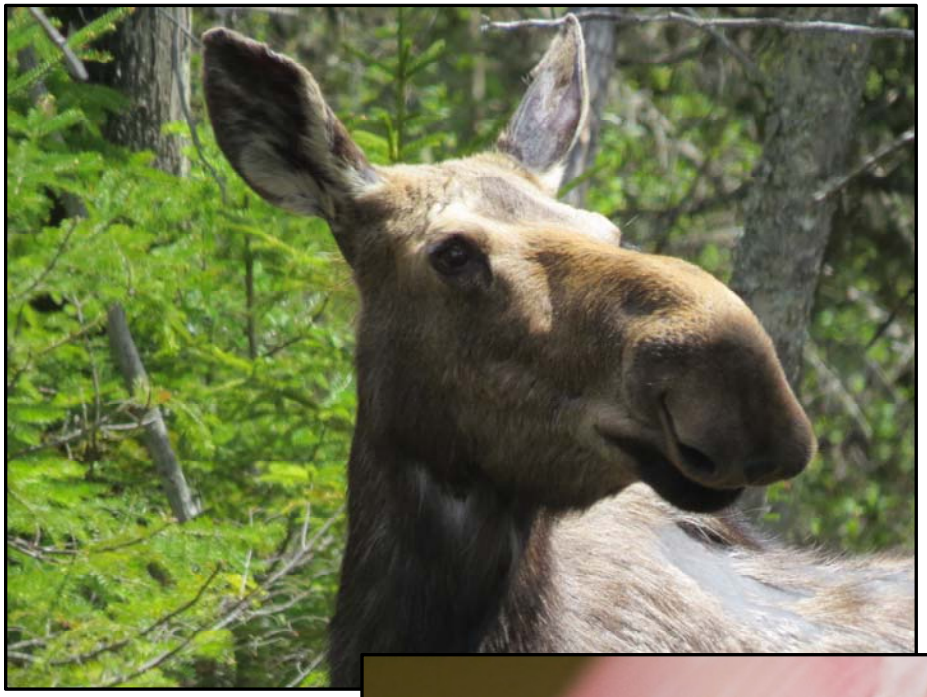


Range is limited by min. temp (> -28.8 degrees C)

Extreme Example: Mountain Pine Beetle

Native Wildlife

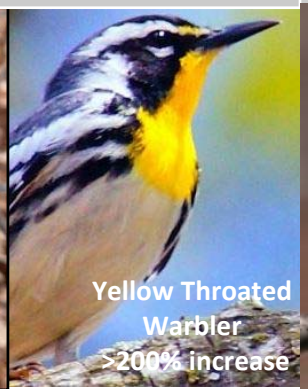
Climate directly and indirectly affects all wildlife.

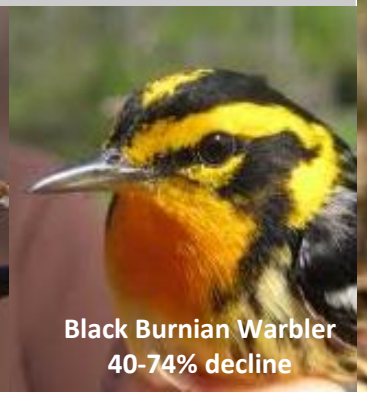


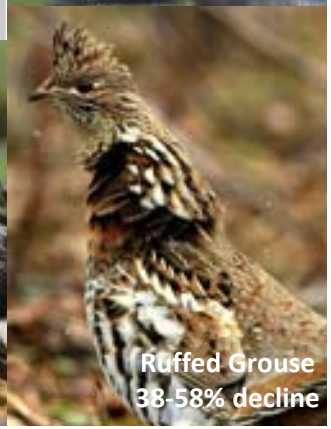
Birds

- Timing of migration and breeding has advanced
- Ranges are expanding, primarily northward
- *Expect* winners and losers

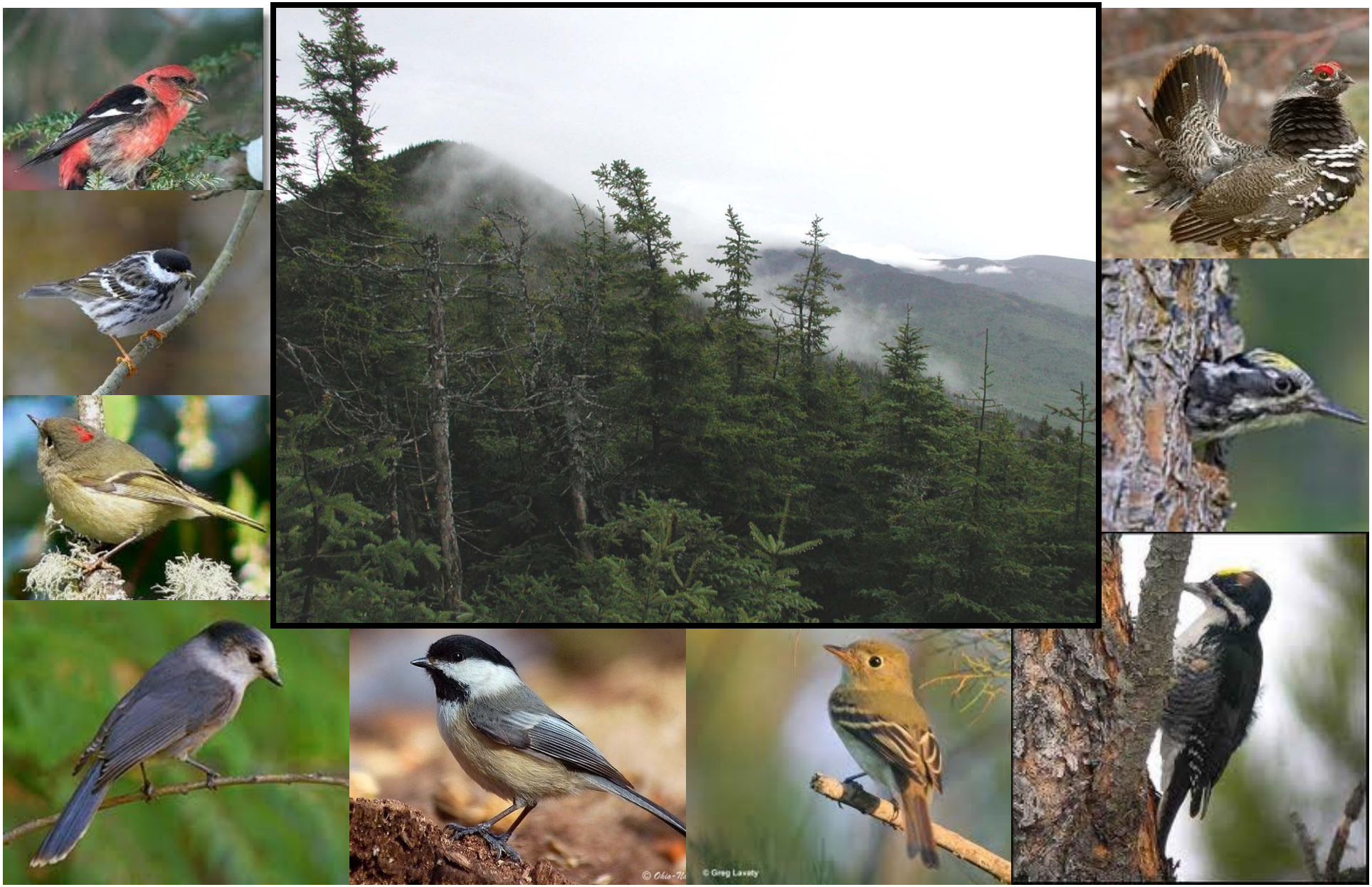
Examples of "Winners"	Examples of "Losers"
Pileated Woodpecker	Common Loon
Northern Cardinal	White-throated Sparrow
Great Horned Owl	Ruffed Grouse
Yellow Throated Warbler	Black Burnian Warbler
Whipperwill	Bicknell's Thrush



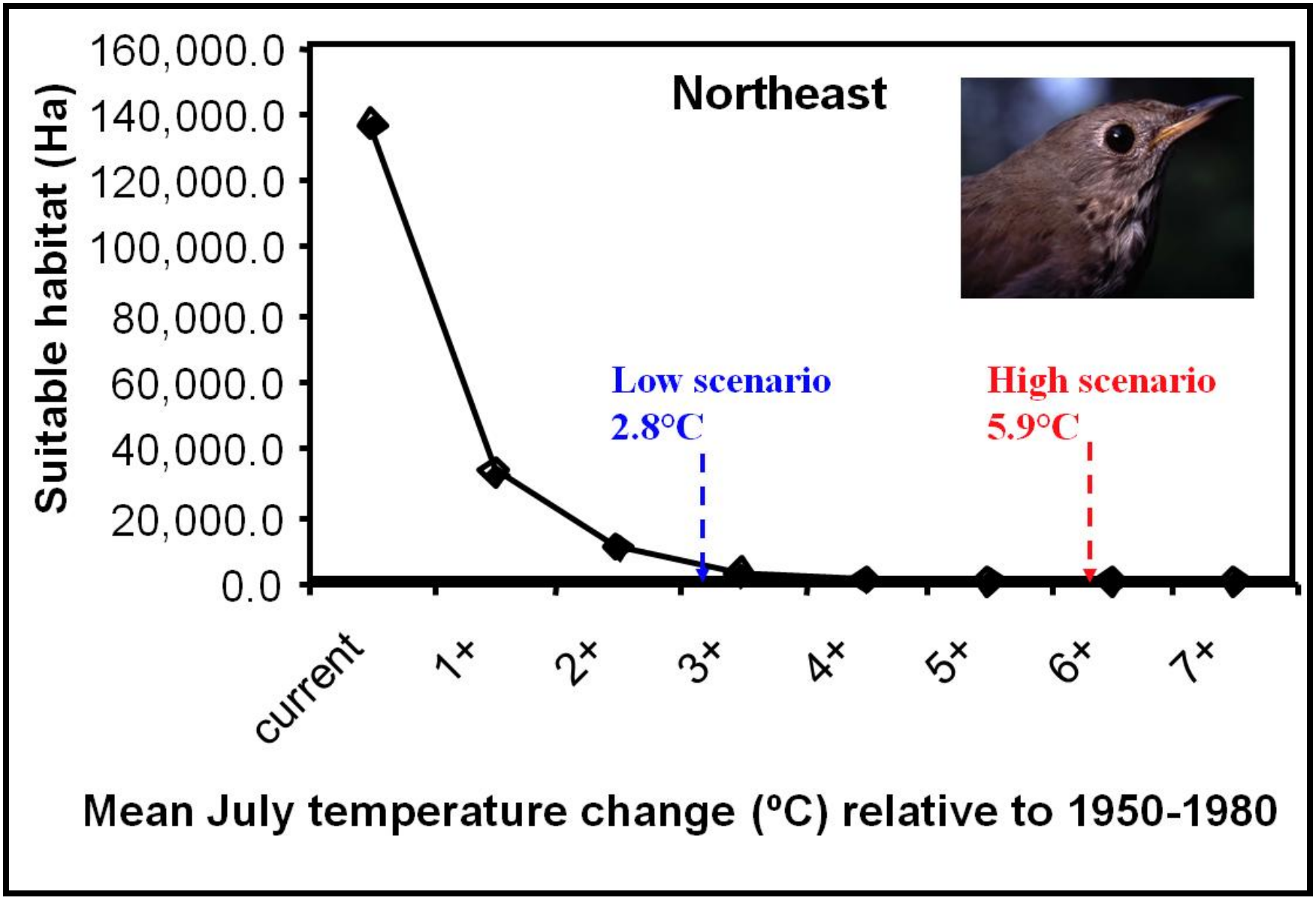




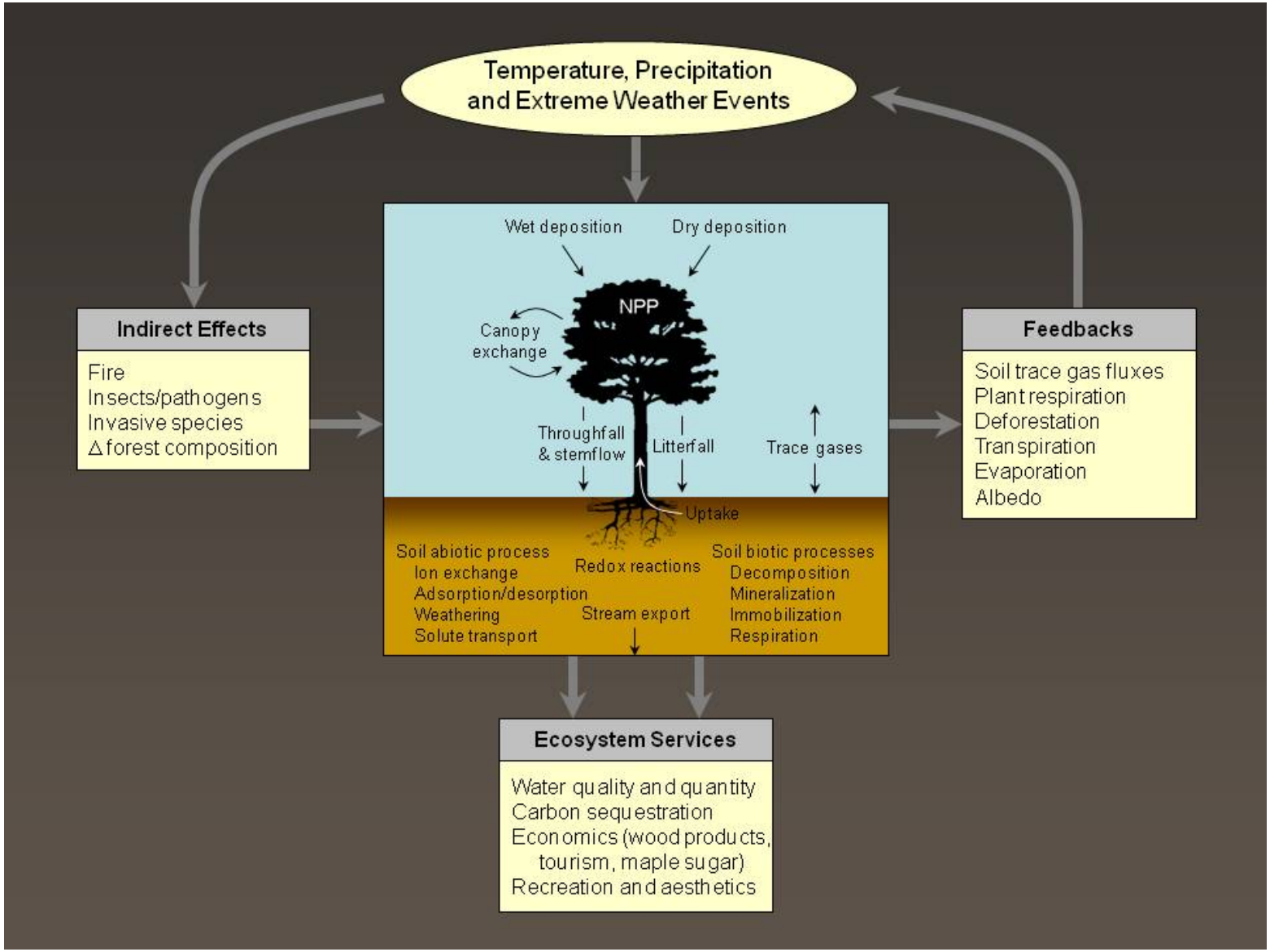
High Elevation Birds



Special Case: Bicknell's Thrush



Forest Biogeochemistry



Closing Statements on Science

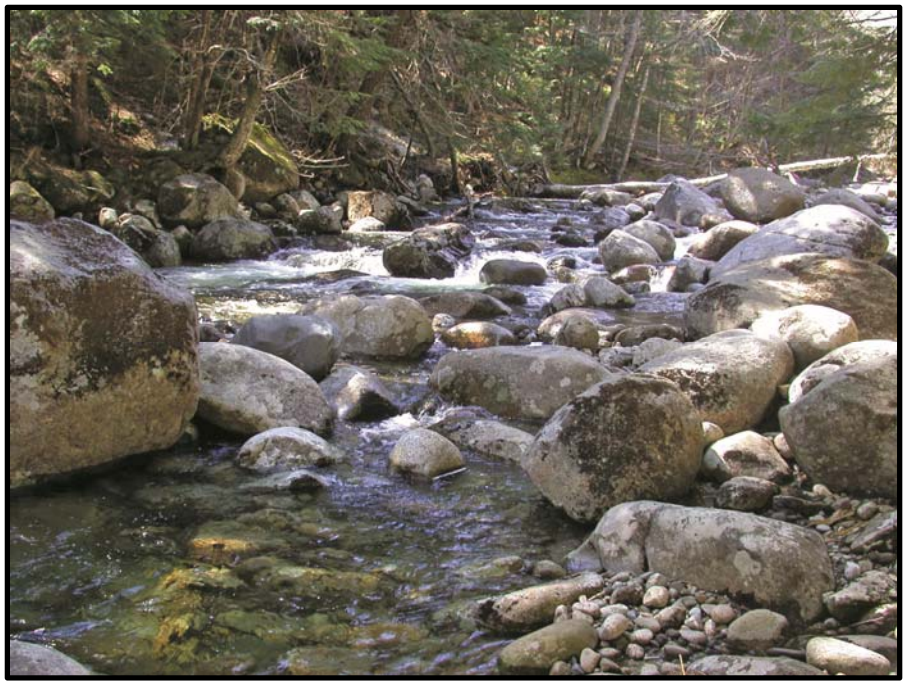
- **The climate of the NE has become warmer and wetter.**
- **Climate models suggest that the climate of the NE will become warmer, wetter, and *drier.***
- **The hydrology of the region has changed, is changing and is projected to continue to change.**
- **These changes in climate and hydrology will have profound and quantifiable impacts on the productivity, species composition and biogeochemistry of northern forests.**

Implications for Policy:
Mitigation

- **Prevent Forest Loss**
- **Enhance Carbon Storage in Managed Forests**
- **Replace Fossil Fuel with 'Smart Biomass'**

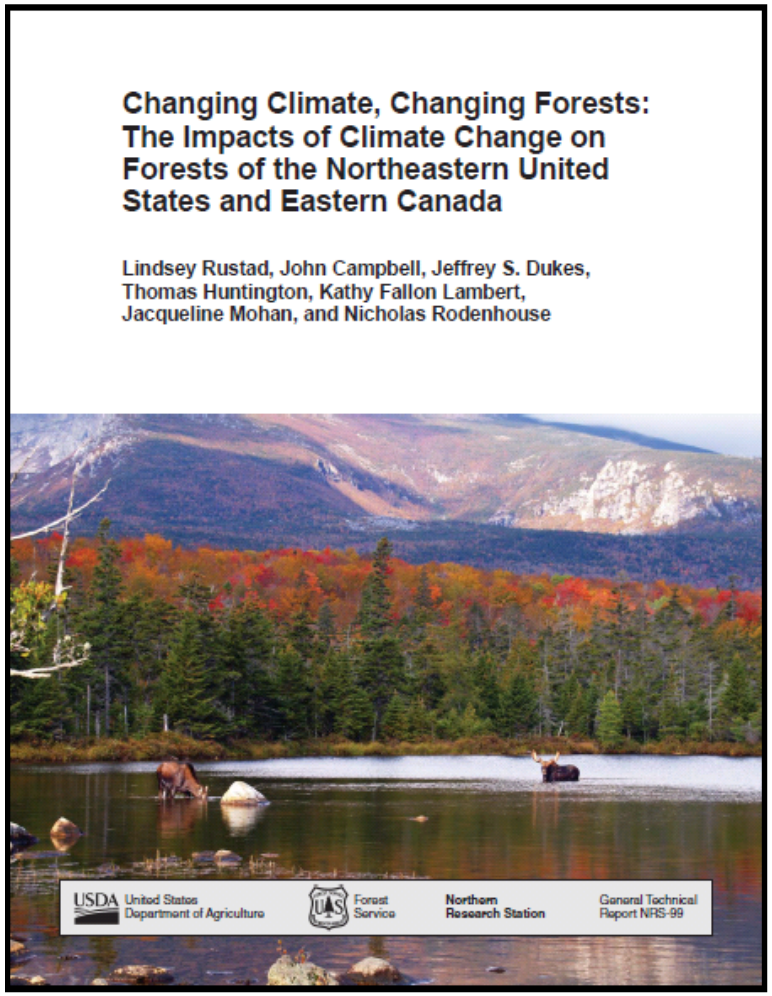
Implications for Policy:
Adaptation

- **Increase Protected Areas**
- **Conserve Stepping Stones, Corridors, and Refuges**
- **Reduce Other Stresses on Forests**



Concluding Remarks

- The science of climate change is well advanced.
- Strategies are available to adapt to, and take advantage of, climate change.
- Need for rapid information exchange.
- Need to be *proactive*, rather than *reactive* to future changes.




Horsey
IT'S SETTLED...
WE AGREE TO SIGN A PLEDGE TO HOLD ANOTHER MEETING TO CONSIDER CHANGING COURSE AT A DATE YET TO BE DETERMINED.
CLIMATE CHANGE
WORLD LEADERS