Understanding Species and Habitat Vulnerability to Climate Change

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What is vulnerability to climate change?

- Degree to which something is susceptible to and unable to cope with climate change
- Function of character, magnitude, and rate of climate change

Vulnerability = + -

Vulnerability = sensitivity + exposure - adaptability

- **Sensitivity** – the degree to which the persistence or functioning of a species or system is dependent on climate or factors driven by climate
- **Exposure** – the magnitude of the change in climate or climate driven factors that the species or system in question will likely experience
- **Adaptive capacity** – the degree to which a species or system can change or respond to address climate impacts

Why assess vulnerability?

Priority setting

Developing adaptation strategies

Fostering collaboration

Sensitivity

Physiological factors

Sensitive habitats

Dispersal abilities

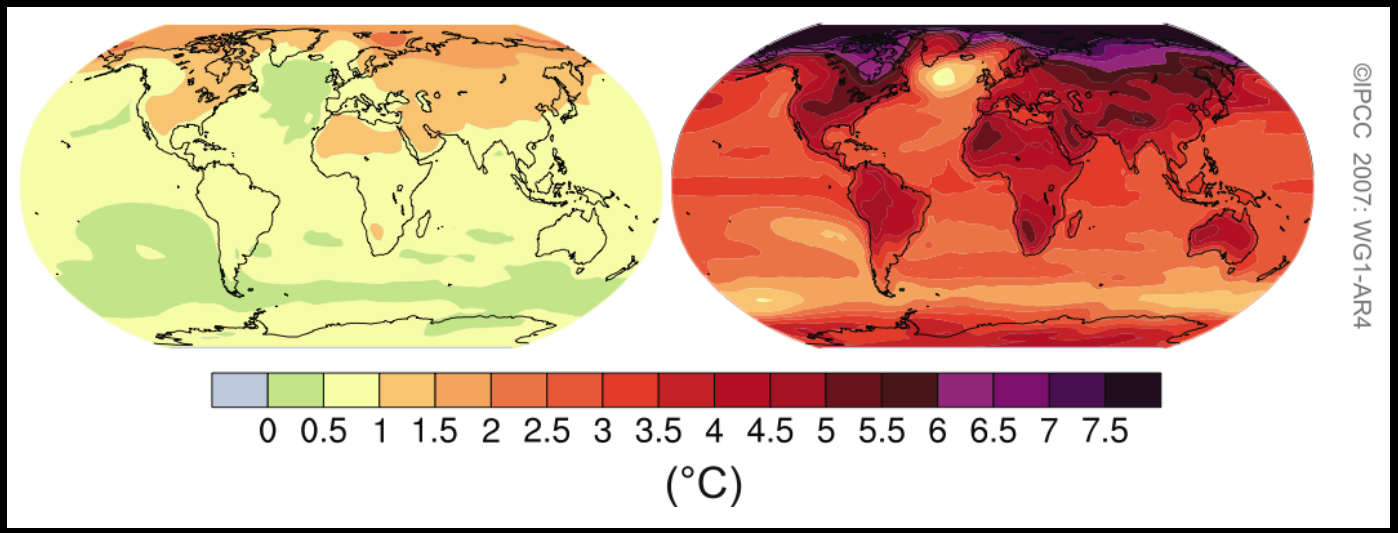
Population growth rates

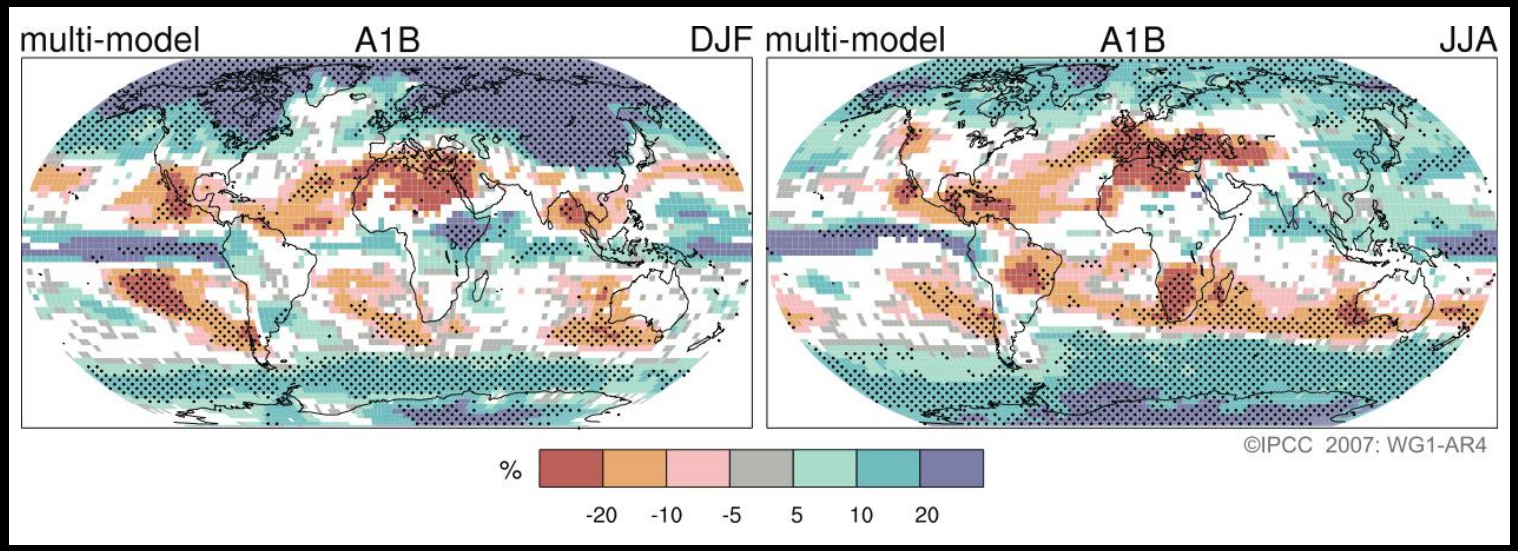
Interspecific dependencies

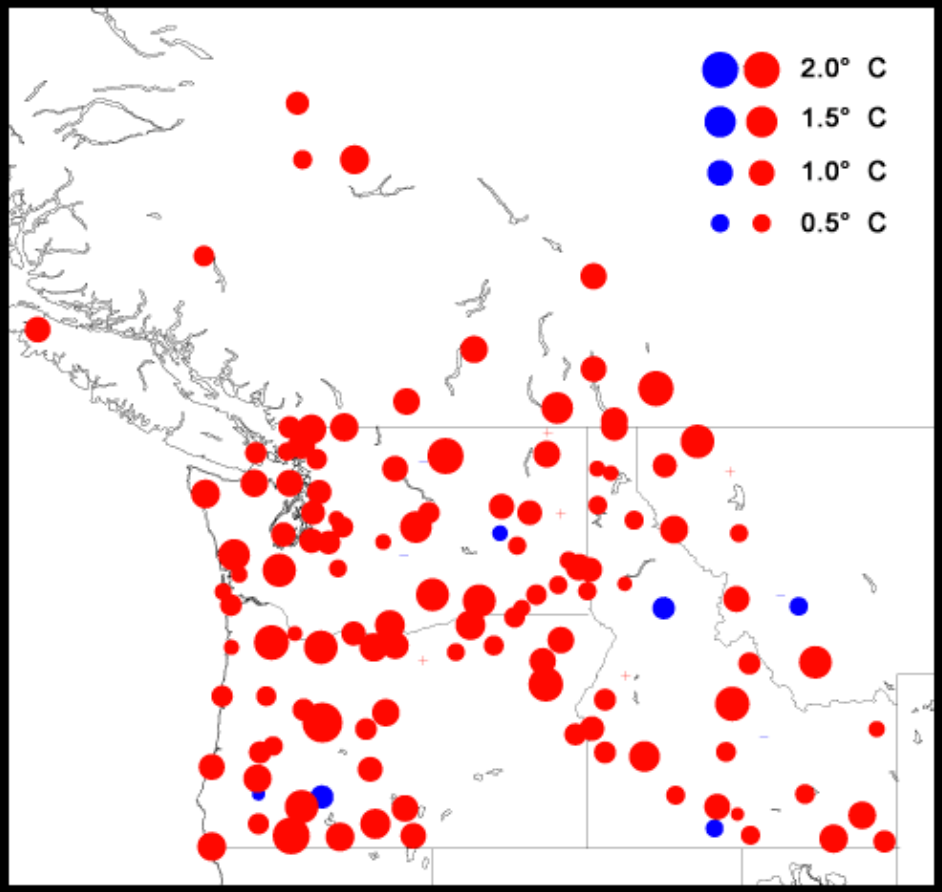
Relative location

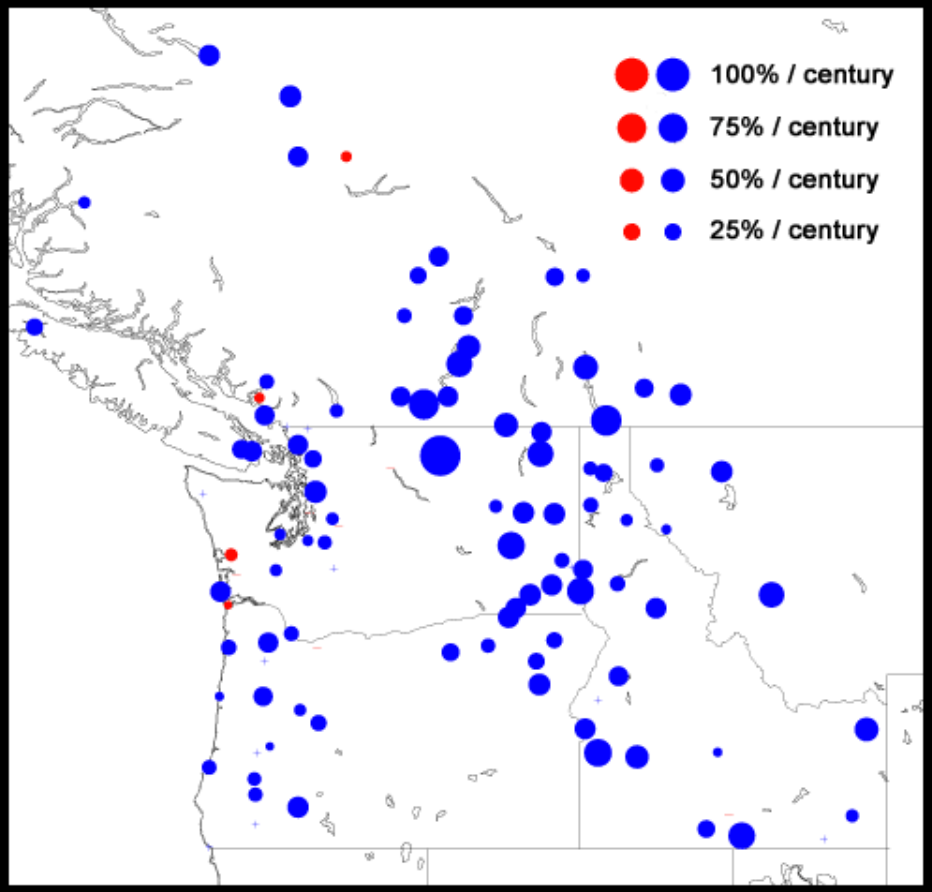
Sensitive disturbance regimes

Exposure


2020-2029
2090-2099
©IPCC 2007: WG1-AR4
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5
(°C)


multi-model
A1B
DJF
multi-model
A1B
JJA
©IPCC 2007: WG1-AR4
%
-20 -10 -5 5 10 20


2.0° C
1.5° C
1.0° C
0.5° C


100% / century
75% / century
50% / century
25% / century

predicted

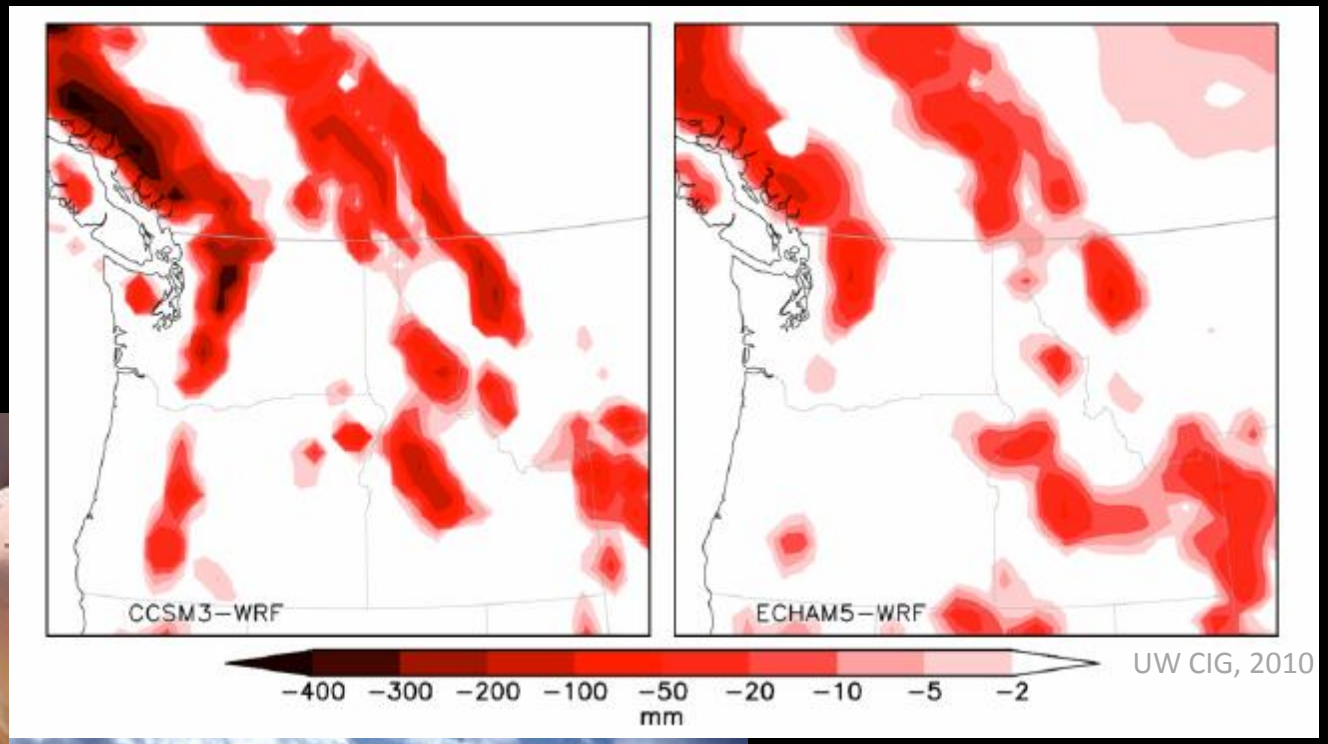
Projected Climate Change

	Temperature Change C° (F°)	Precipitation Change %
2020s	+1.1 (2.0)	+1.3
2040s	+1.8 (3.2)	+2.3
2080s	+3.0 (5.3)	+3.8

Climate Impacts Group, 2009

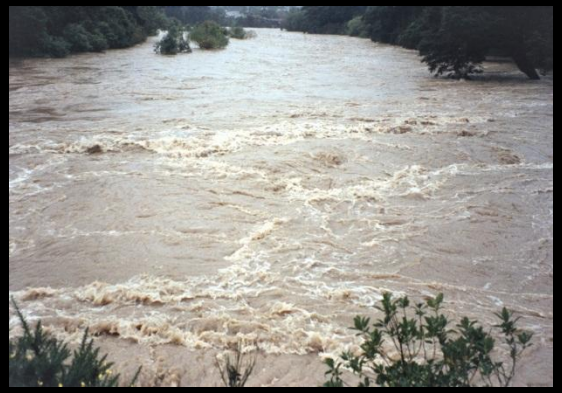
predicted

Water & Snow (or lack there of…)



UW CIG, 2010

Other exposure components



Adaptive capacity

Population growth rates

Genetic variability

Phenotypic plasticity

Landscape permeability

Dispersal abilities

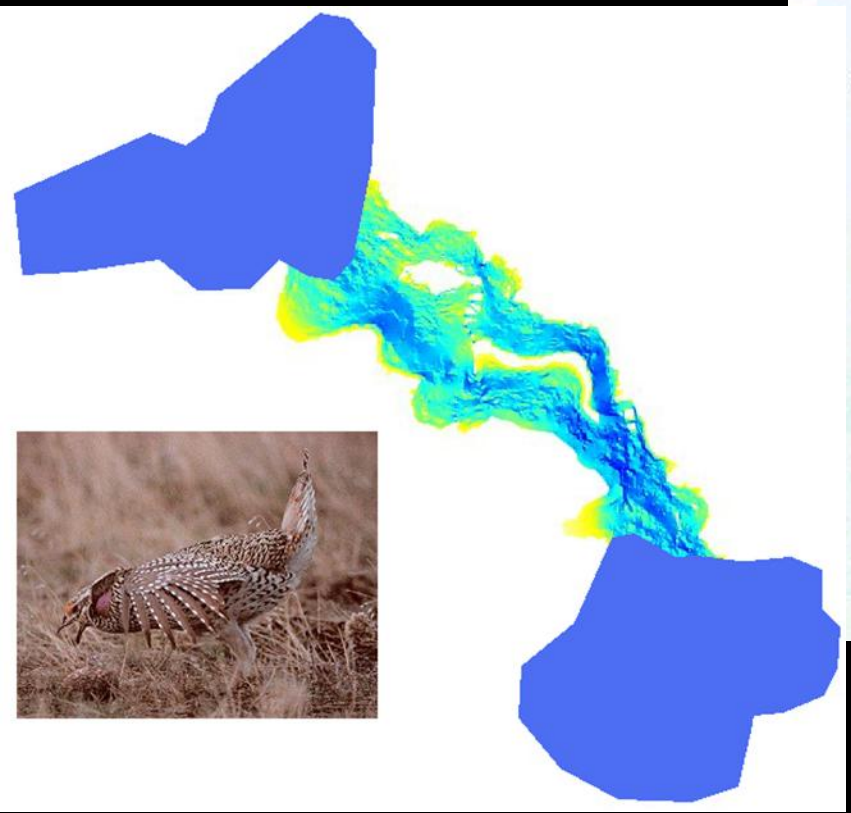
Evolutionary potential

Behavioral plasticity

"the potential, capability, or ability of a system to adjust to climate change, to moderate potential damages, to take advantage of opportunities, or to cope with the consequences"
(IPCC 2007)

protected areas

connectivity



Remove other threats

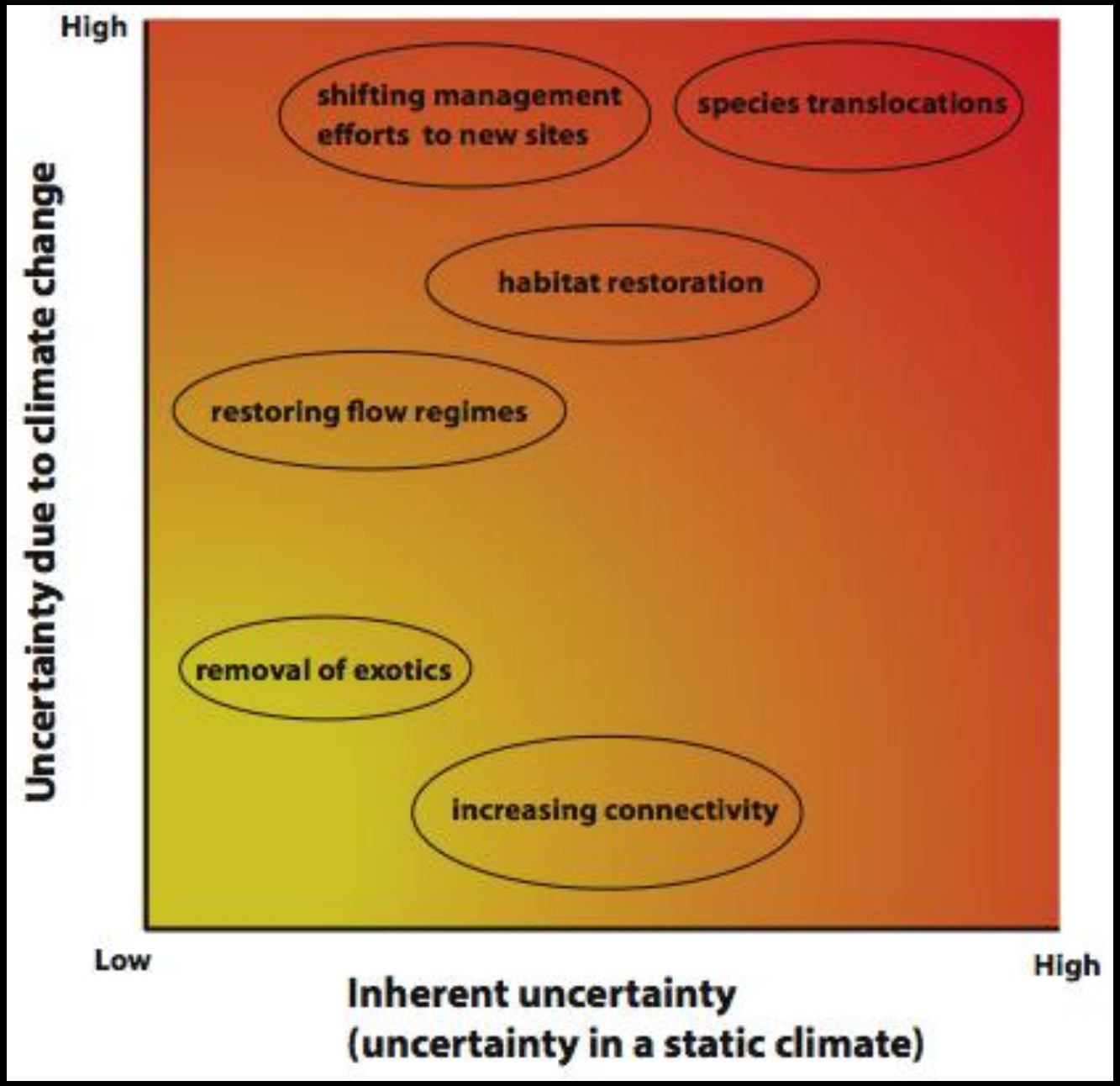
Restore habitat

Restore natural disturbance regimes

Promote evolutionary potential

Translocations

Adaptive Capacity & Management Potential:


High
Uncertainty due to climate change
shifting management efforts to new sites
species translocations
habitat restoration
restoring flow regimes
removal of exotics
increasing connectivity
Low
High
Inherent uncertainty
(uncertainty in a static climate)

Which species, communities & systems are most sensitive?

Keith Lazelle

Which places will likely see the most change?

Keith Lazelle

Which species and systems will be able to “adapt”?

Keith Lazelle

Which species and systems will be most vulnerable?

Keith Lazelle

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