

Species Climate Sensitivity Analyses

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Overview

1. Background

2. The Study

- Objectives
- Methods
- Products

3. Summary









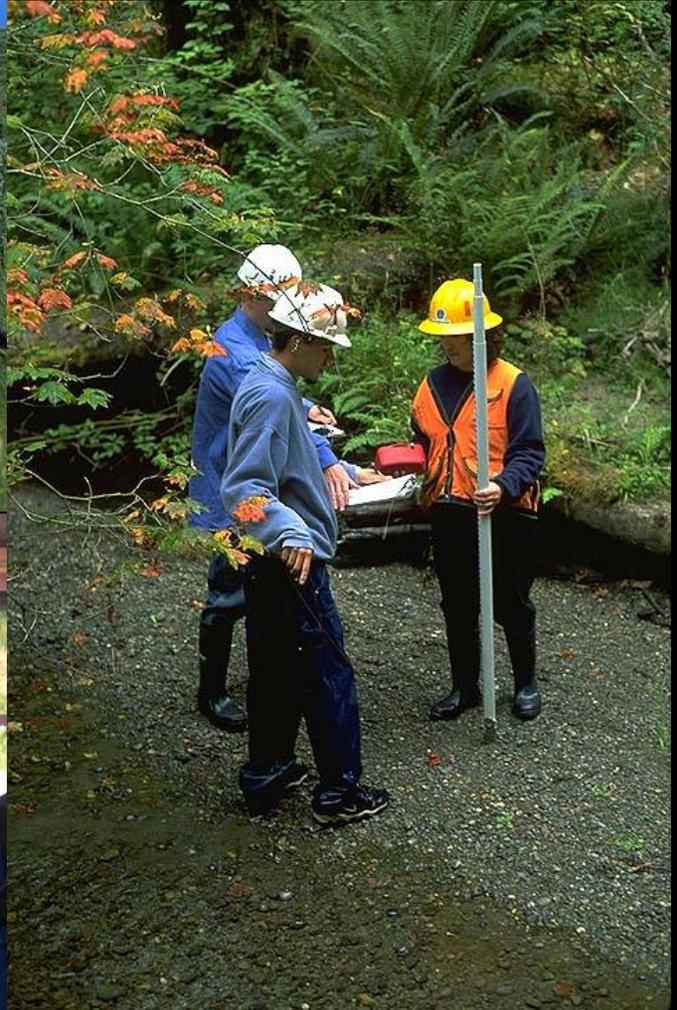


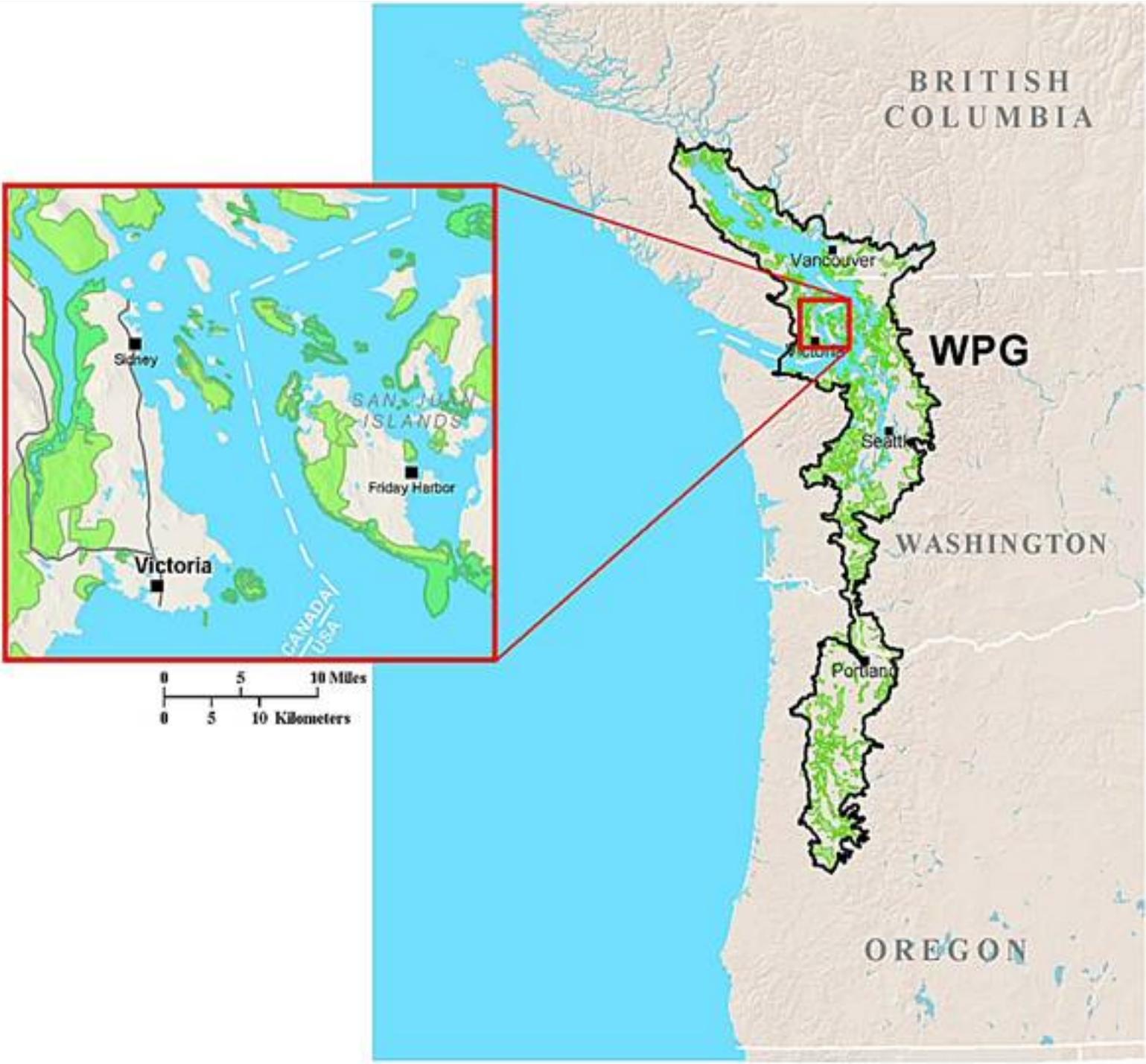
Discolored foliage is a sign that these lodgepole pines have been attacked and killed by the mountain pine beetle.











Protected & managed lands will change



Keith Lazelle

Which species & systems
Where will we likely see the most change?
What will these changes look like?
Which species & systems
will be most vulnerable?

The Study

Study Objectives

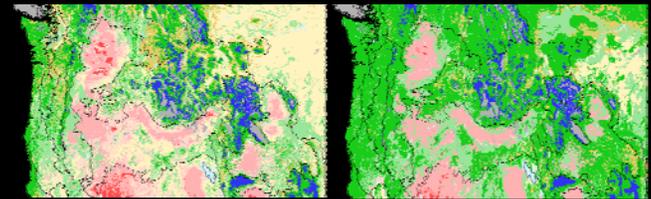
Study Area

- Assess the impact on species & systems
- Determine impact to protected & managed lands
- Facilitate smart strategy development



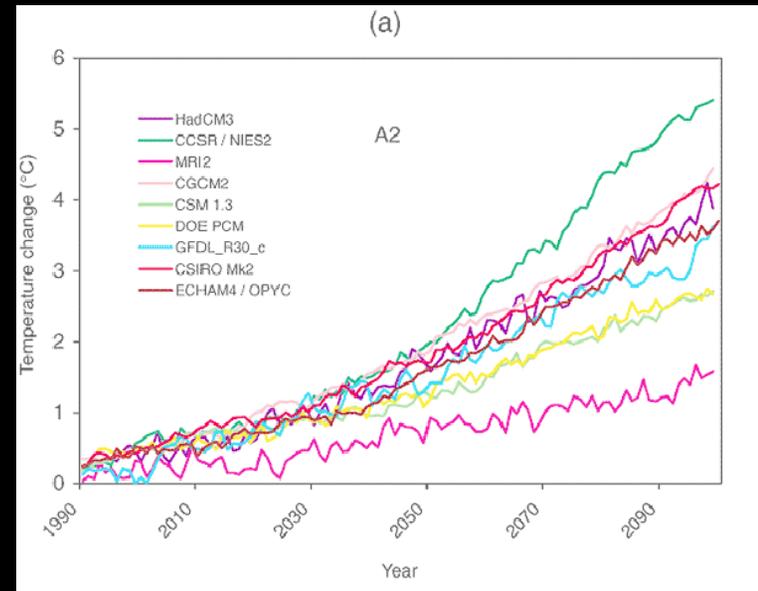
Methods

- Database of climate change sensitivities
- Simulate vegetation and animal responses
- Compare results with protected & managed lands
- Foster collaboration between modelers and practitioners

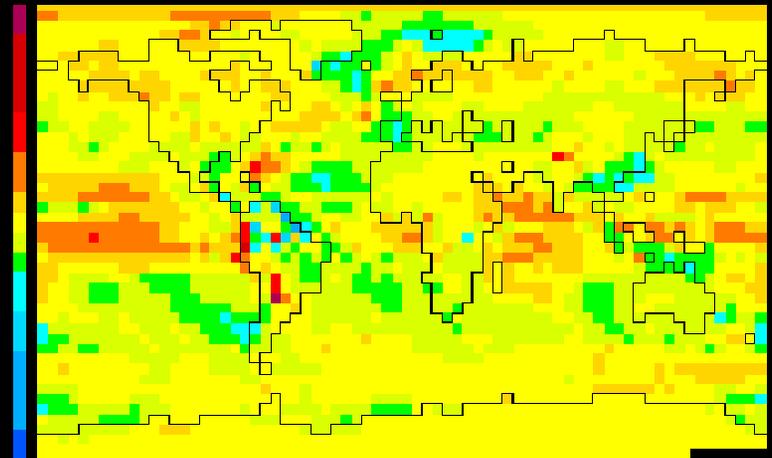


Common challenges of using climate change studies

- Uncertainty – different models produce different results
- Spatial resolution is too coarse
- Results not applicable to practitioners

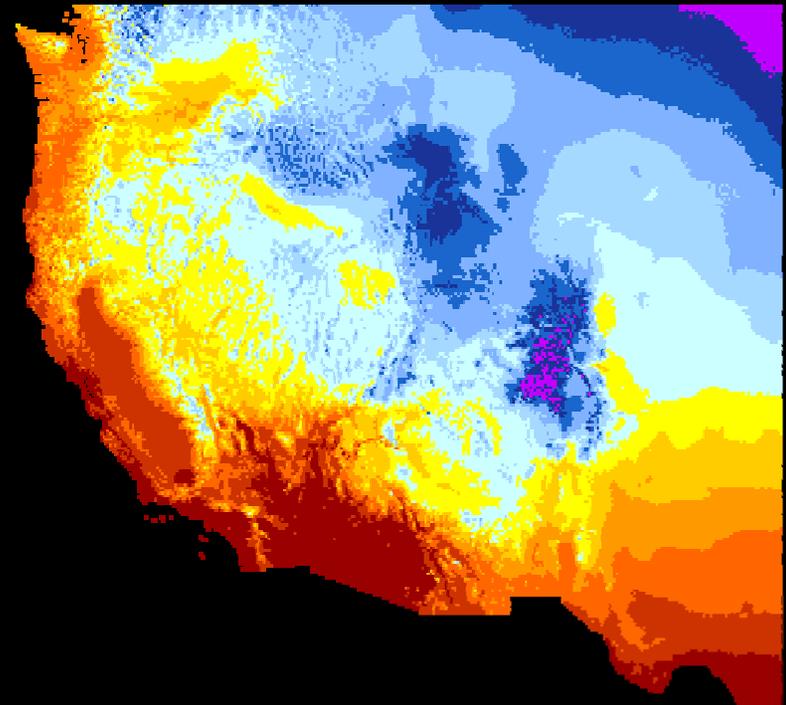


From Cubasch et al. 2001



Our Solutions

- Incorporate uncertainty into results
- High spatial resolution
- Temporal analyses (e.g., animations)



Part I:

Climate Sensitivity Database



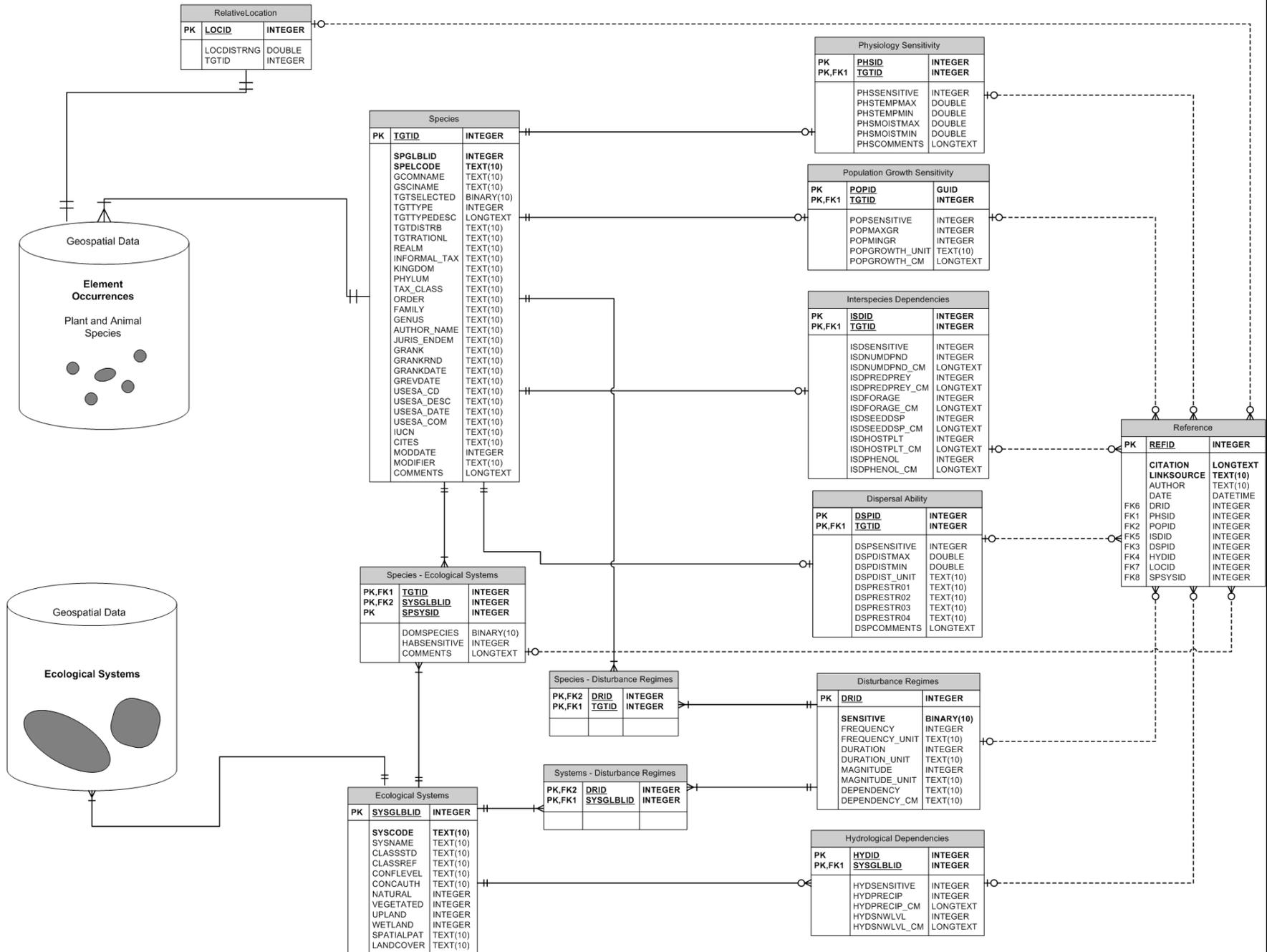
Climate Sensitivity Database

Physiological factors
Sensitive habitats
Dispersal abilities
Population growth rates
Interspecific dependencies
Relative location
Sensitive disturbance regimes



Climate Change Database – Logical Schematic v1.0

April 3, 2008



Data Entry Form - Species

Review Complete

Scientific Name:
 Common Name:
 Taxonomy:

Save Edits

Kingdom:
 Phylum:
 Class:
 Order:
 Family:
 Genus:

NatureServe Global ID:
 NatureServe Element Code:
 Rounded Global Rank:
 Global Rank:
 US Endangered Species Act Code:
 IUCN:

Dispersal Ability | Disturbance Regime | Interspecies Dependencies | Physiology | Population Growth | Ecological Systems

Sensitivity Score

- 1 = extended range dispersal (> 20 km)
- 2 = moderate range dispersal (5 - 20 km)
- 3 = restricted range dispersal (0 - 5 km)

Dispersal Distance Range:

Maximum:
 Minimum:
 Distance Unit:

Dispersal Restrictions:

Restriction 1:
 Restriction 2:
 Restriction 3:
 Restriction 4:

Comments:

References:

Citation	Link to Source	Lead Author	Date Published
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Part II:

Future Climate Projections



Climate Data

General circulation model (GCM) simulations

10 GCMs:

CCCMA-CGCM3.1

CNRM-CM3

GFDL-CM2.0

GFDL-CM2.1

GISS-ER

INM-CM3.0

MIROC3.2

MRI-CGCM2.3.2a

NCAR-CCSM3.0

UKMO-HadCM3

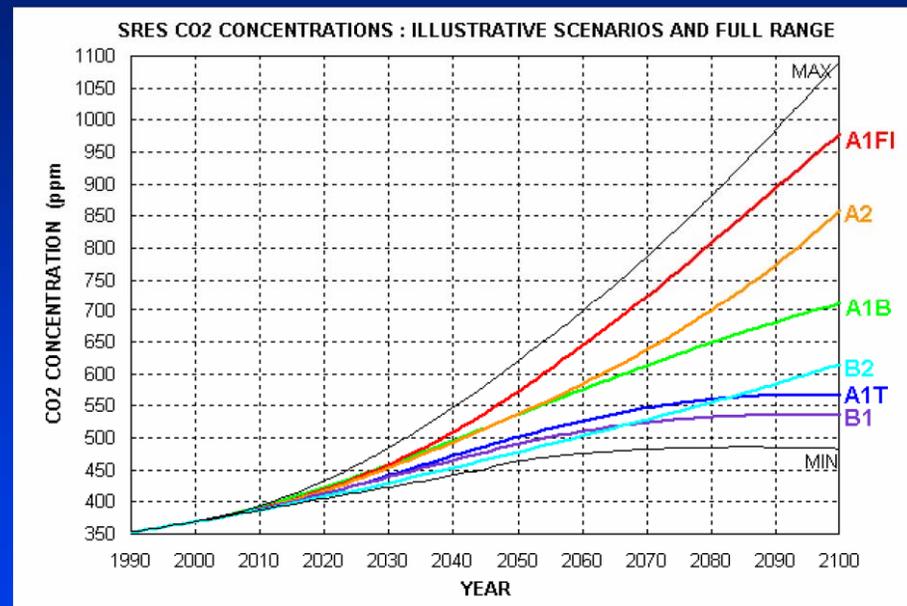
3 emissions scenarios:

A2

A1B

B2

Representative SRES CO₂ concentrations



(T. Wigley)



Part III:

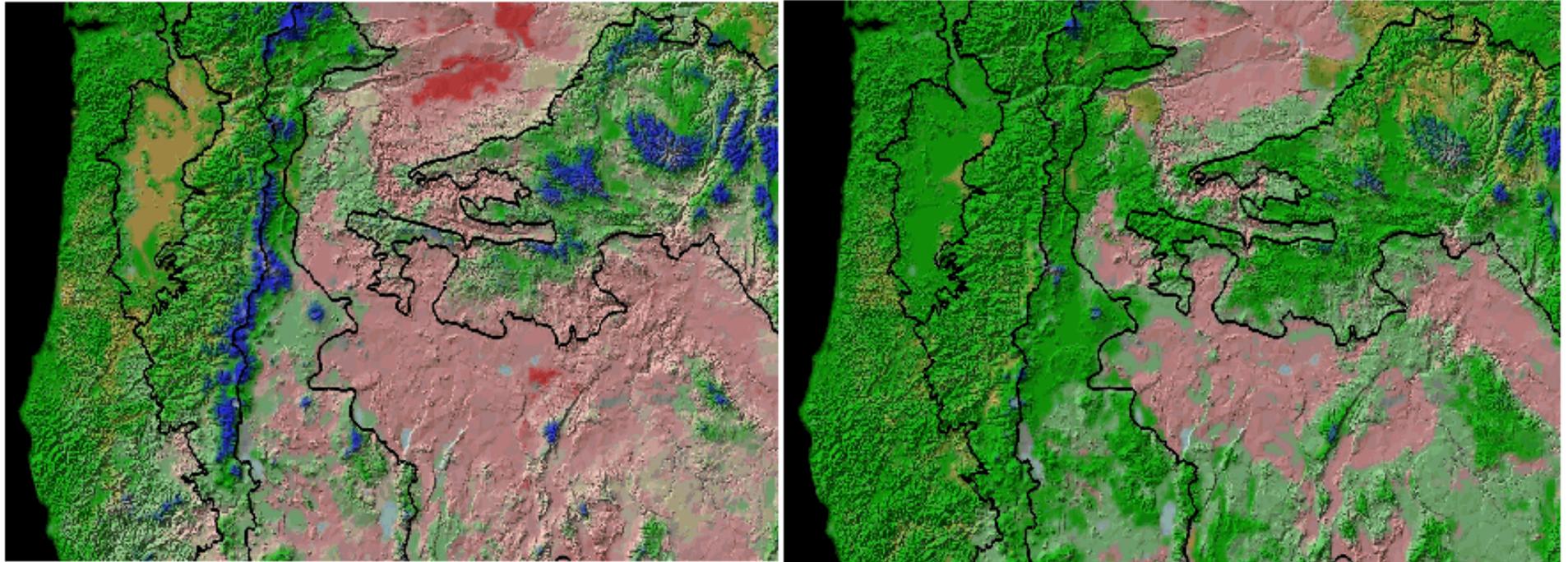
Future Vegetation Projections



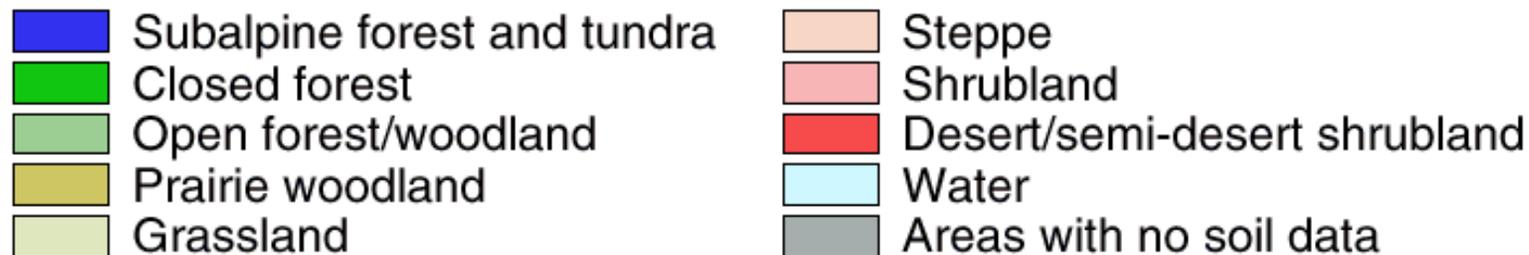
Simulated Biomes

1951-1980, 340 ppm CO₂

2050-2059, 554 ppm CO₂

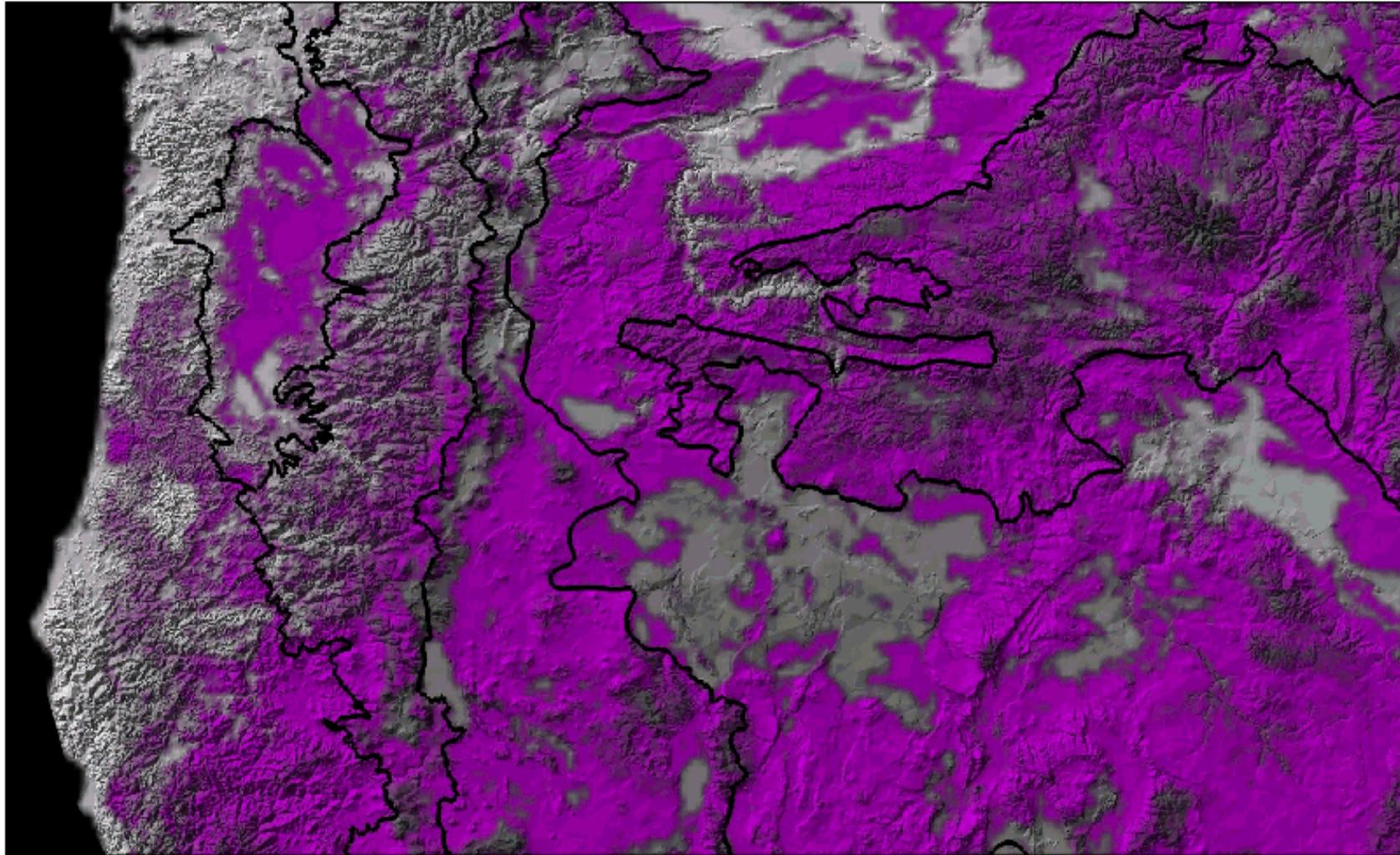


Environmental Change Research Group, Dept. of Geography, Univ. of Oregon. Model: BIOME4, ver. 2 (J. O. Kaplan and I. C. Prentice)



Environmental Change Research Group, Dept. of Geography, Univ. of Oregon. Climate data: CRU CL 1.0 (New et al. 1999); Mapping and climate interpolation programs: P. J. Bartlein (Univ. of Oregon, pers. comm.); HadCM2 (Mitchell and Johns 1997). Soil data: CONUS-SOIL (Miller and White 1998); Vegetation model: BIOME4 (Kaplan 2001), modified by S. L. Shafer (USGS).

Simulated Future Biome Change (2050-2059)



Change



Environmental Change Research Group, Dept. of Geography, Univ. of Oregon. Climate data: CRU CL 1.0 (New et al. 1999); Mapping and climate interpolation programs: P. J. Bartlein (Univ. of Oregon, pers. comm.); HadCM2 (Mitchell and Johns 1997). Soil data: CONUS-SOIL (Miller and White 1998); Vegetation model: BIOME4 (Kaplan 2001), modified by S. L. Shafer (USGS).

Part IV:

Animal Range Shift Projections



Modeling potential range shifts

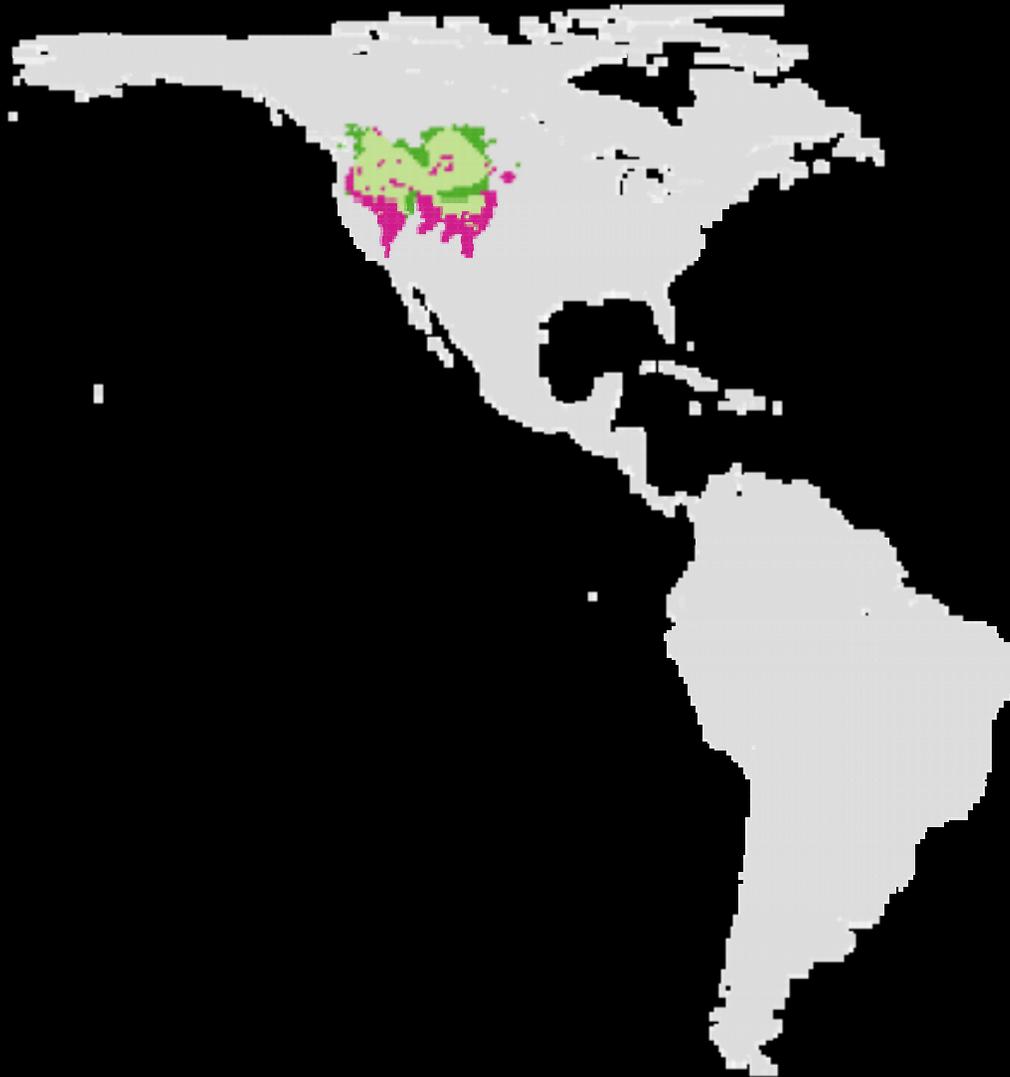
Current ranges modeled
using current climate

Predicted future climate
used to predict future
ranges



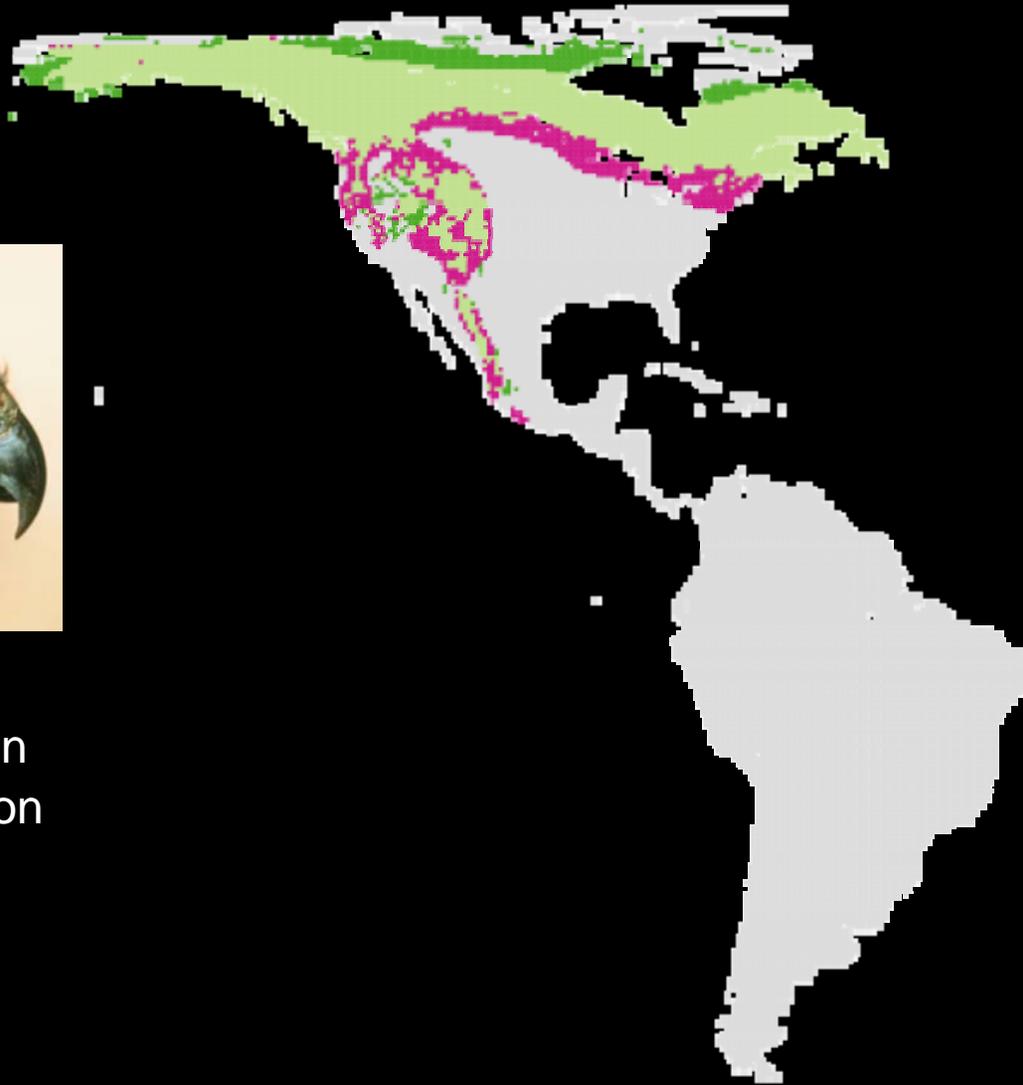
USGS

Yellow-bellied Marmot (HADCM3 A1B)



-  stable
-  expansion
-  contraction

Northern Goshawk (HADCM3 A1B)



-  stable
-  expansion
-  contraction

Douglas Squirrel (HADCM3 A1B)



-  stable
-  expansion
-  contraction



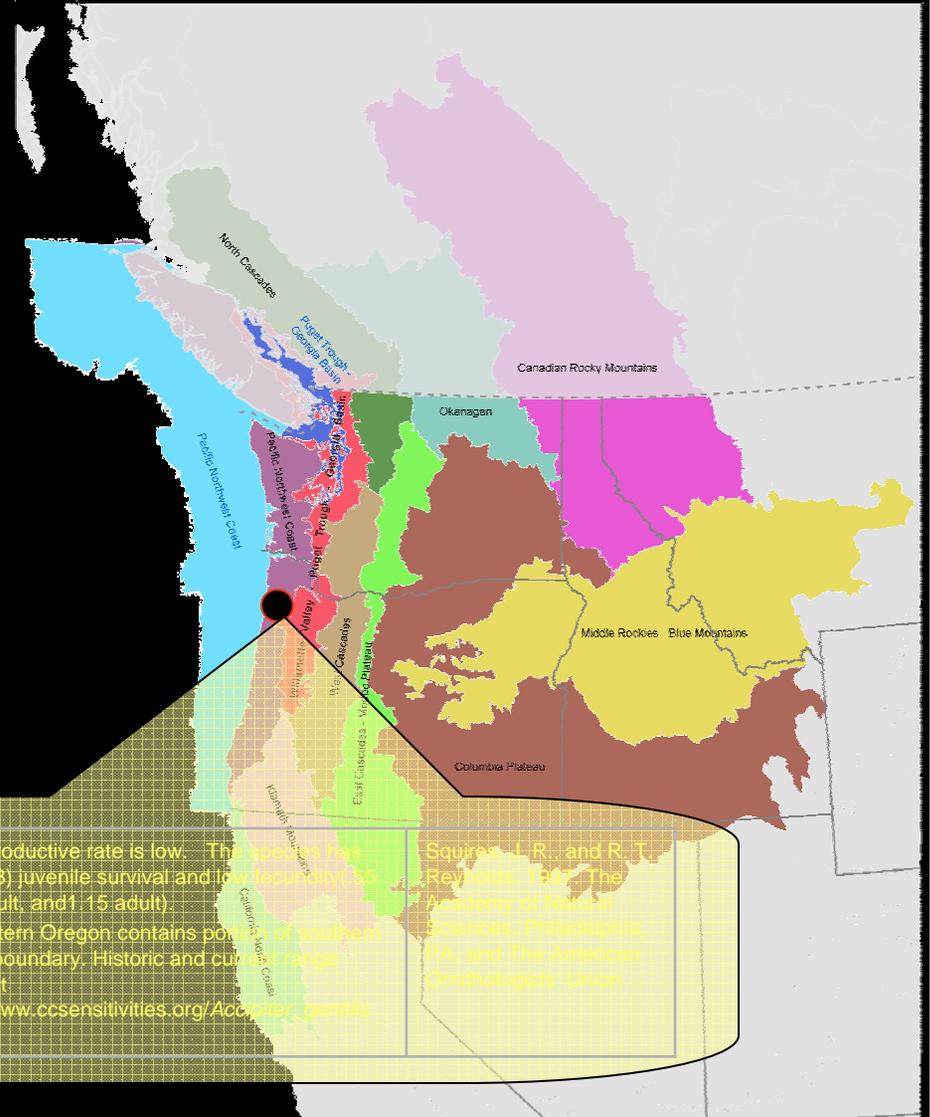
Part V: Comprehensive Assessment

- Synthesize impacts on species and systems
- Identify refugia
- Compare to current protected & managed lands



Products will include

- Searchable, spatially referenced climate change sensitivity database



Northern Goshawk
Accipiter gentilis

1

2

1. Reproductive rate is low. This species has low (.33) juvenile survival and low fecundity (1.5 sub-adult, and 1.15 adult).
2. Western Oregon contains portion of southern range boundary. Historic and current range maps at http://www.ccsensitivities.org/Accipiter_gentilis

Squires, J. R., and R. T. Reynolds. 1997. The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union

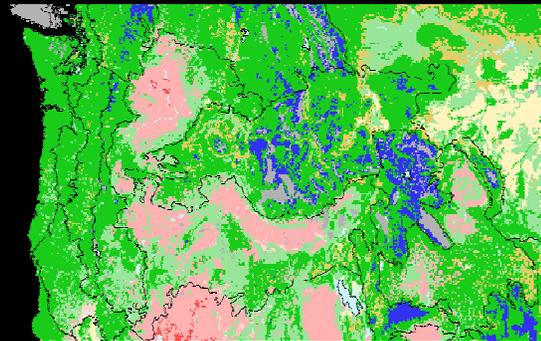
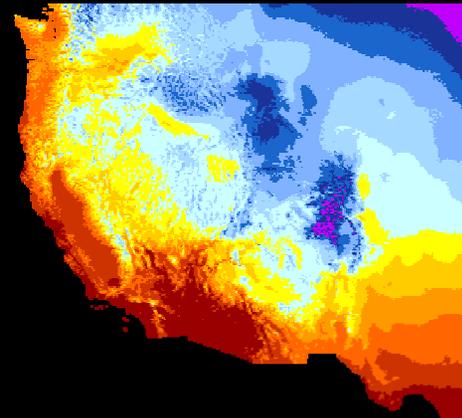
Products will include

- Projected change maps

Climate

Vegetation

Birds and mammals

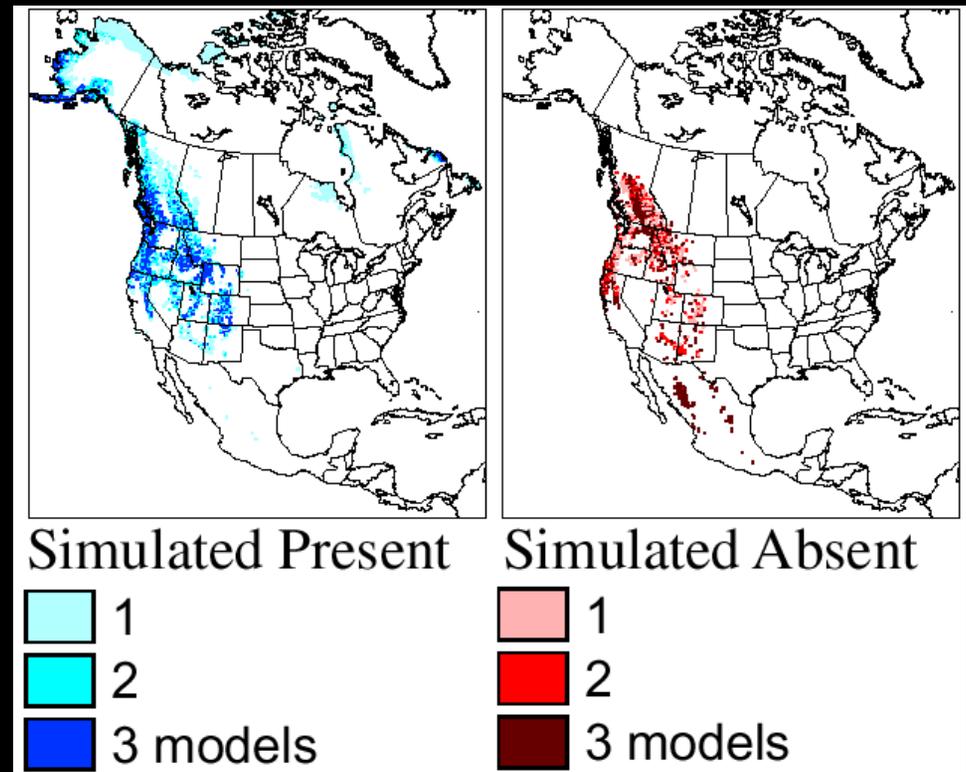


- Protected/managed lands analyses



Products will include

- Uncertainty maps and documentation



Products will include

- Web access
- Peer-reviewed journal articles



Summary

Which species & systems are most sensitive?

Which places will likely see the most change?

What will these changes look like?

Which species and sites will be the most vulnerable?



Keith Lazelle

