

Impact of climate change on Australian agriculture: Evidence from property values

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Motivation

- Informing climate change policy
- We're going to concentrate on agriculture
 - Key export earner
 - Major employer in rural Australia
 - Huge areal extent – implications for landuse

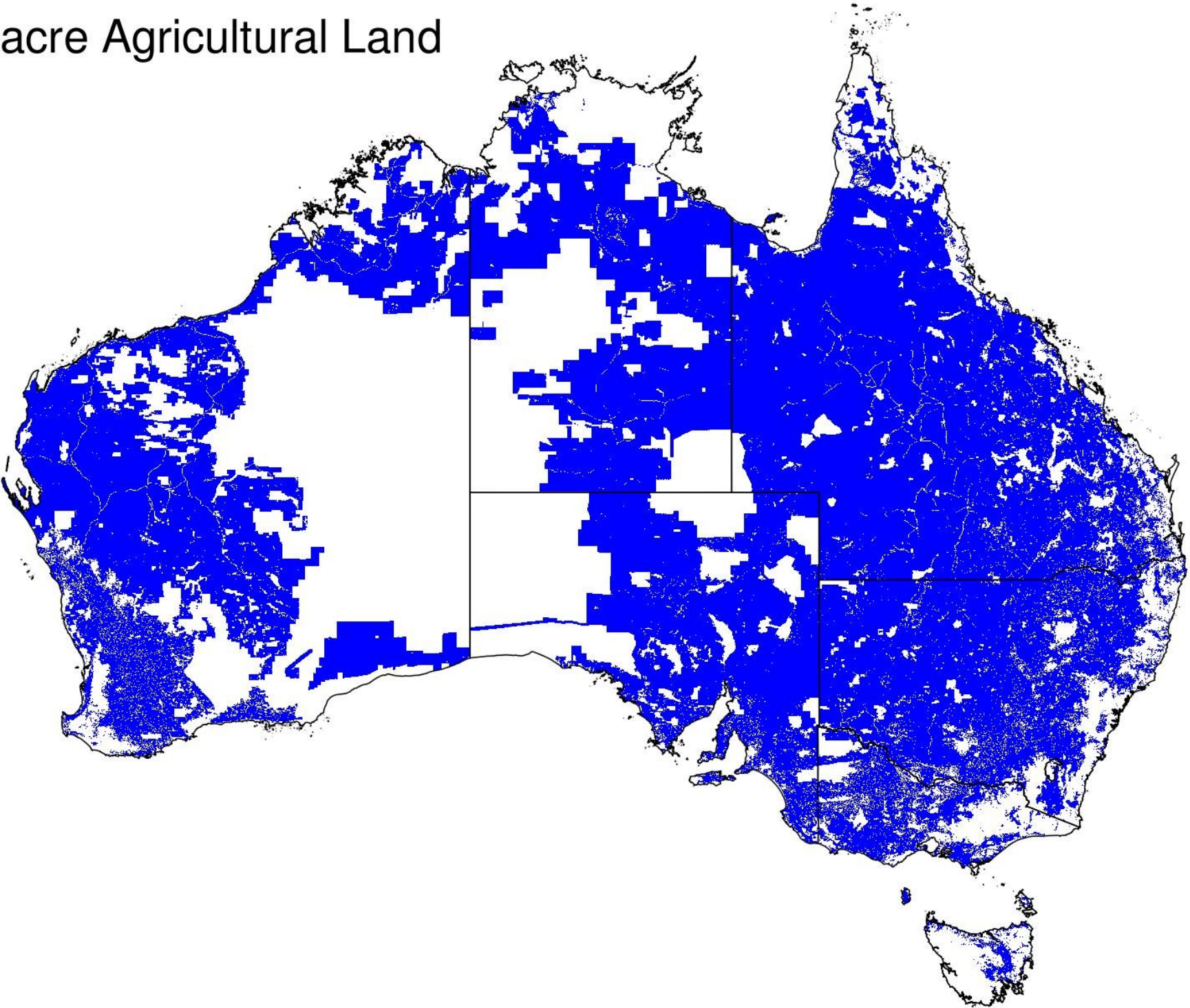
Key Question

How will projected climate change in the 21st century affect agricultural land values?

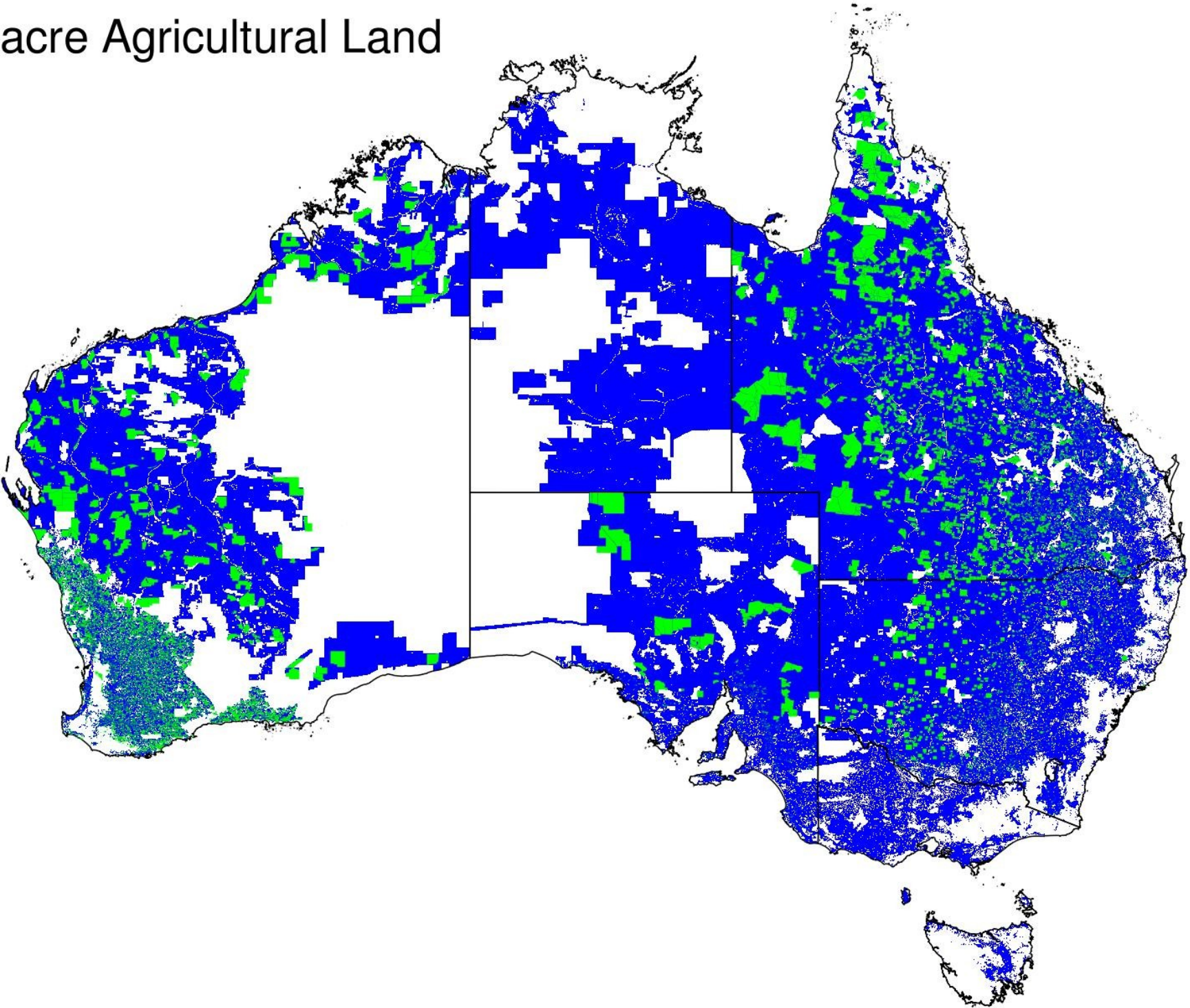
The Ricardian Approach

- Climate affects productivity of land.
- Productivity of land is reflected in land value.
- We regress the market price of land on climate variables and a set of controls.
- Combine with climate projections to make predictions about land value in the future.

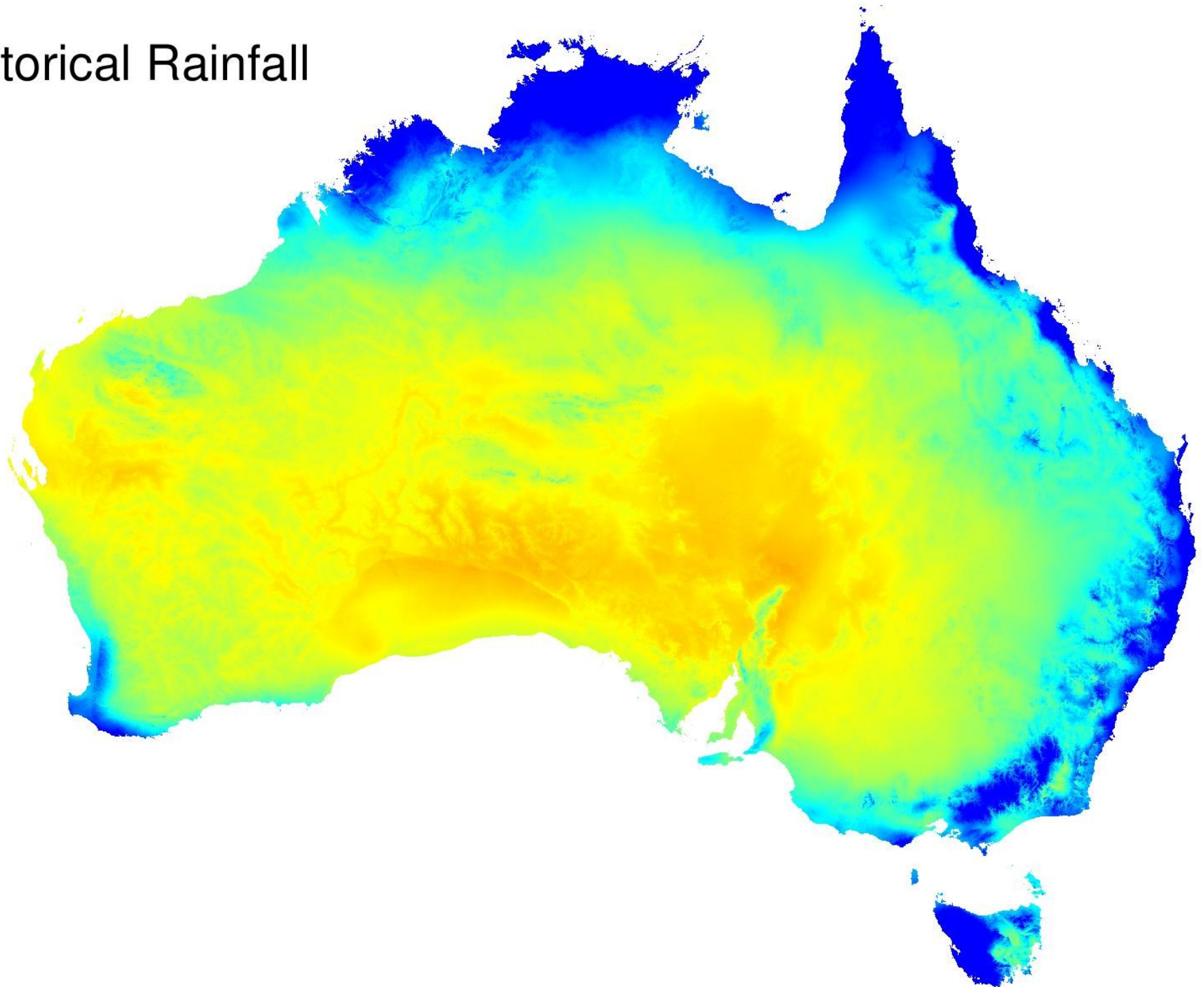
Broadacre Agricultural Land



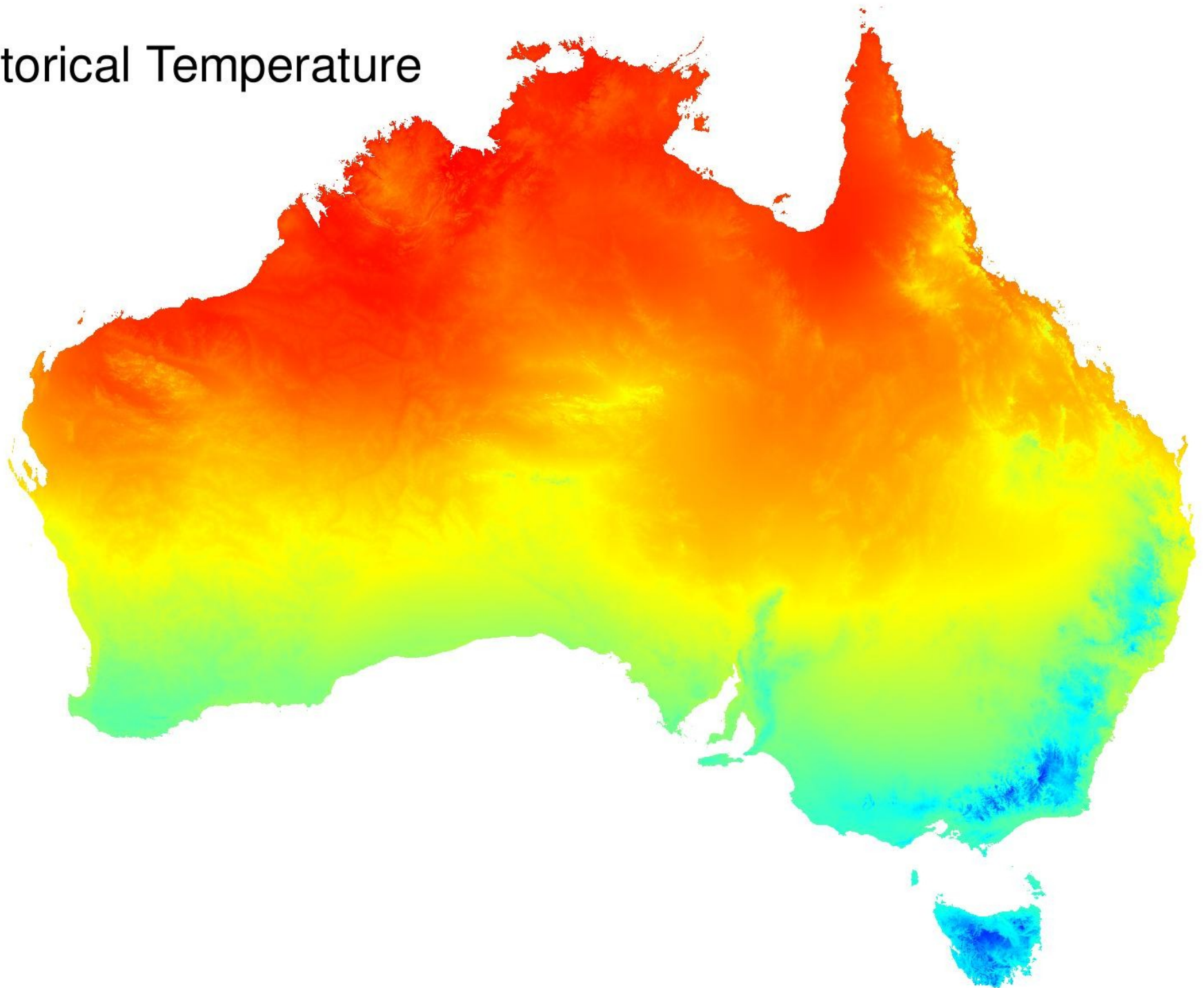
Broadacre Agricultural Land



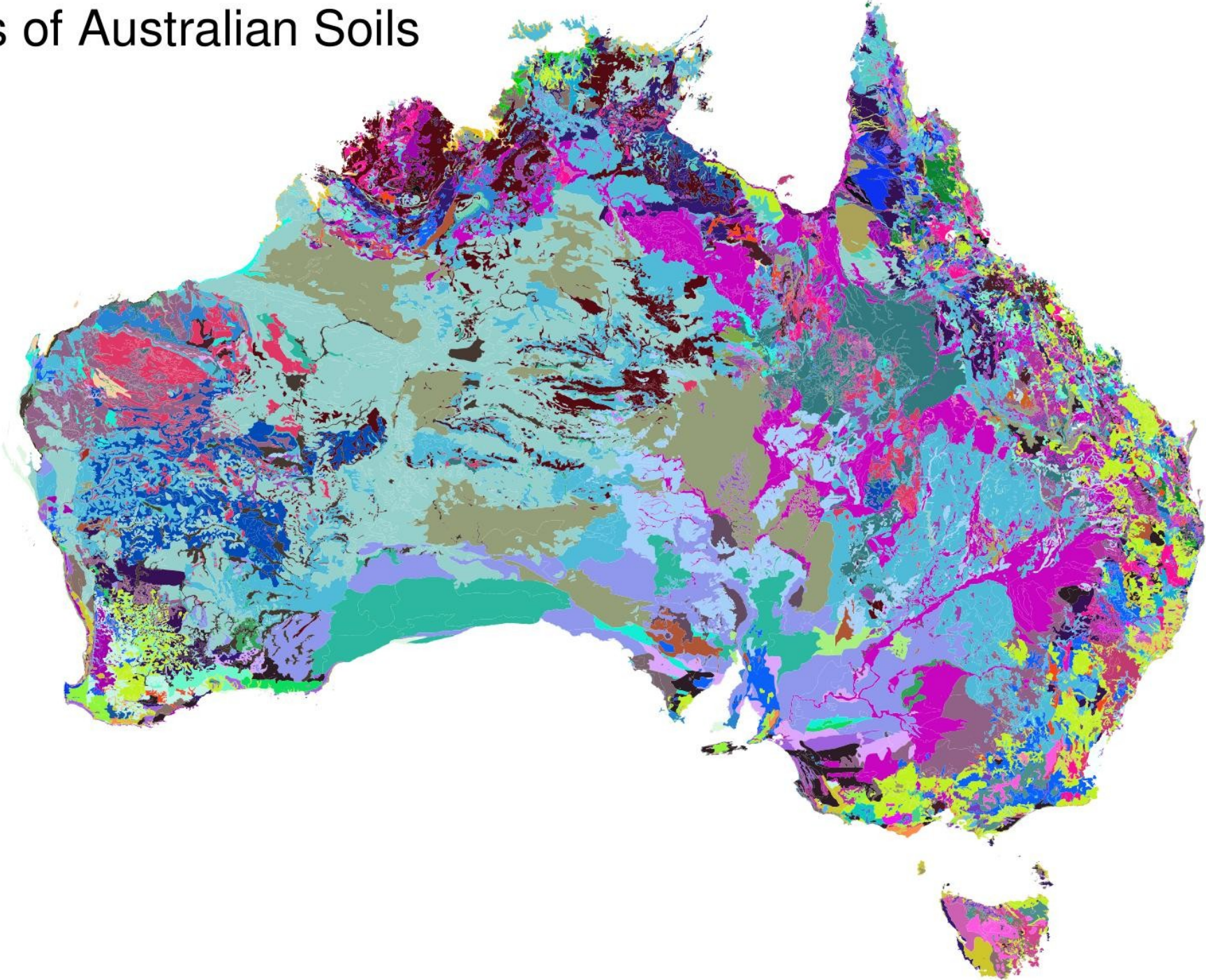
Historical Rainfall



Historical Temperature



Atlas of Australian Soils

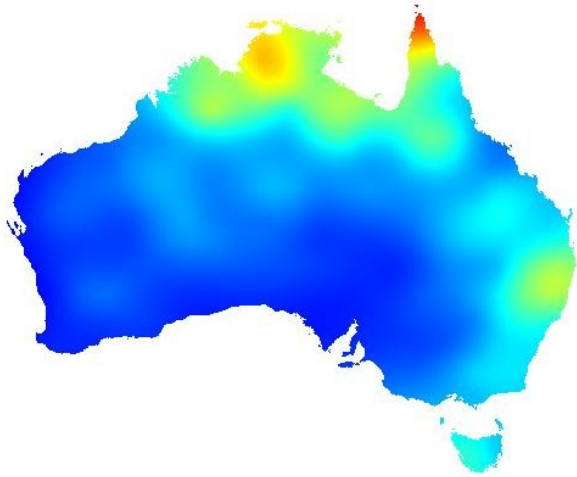


Set of marginal values for climate

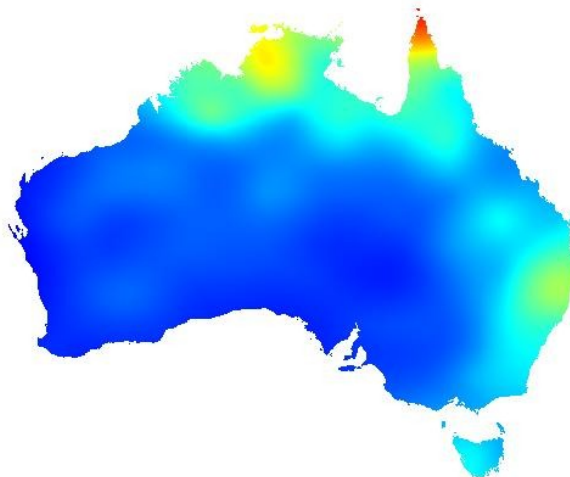
Projected Climate Surfaces for Australia - A1B Scenario -

Mean Rainfall

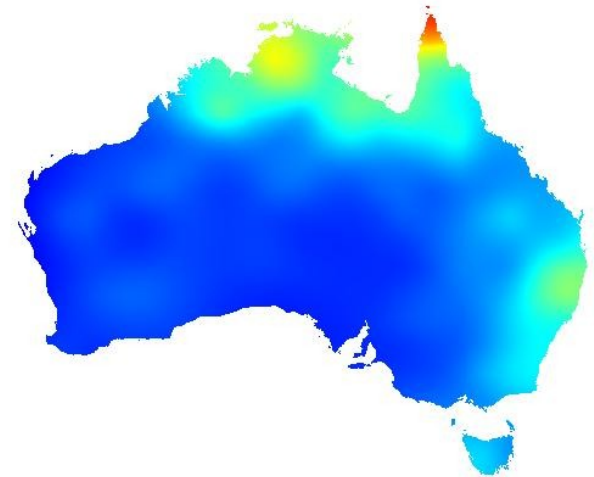
2001-2010



2021-2050

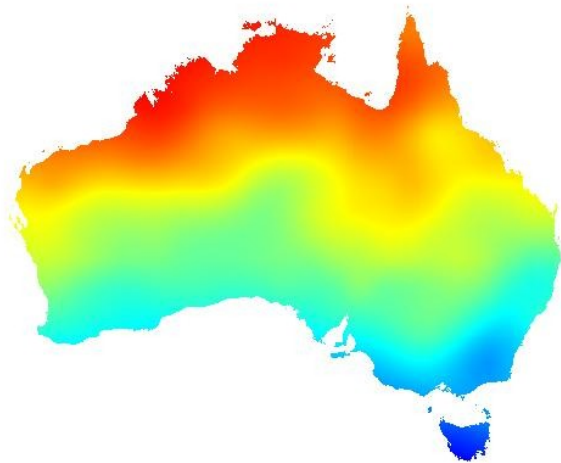


2071-2100

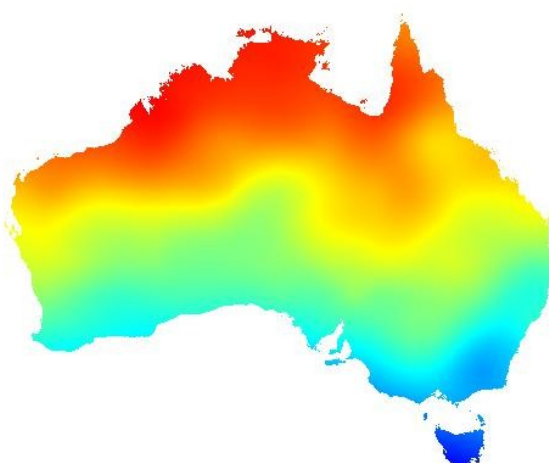


Mean Temperature

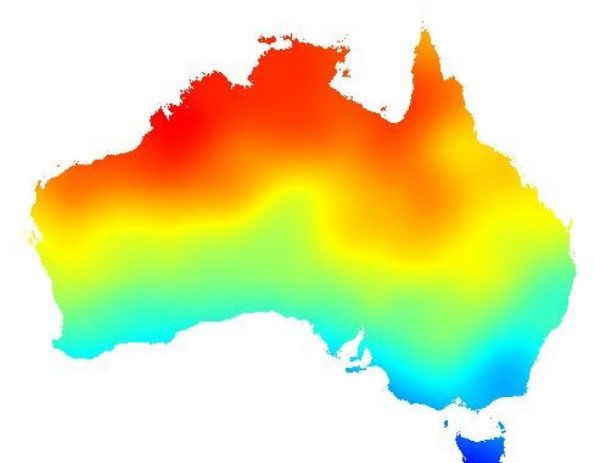
2001-2010



2021-2050



2071-2100





How Will Land Values Change?

The Empirical Model

- Log-linear specification
- Dependent variable is log of price per hectare
- Climate variables averaged across past 30 years
 - mean daily temperature and mean of daily temp. squared
 - mean annual rainfall and mean of annual rainfall squared
 - mean number of days in a year that the maximum temperature exceeds 45°C
- Controls for topography, soil quality, major roads

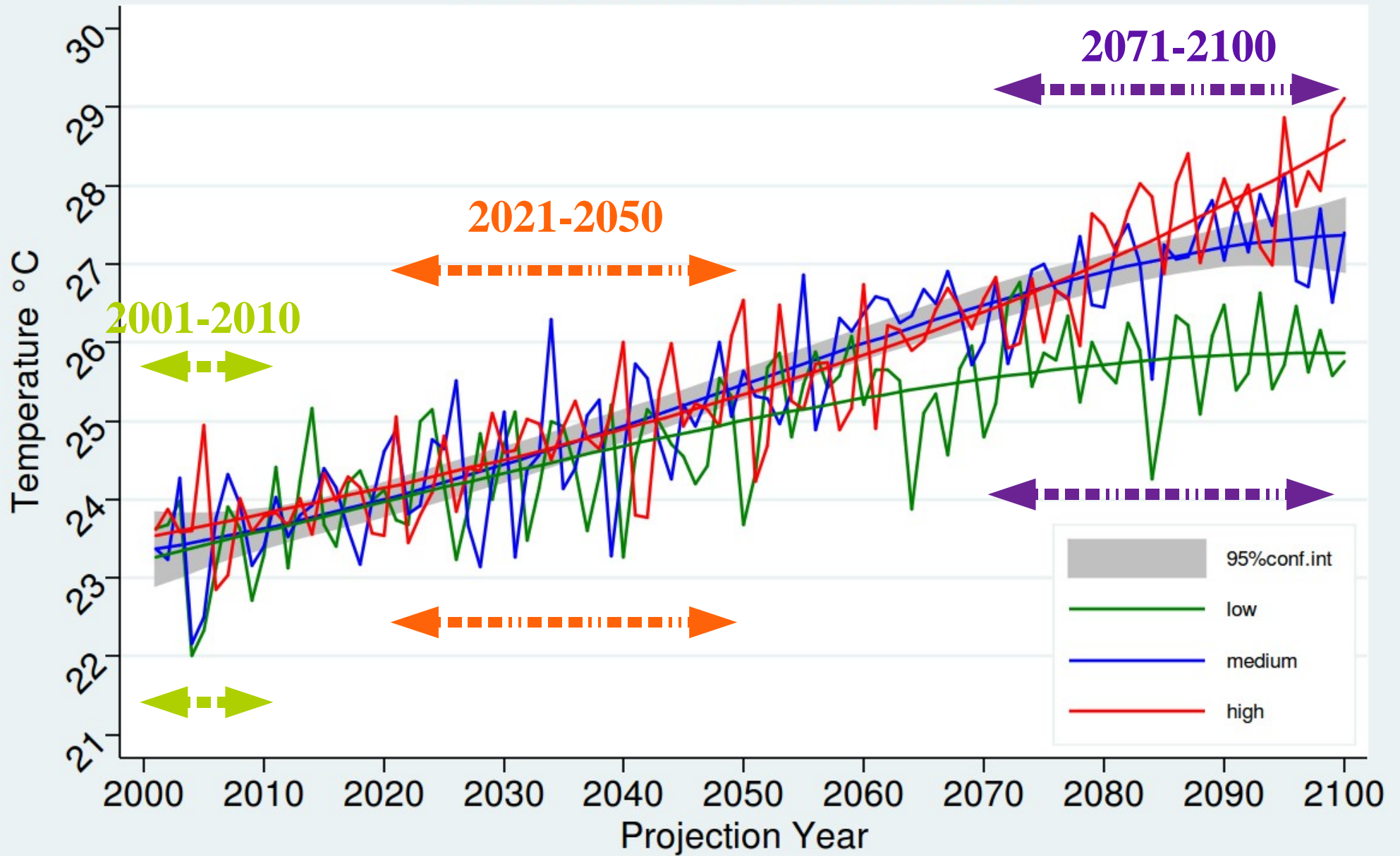
Robustness/Limitations

- Omitted Variables
- Specification
- Limitations
 - Partial equilibrium
 - Changing CO₂ - the fertiliser effect

The Climate Projections

CSIRO Temperature Simulation

Three GHG Emissions Scenarios



Results

%Change in Broadacre Agricultural Land Values by State vs Baseline
(1977-2006)

Time Period		2021-2050	2071-2100		
Region	GHG Emissions Scenario	composite	low	medium	high
	NSW	-26%	-48%	-59%	-64%
QLD	-33%	-58%	-71%	-74%	
SA	-25%	-55%	-67%	-71%	
WA	-29%	-54%	-69%	-75%	
Australia	-30%	-54%	-68%	-72%	

Interpreting the Results

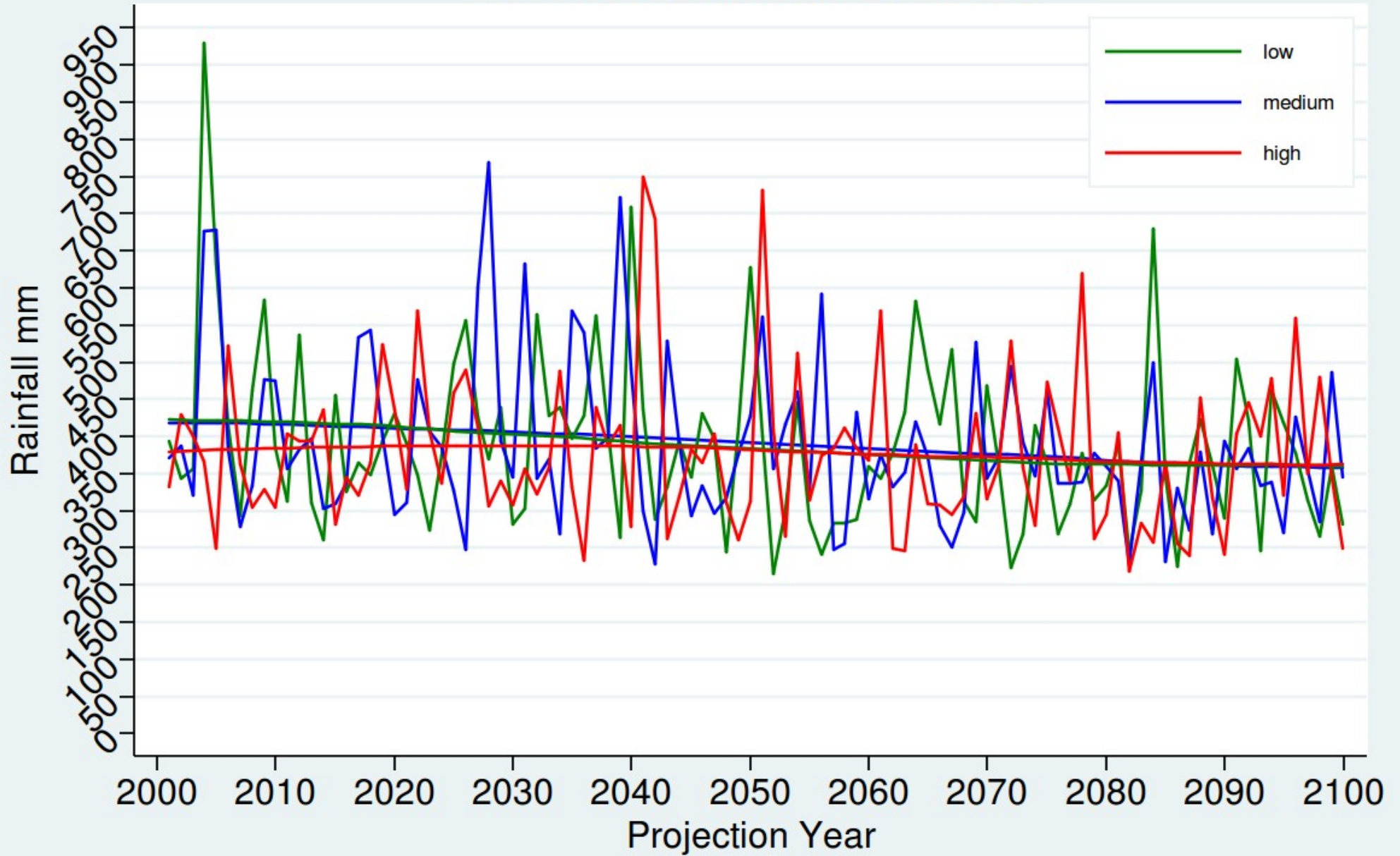
- What are the drivers?
- Where are the changes occurring?

Relative Importance between Temperature and Rainfall

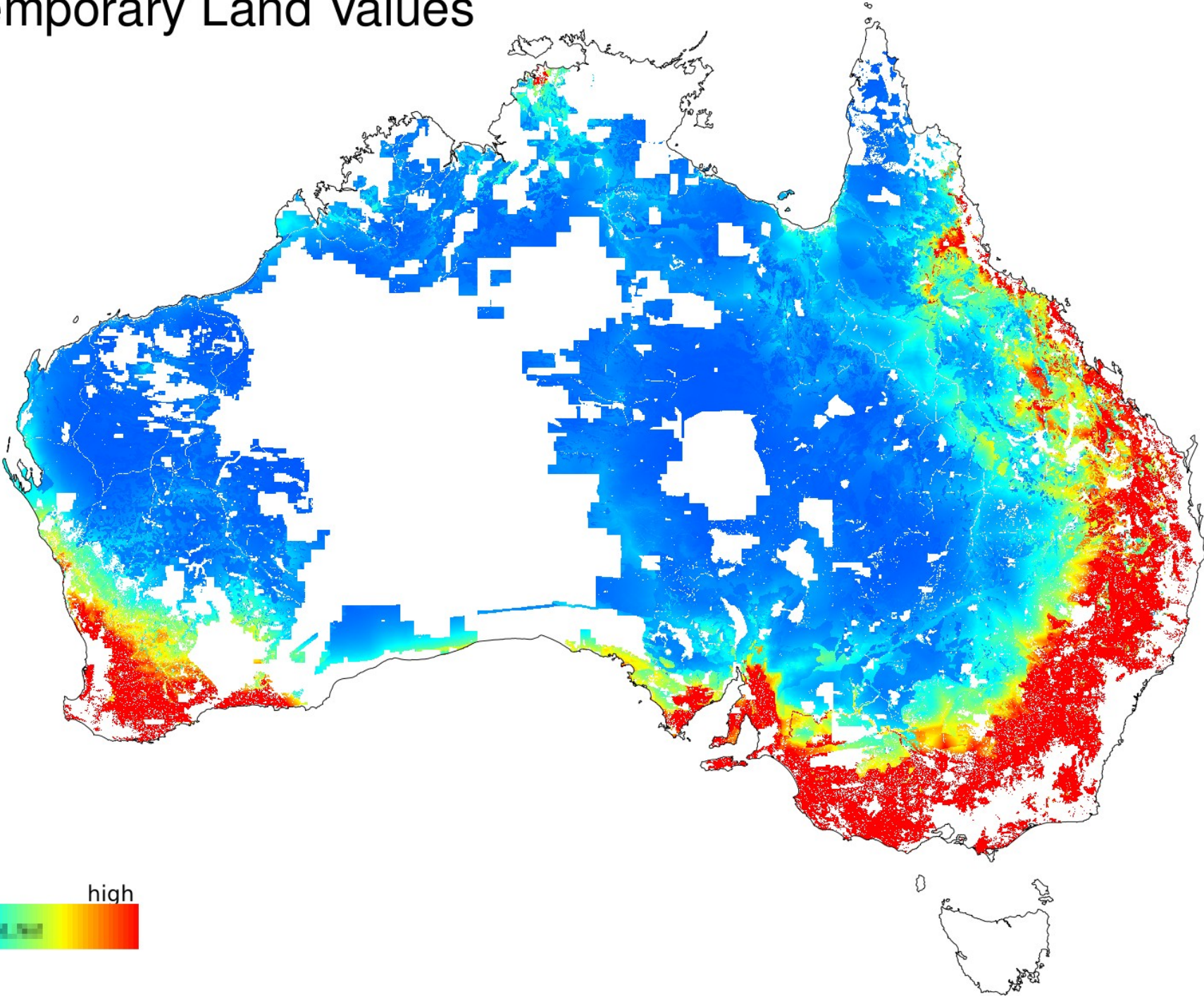
- Increasing mean temperature is the driver
 - E.g., Australia wide, accounts for 90% of drop in land value
- Surprising?
 - Lets look at rainfall

CSIRO Rainfall Simulation

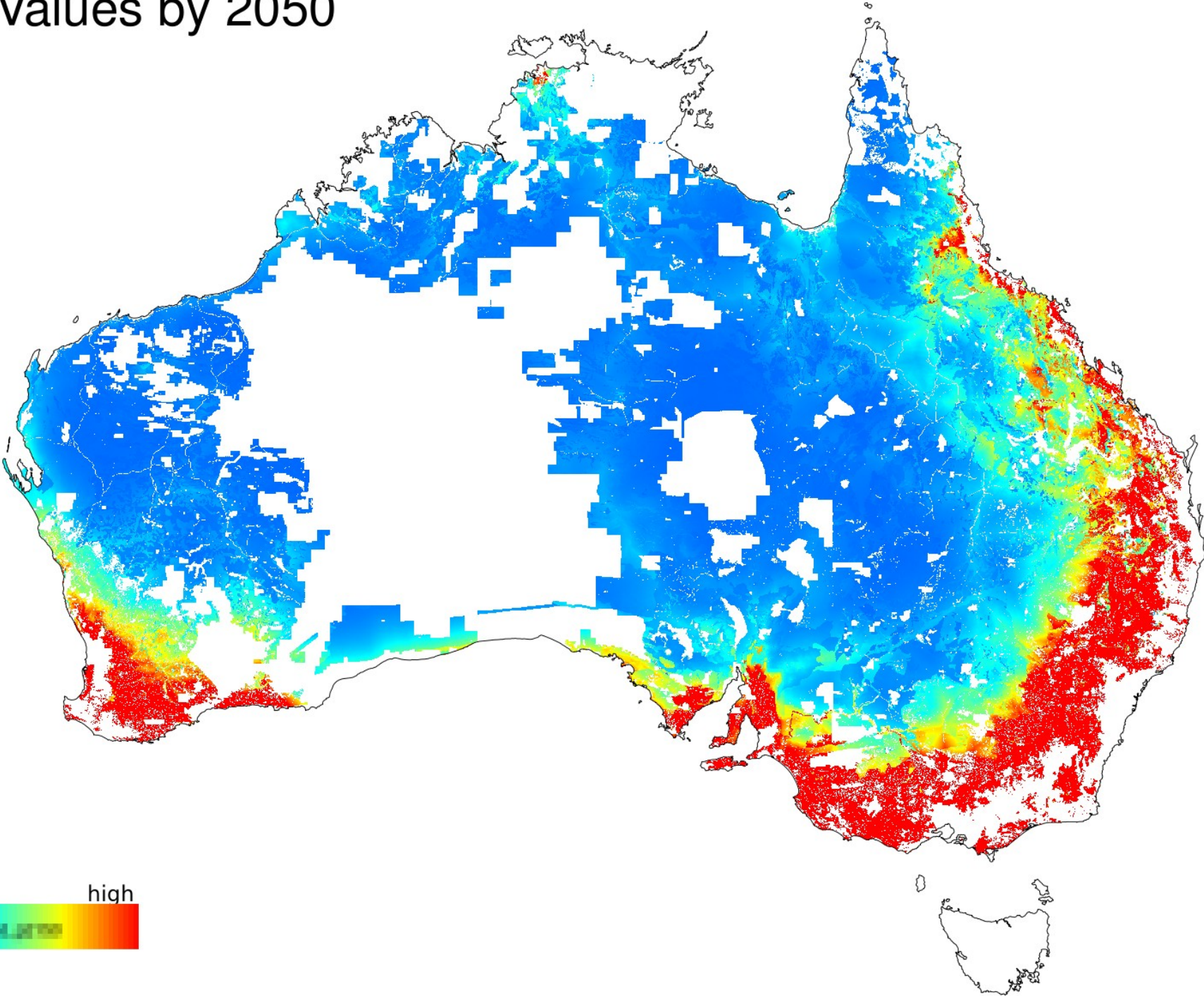
Three GHG Emissions Scenarios



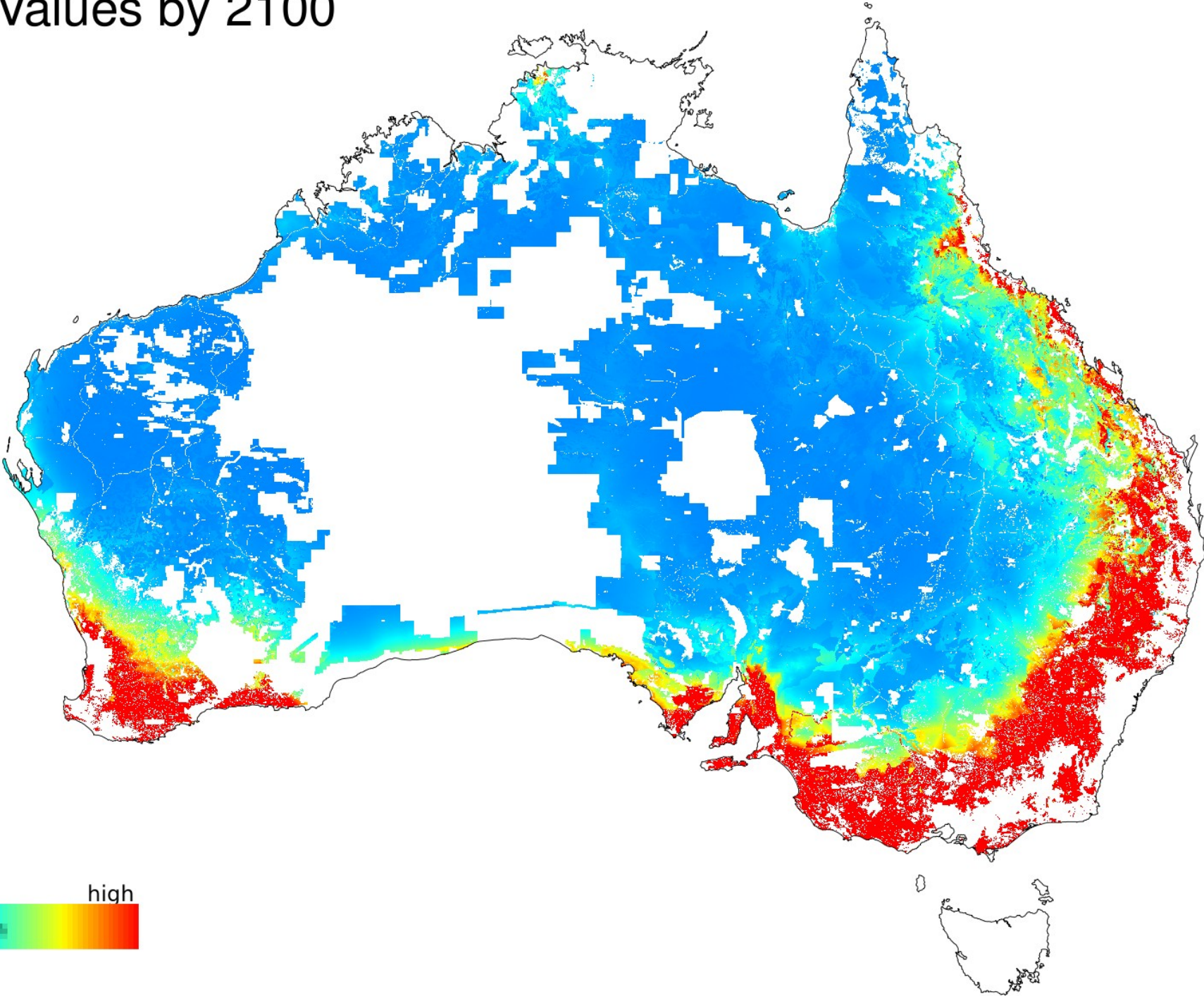
Contemporary Land Values



Land Values by 2050



Land Values by 2100



Conclusion

- Should I sell the farm?
 - Potentially large downward trends in land values particularly in cropping areas
 - Less obvious what's going on in grazing lands