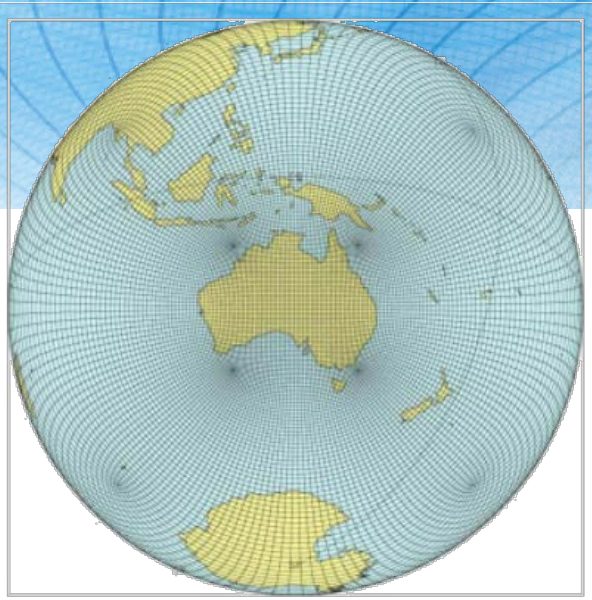

Projections, Predictions, or Trends?

The challenges of projecting changes to fire regimes under climate change

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9-11th October, 2013

National Environmental Research Program

LANDSCAPES & POLICY hub

What are we looking for?

- Aims differ, and are more or less difficult -

To project changes to:

1. fire regime (intensity, timing, frequency);
2. fire behaviour;
3. fire danger (FFDI, GFDI)

- At what scale?

1. Spatial scale - continental trends vs landscape forecasts

2. Temporal scale – seasonal predictions vs long-term projections. Eg. Operational requirements are for seasonal forecasts (POAMA combined with MODIS data?)

Longer-term trends – we have many proxies already

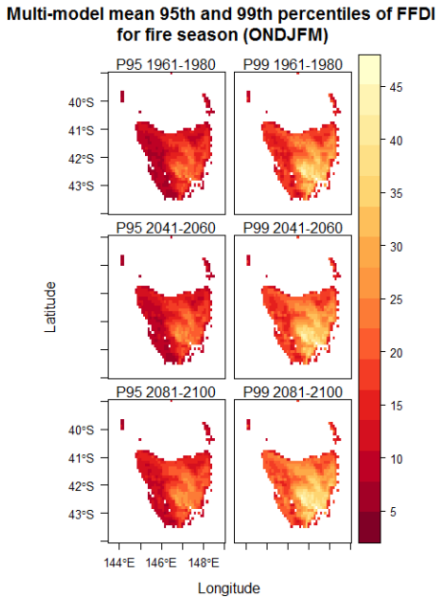
What we can say …

A. Fire Weather

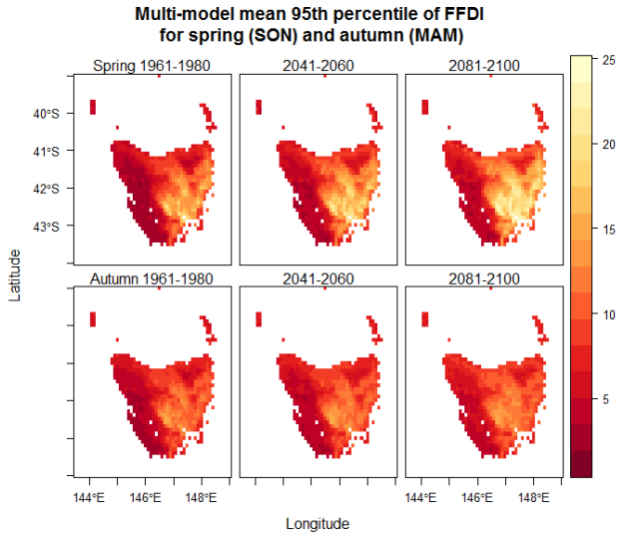
Although there are some regional and seasonal differences, in general:

- Temperatures are increasing
- Rainfall is (generally) decreasing
- Changes to extremes are occurring
- There will be more hot days, and an extension of the summer season

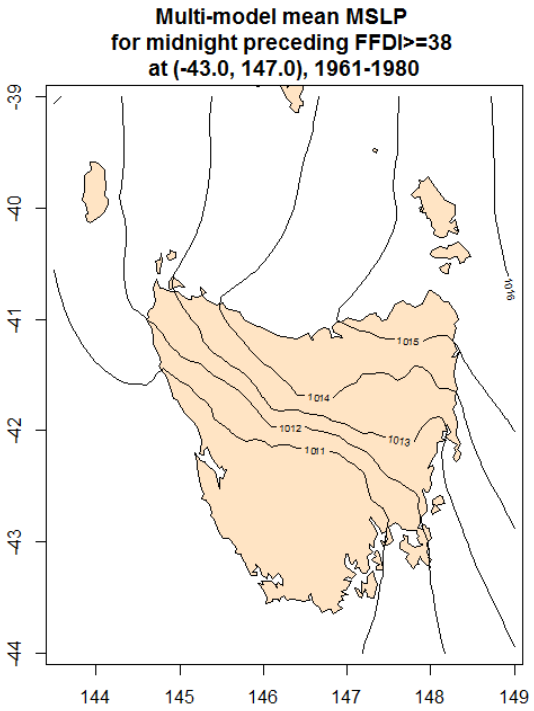
A substantial increase in the fire danger in many areas by the end of the century (A2)

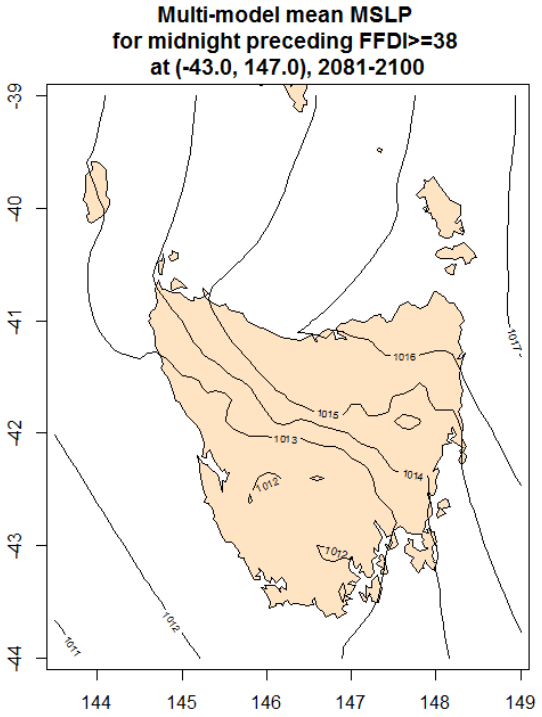


Paul Fox-Hughes



Synoptic Patterns





Paul Fox-Hughes

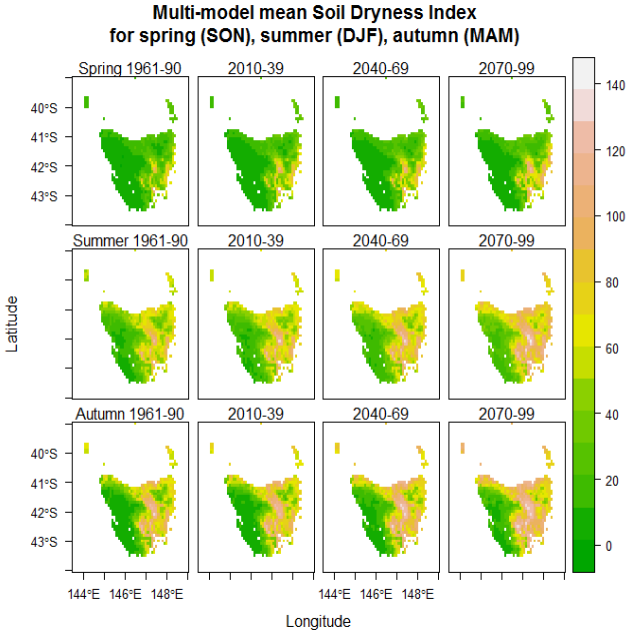
Bushfire weather is not just the coincidence of hot temperatures and dryness, but is a result of particular synoptic patterns

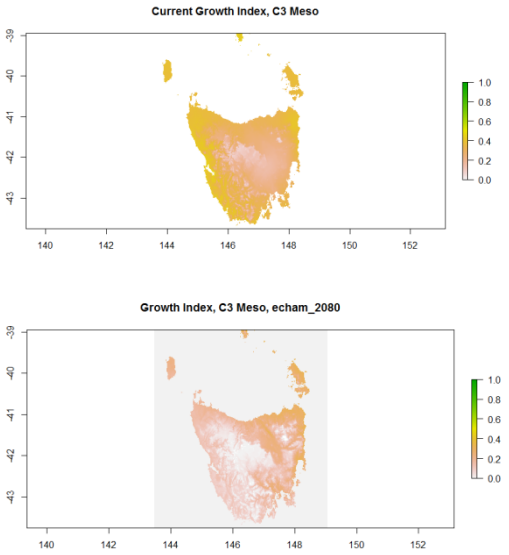
- There are a greater number of such events during 2081-2100 than is the case for 1961-1980
- The pattern resembles that associated with actual dangerous fire weather days, increasing confidence in the simulations

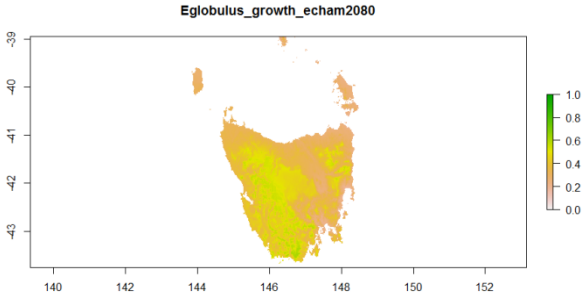
What we can say …

B. Proxies for fuel component

1. Soil Dryness Index (SDI)
2. Growth Indices
3. Heat accumulation

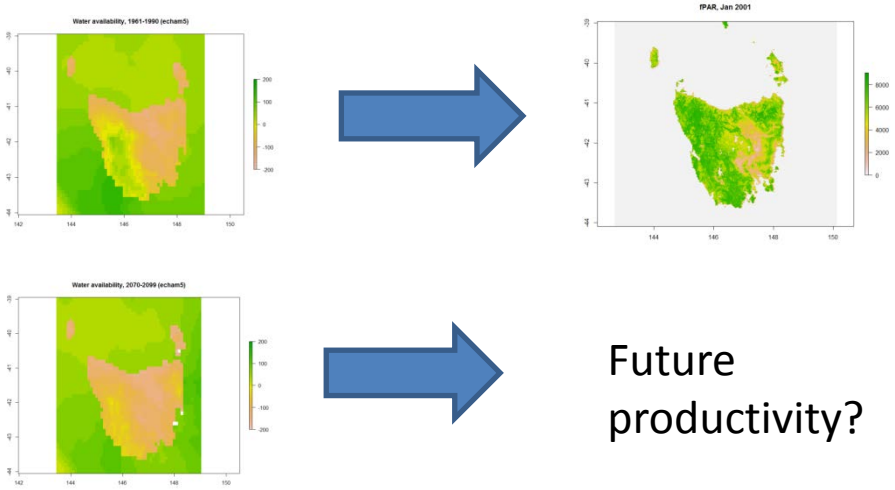






What we can't say …

- Current relationships between vegetation and proxies will remain stable into the future conditions (eg water availability and fPAR)
- Transferability is low, scale dependent (continent vs regional)
- CO_2 responses unknown (limits to fertilisation effect, interactions with rainfall and nutrients)
- Changes to vegetation composition, structure unknown
- Transformational change unpredictable, feedback mechanisms unknown



Soil

Climate

Vegetation type, structure

CO_2

Available Moisture

Plant Growth

Management

BIOMASS

Soil

Recent rainfall and temperature

Vegetation type, structure

CURING (availability to burn)

Current rainfall, temperature, relative humidity, wind – surface and atmospheric

Drought factor – antecedent rainfall

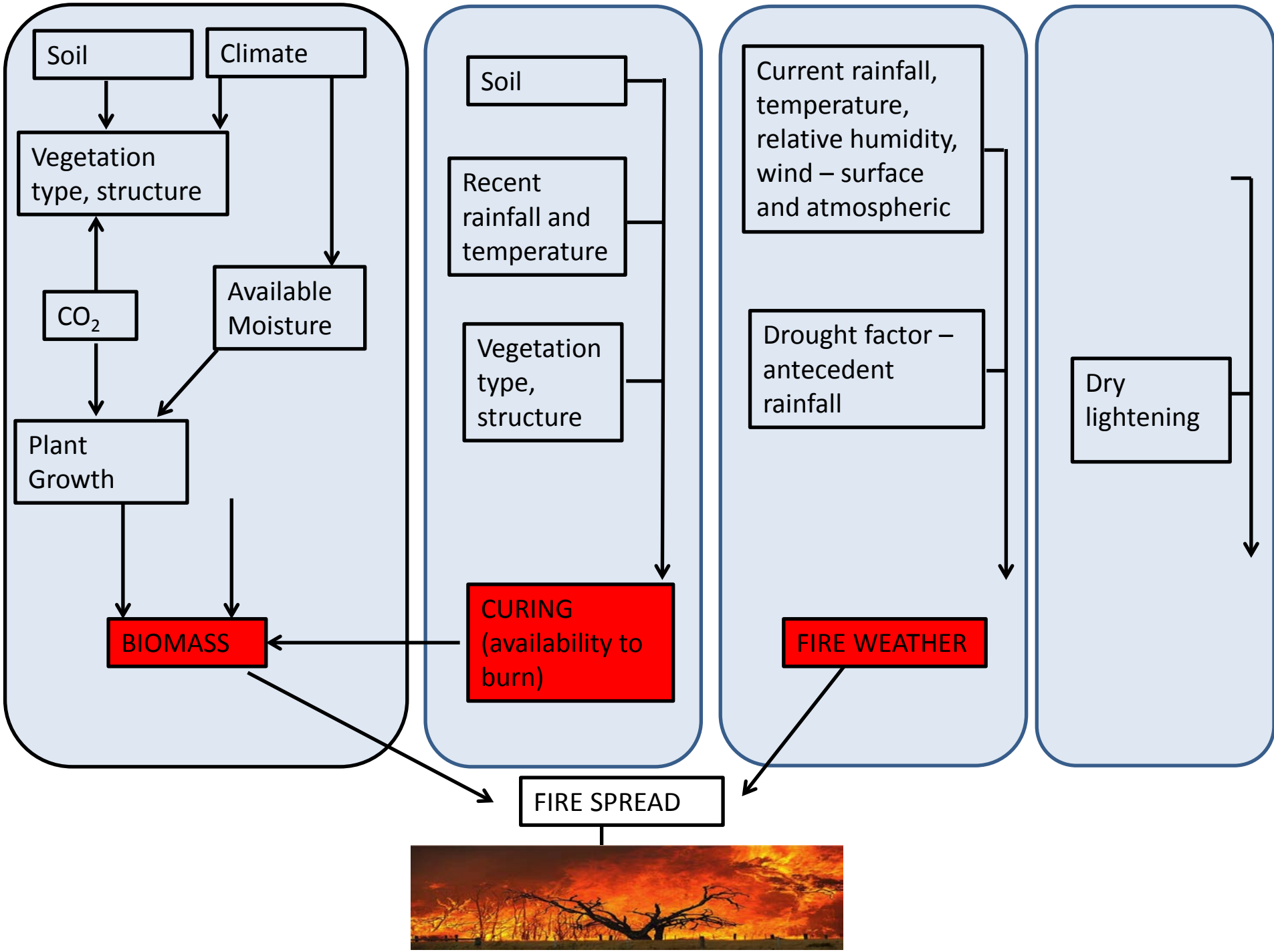
FIRE WEATHER

Human (proximity to settlement)

Dry lightening

IGNITION

FIRE SPREAD


Soil
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Vegetation type, structure
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FIRE WEATHER

FIRE SPREAD

Projection vs Prediction

What will happen at a particular time, place?

vs

What may happen in the future?

Climate projections are not predictions of future conditions - they are descriptions of possible future climates under a given set of plausible scenarios of climate forcings.

Regional Climate models that include Dynamic vegetation models (eg. LPX) to incorporate fire and land cover enable biomass to be projected, but they are still projections.

Scale will be a limiting factor to how well they model landscape scale heterogeneity.

Regional Climate models very expensive and time-consuming, which will always limit their availability

Trends

- Short-term seasonal forecasts may become possible
- Predictions (c.f. projections) about long-term future fuel loads, fire regime or fire activity under climate change are not possible – and it is not just a matter of waiting for better climate models
- But, climate models (particularly RCMs) do provide us with very good projections, which give definite trends that can be used to define potential future pathways

3 biggest modelling challenges

1. Mismatch between our tools (projections) and our need for predictions
2. Using trends to provide useful indications of change on the ground
3. Attempting to model non-linear, threshold changes