

# Home and Away: Checking and improving descriptions of tree species climatic requirements

Trevor Booth

CSIRO Ecosystem Sciences and CSIRO Climate Adaptation Flagship

# Outline

- Objective
- Background – Species distribution models (SDM)
- Plant responses to climate change
- Using ALA along with other systems
  - CABI - Forestry Compendium
  - GBIF - Global Biodiversity Information Facility
- Conclusions

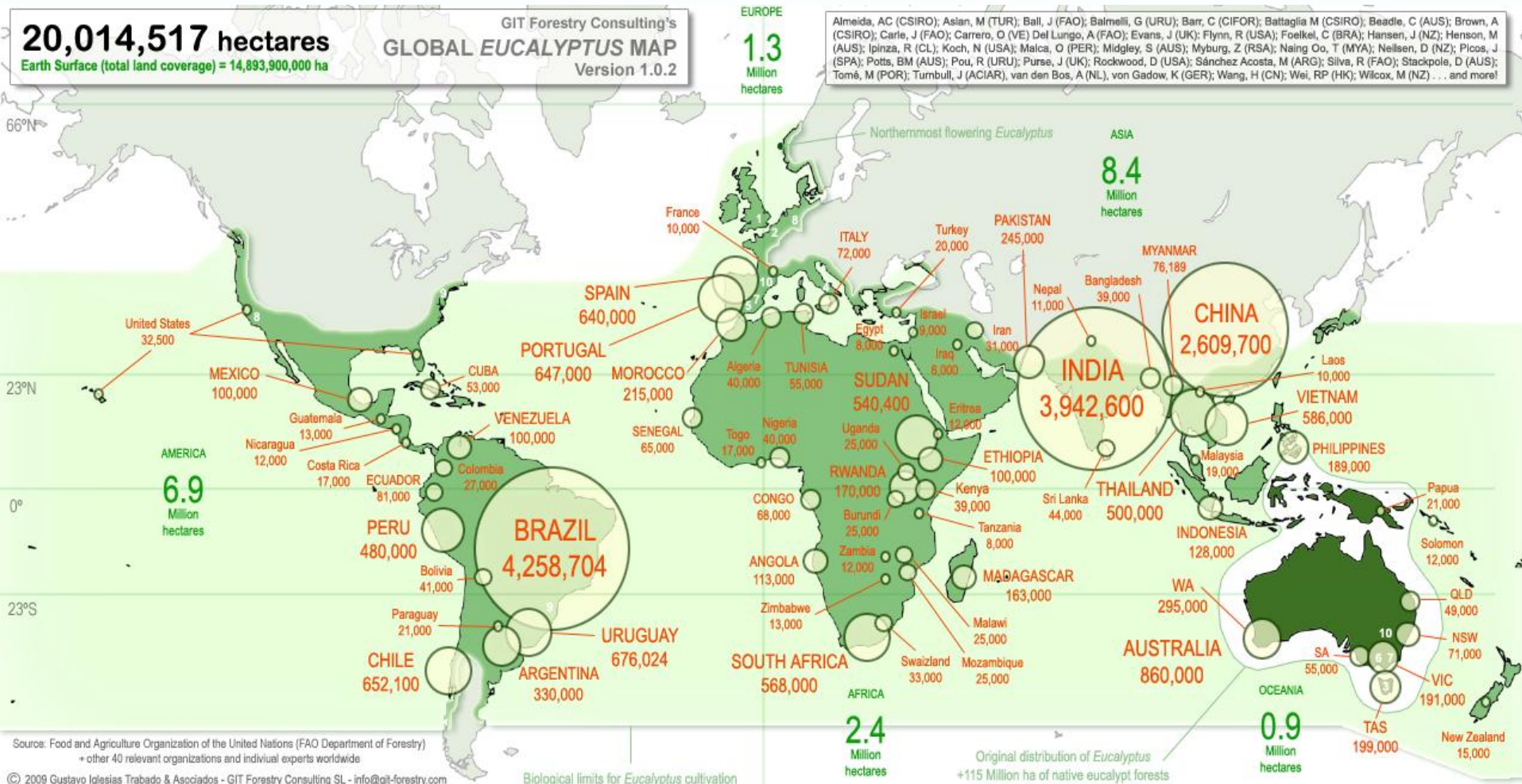
# Background

- BIOCLIM – First SDM - 1984
- Realised & fundamental niche (Booth *et al.* 1988) (nat. distrib.) & (o/s trials) – eucalypts, some  $>4^{\circ}\text{C}$
- Global climatological audit proposed (Booth 1991)
  - Climatic interpolations for all countries
  - Spp. natural distributions
  - Trials outside natural distribution
  - Spp. climatic requirements
  - Map suitable areas for particular species

# Plant responses to climate change

- Adapt, Evolve, Move or Die
- Eucalypts
  - Very slow to evolve
  - Very poor dispersal
  - Adapt or die
- Many CC studies ignore intrinsic adaptability

# >100 eucalypt species tested in >90 countries



# CABI Forestry Compendium

Descriptions for >1200 species from around the world

## *Eucalyptus nitens*

### Climatic requirements (Plantations)

Mean annual temperature 9 to 18°C

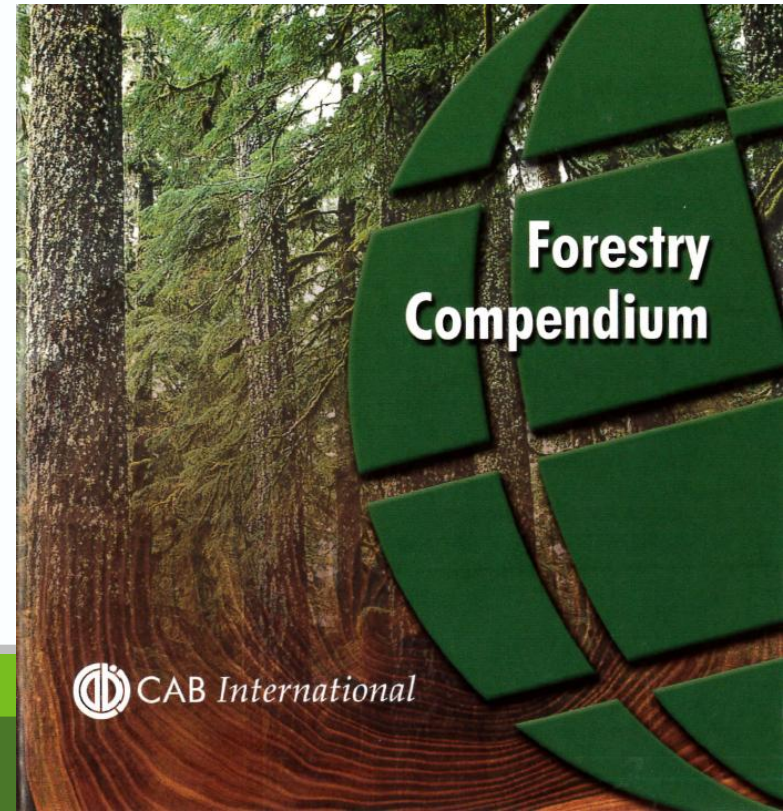
Mean max T hottest month 20 to 28°C

Mean min T coldest month -1 to 7°C

Mean annual precip. 750 to 1500 mm

Booth and Pryor (1991) - expert opinion

- Simple ranges, but could use MaxEnt



# Atlas of Living Australia – *E. nitens*

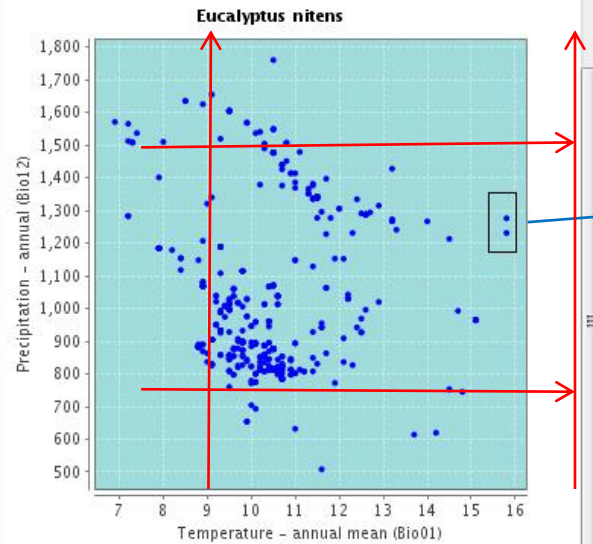


Add to Map Tools Import Export Help

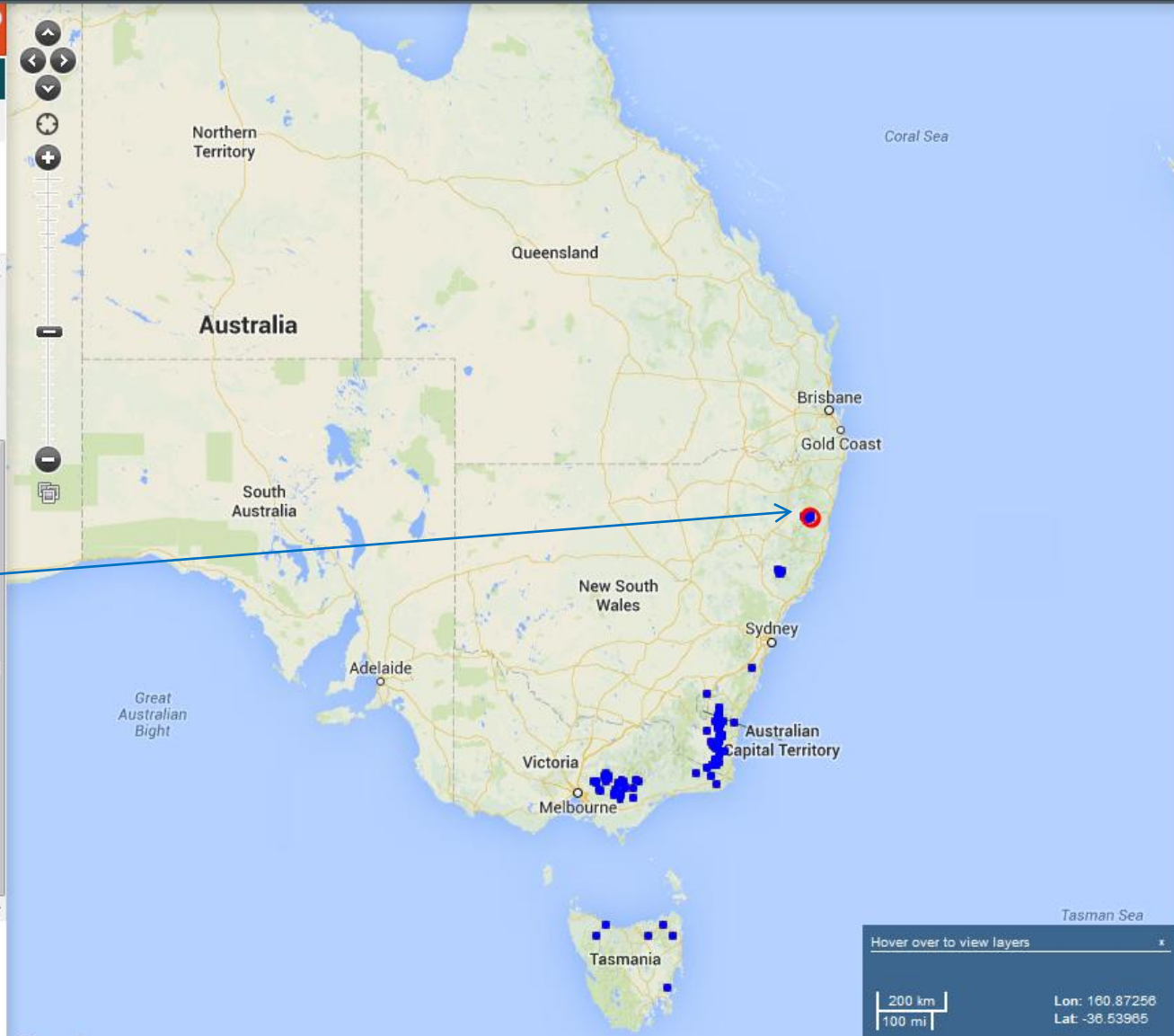
- E. nitens*
- Eucalyptus nitens*
- Map options

Precipitation - annual (Bio12): 1174.00 - 1330.00

Highlight occurrences on the scatterplot that are in an area



- Quick links
- [View metadata for "Eucalyptus nitens"](#)
  - [Download all records for "Eucalyptus nitens"](#)
  - [Produce scatterplot for "Eucalyptus nitens"](#)



Hover over to view layers

200 km  
100 mi

Lon: 160.87256  
Lat: -38.53965

# Global Biodiversity Information Facility

- *E. nitens* occurrences - Australia 413 (from ALA), Spain 33, Chile 1, New Zealand 5, USA 2, South Africa 1
- Old & new interfaces



## Global Biodiversity Information Facility

Free and open access to biodiversity data

440,206,302  
OCCURRENCES

1,454,695  
SPECIES

14,795  
DATASETS

596  
DATA PUBLISHERS

[Data](#) [News](#) [Community](#) [About](#)





# *E. nitens* - GBIF data – analysed in ALA



Add to Map Tools Import Export Help

E nitens - Spain only

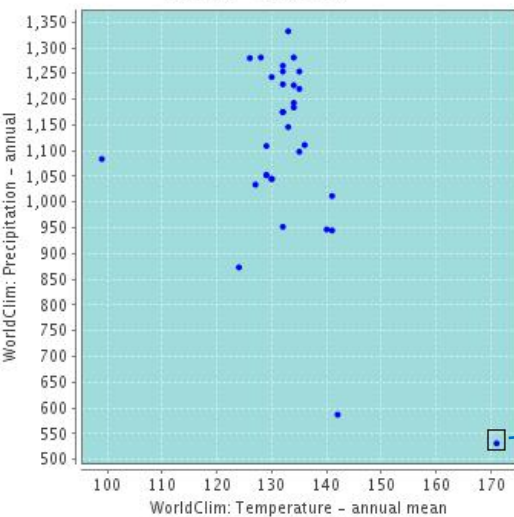
E nitens - Spain only

Map options

Highlight occurrences on the scatterplot that are in an area

Clear

E nitens - Spain only

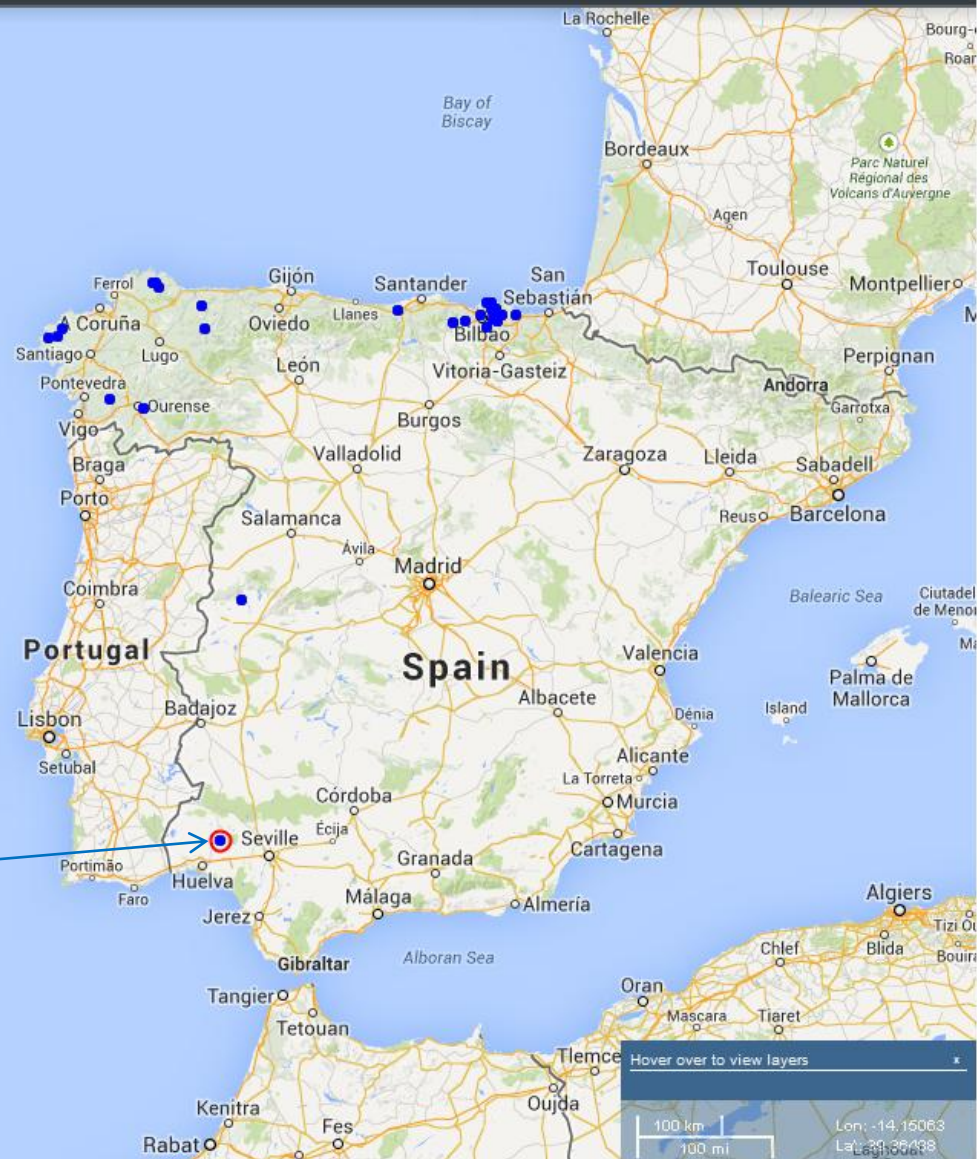


Quick links

[View metadata for "E nitens - Spain only"](#)

[Download all records for "E nitens - Spain only"](#)

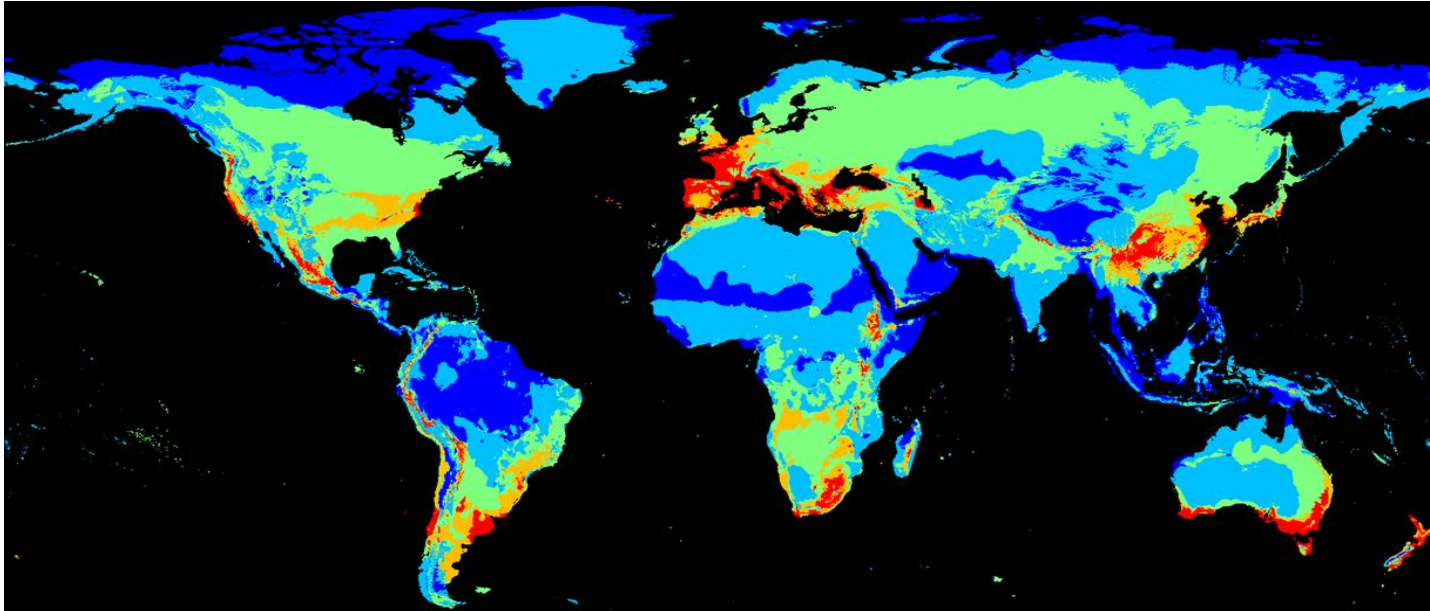
[Produce scatterplot for "E nitens - Spain only"](#)



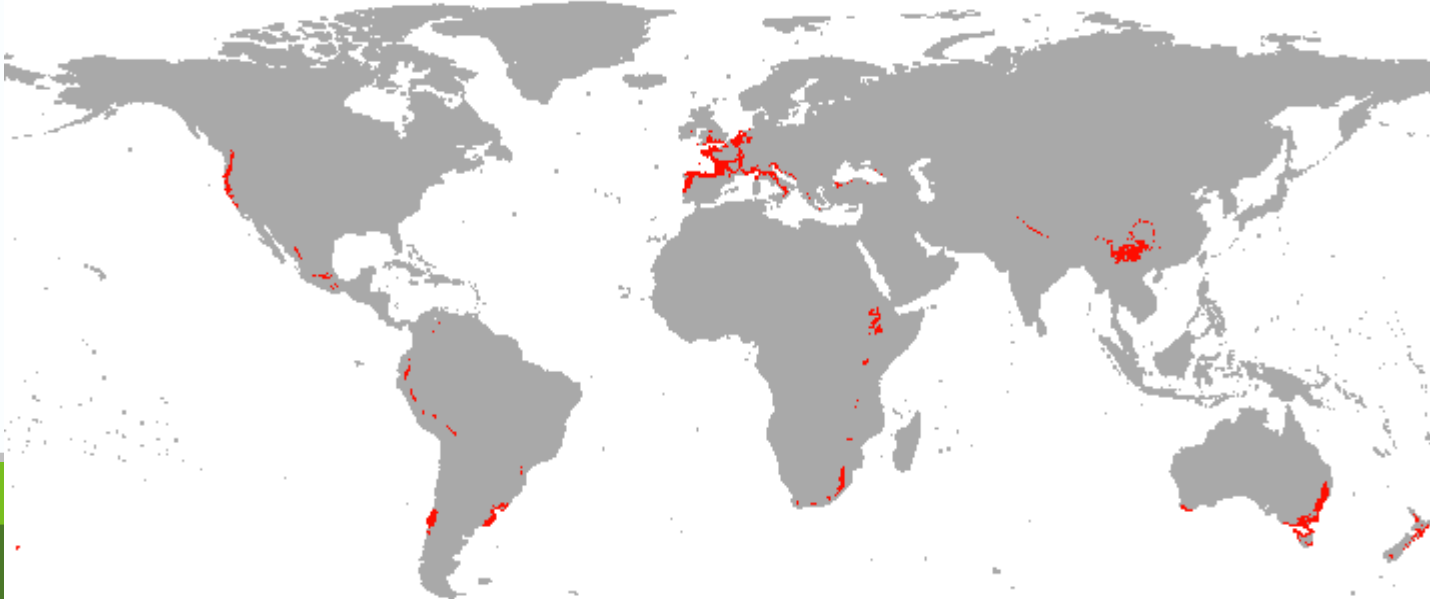
Hover over to view layers

100 km 100 mi Lon: -14.15063 Lat: 36.92498

# *E. nitens* – GBIF niche & CABI (2005)



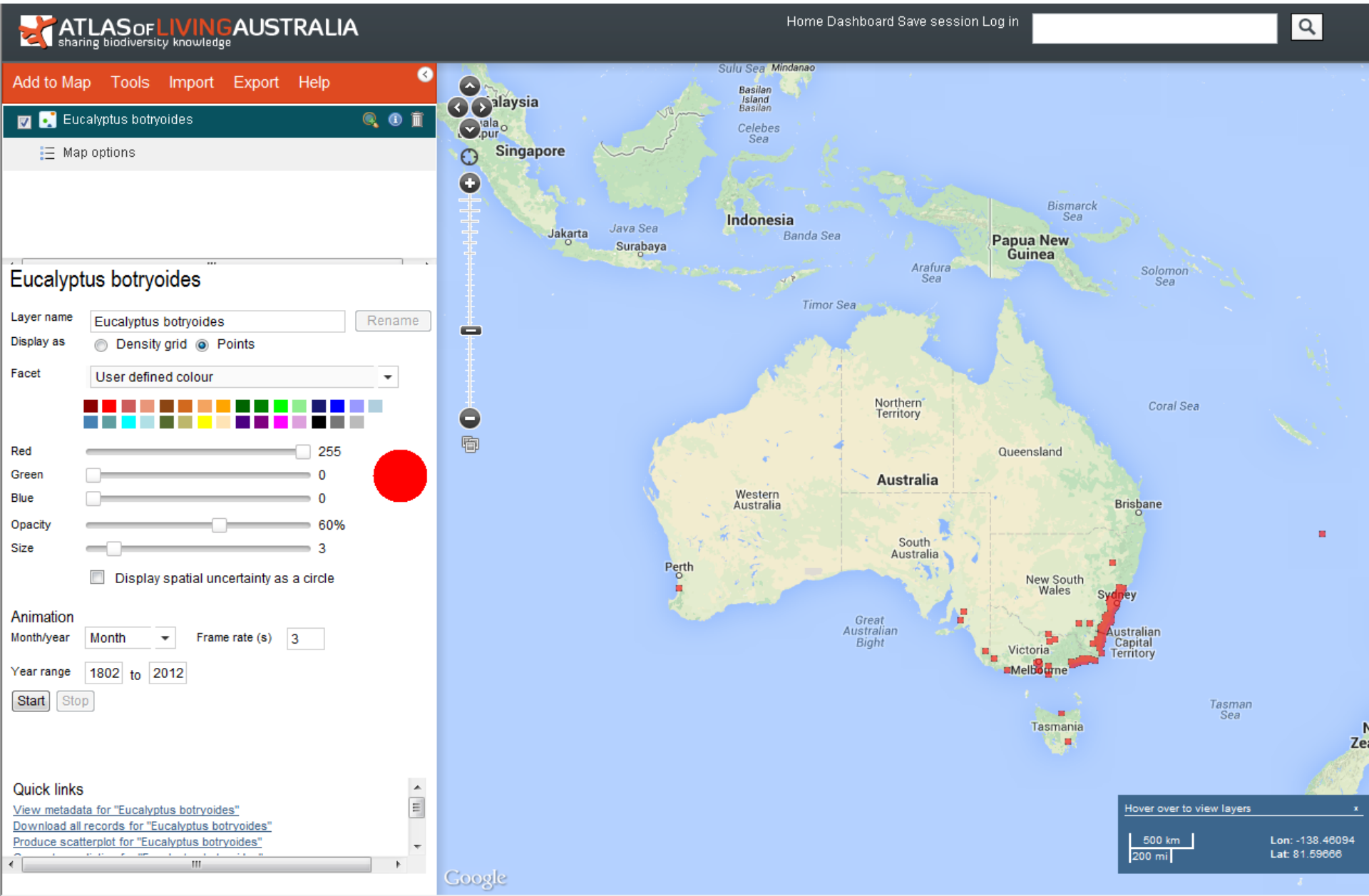
GBIF incl.  
ALA data



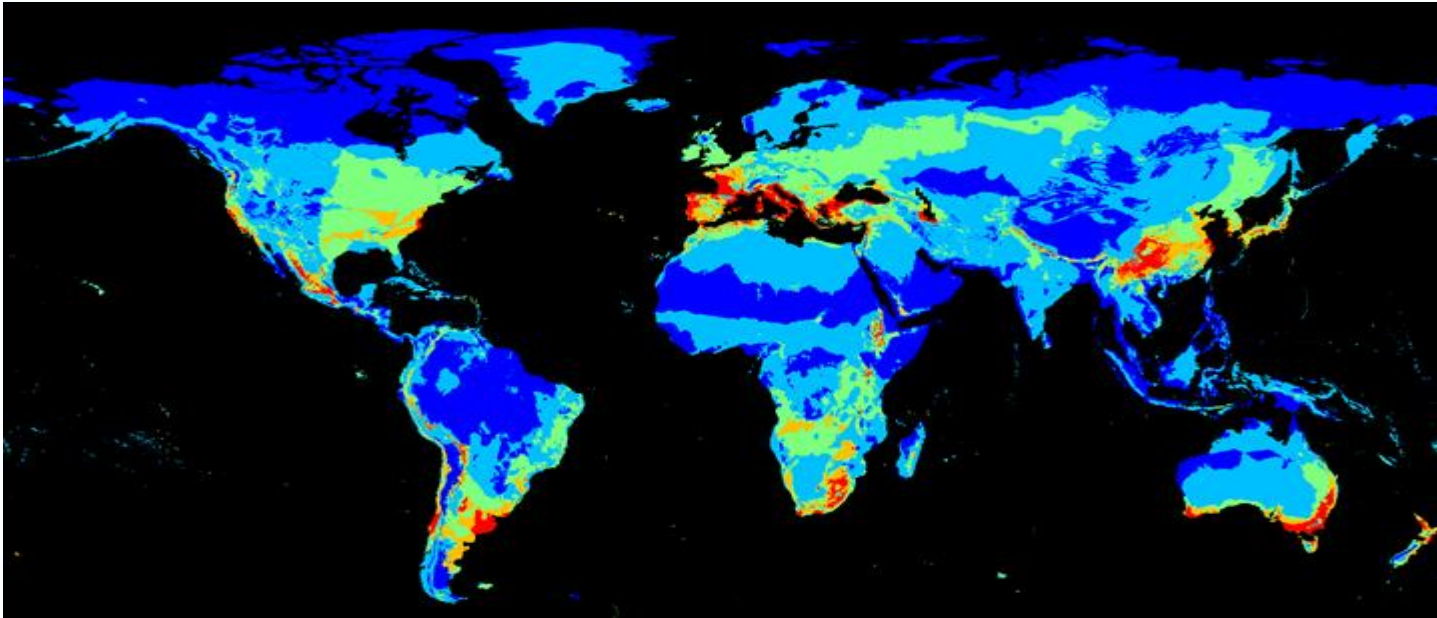
CABI –  
Booth  
& Pryor  
1991

Red -  
most  
suitable

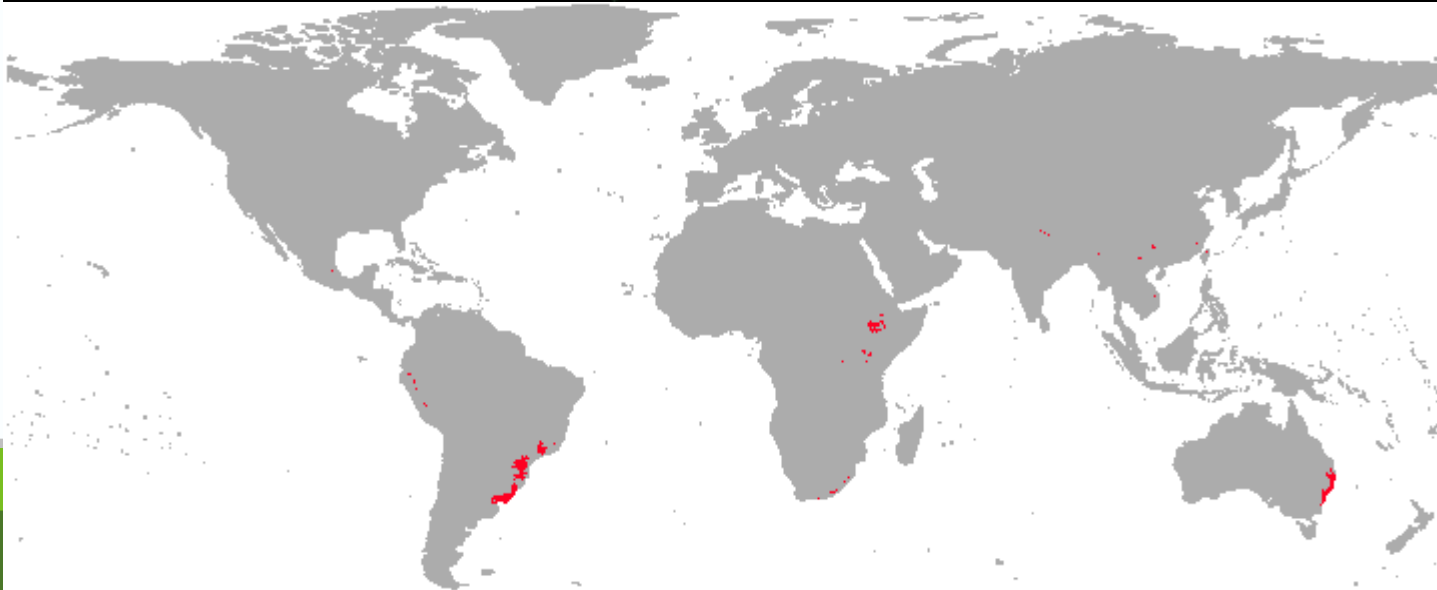
# *E. botryoides* – a lesser-known eucalypt



# *E. botryoides* – GBIF niche & CABI (2005)



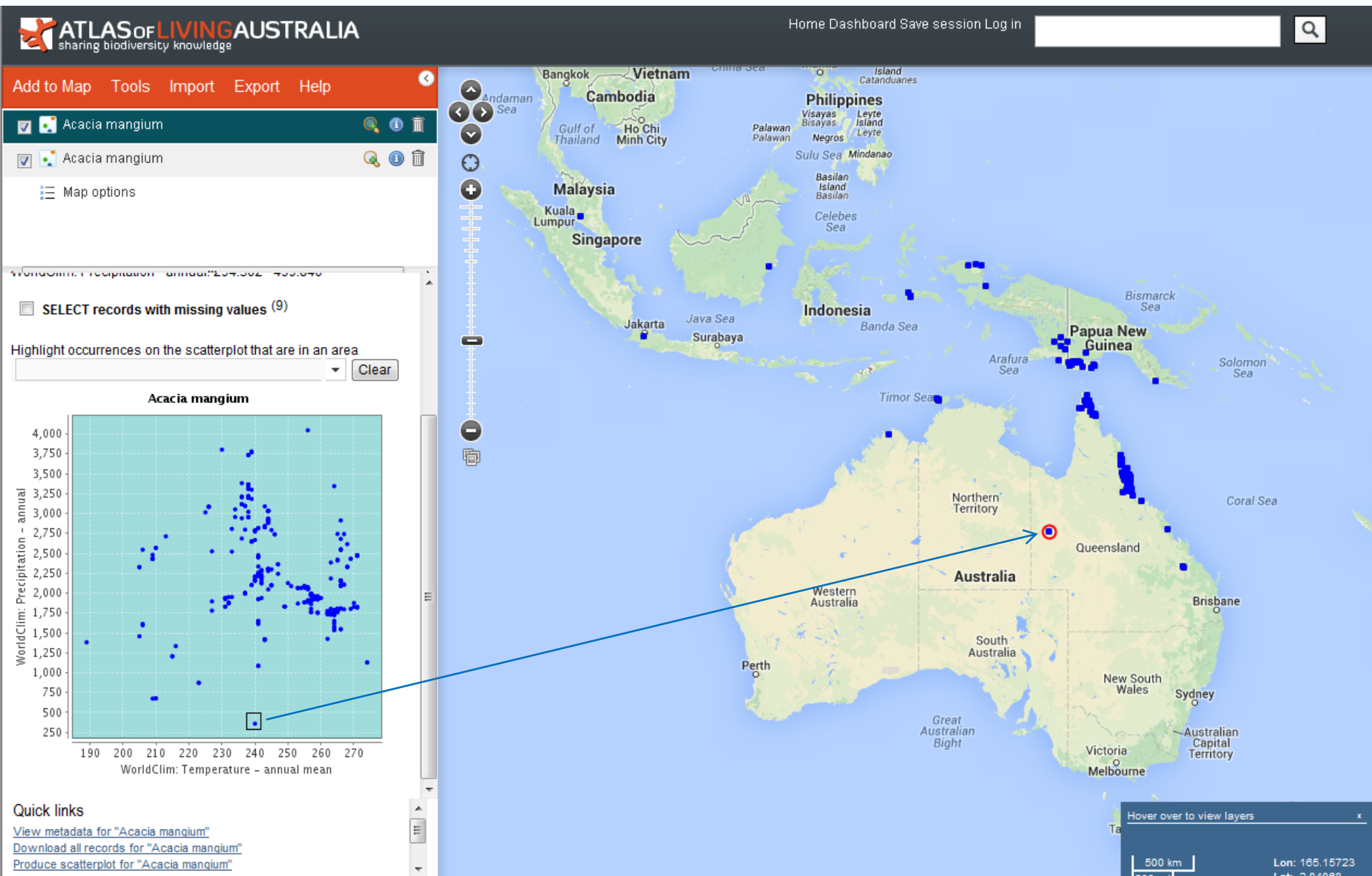
GBIF incl.  
ALA data



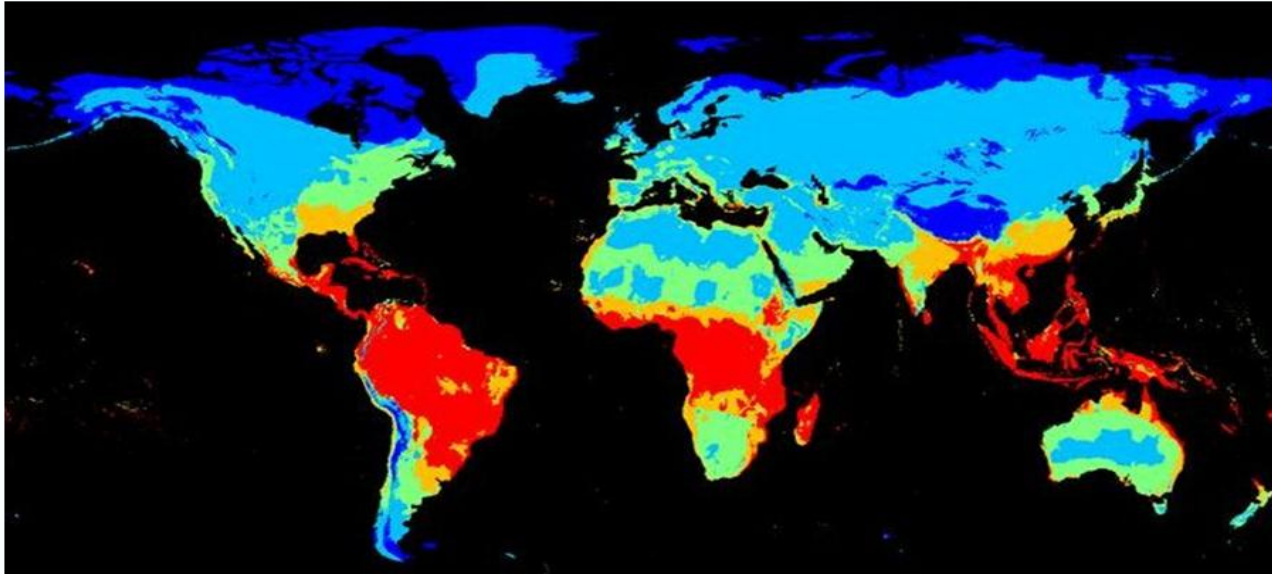
CABI

Red -  
most  
suitable

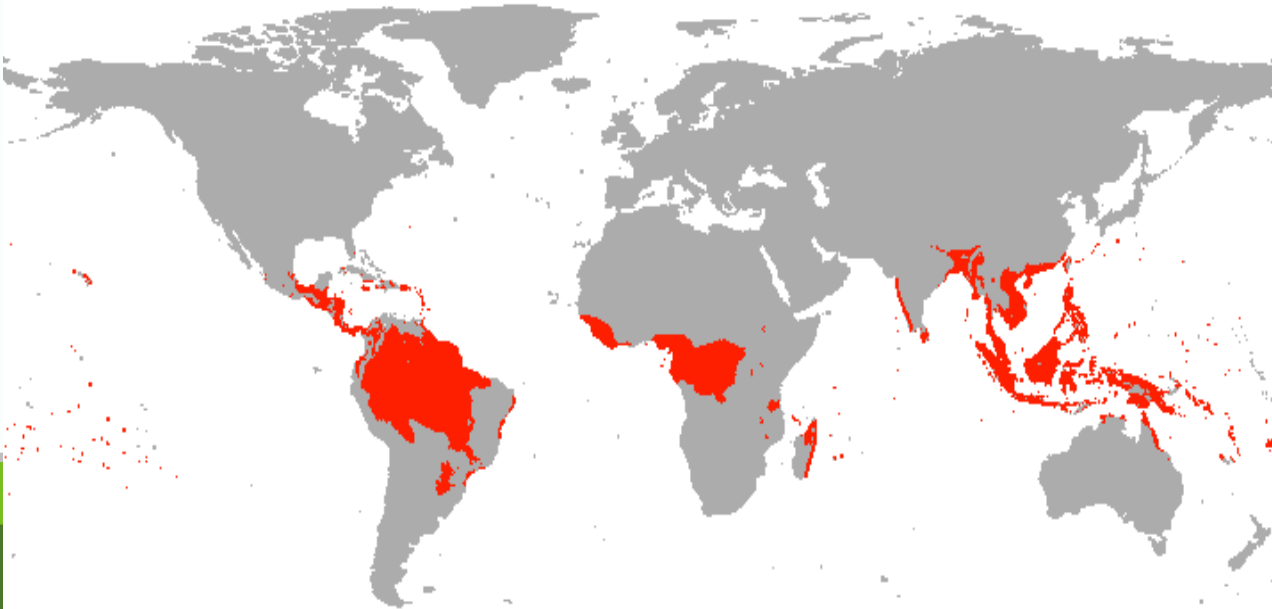
# Acacia mangium



# *Acacia mangium* – GBIF niche & Expert



GBIF incl.  
ALA data



Harwood

# *Acacia mangium* – plantations – CliMond

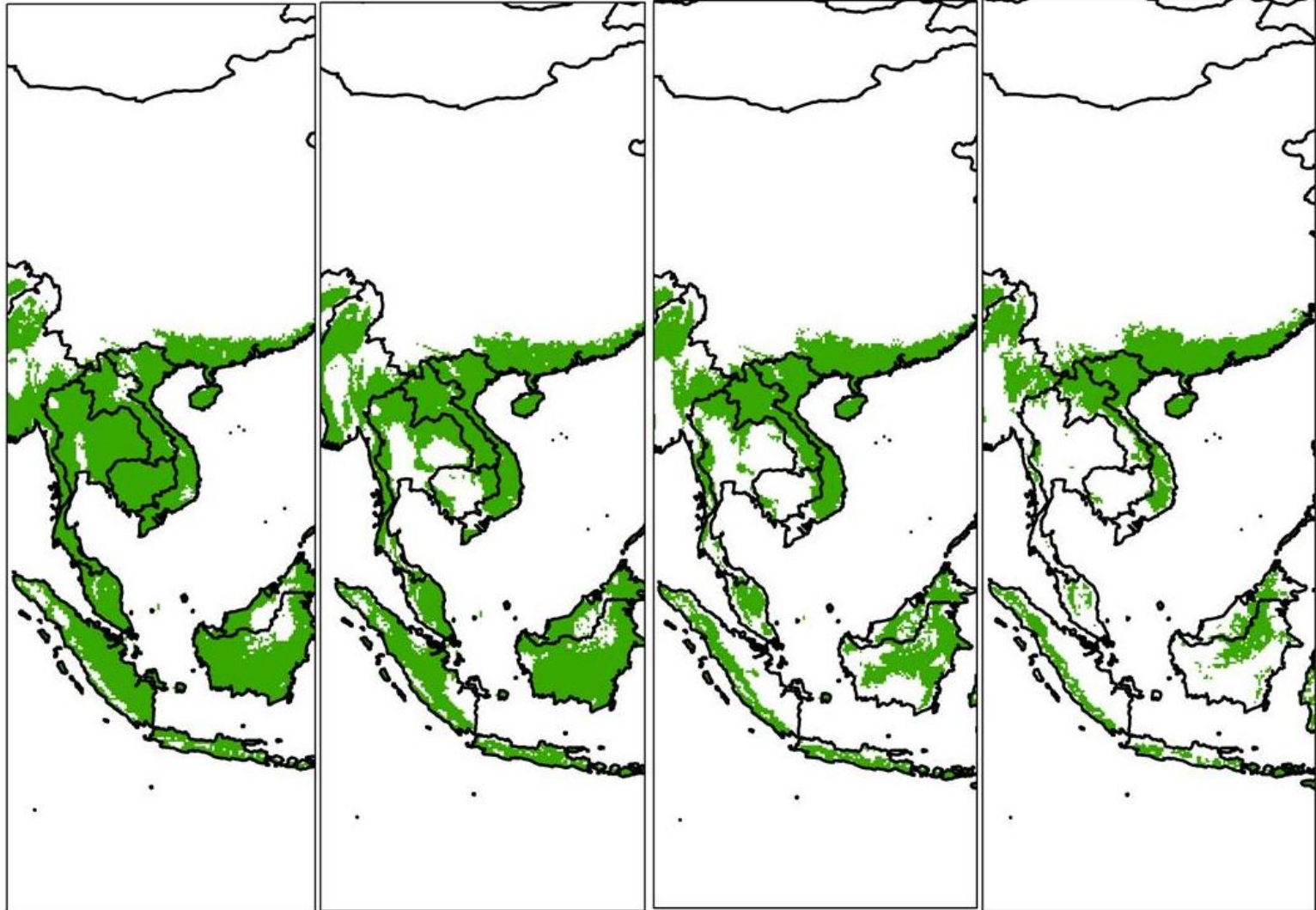
Booth, Jovanovic & Harwood (2014), *New Forests*, 45, 507-522

Current

CSIRO A2\_2030

CSIRO A2\_2050

CSIRO A2\_2080



Green -  
most  
suitable

# Conclusions

- ALA together with CABI (2005) & GBIF can assist
- Help manage stands under climate change
- Intrinsic climatic adaptability
- Limitations
  - GBIF – ‘occurrences’ not all geocoded
  - GBIF – not comprehensive
- Improvements - provenance information
- For more info see Booth (2014) Using biodiversity databases ... Forest Ecology & Management 315, 95-102  
also Booth *et al.* (2014) A generic method., New Forests



# Thank you

## Ecosystem Sciences

t +61 2 6246 4217

e [trevor.booth@csiro.au](mailto:trevor.booth@csiro.au)

w [www.csiro.au](http://www.csiro.au)

ECOSYSTEM SCIENCES

[www.csiro.au](http://www.csiro.au)

