

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

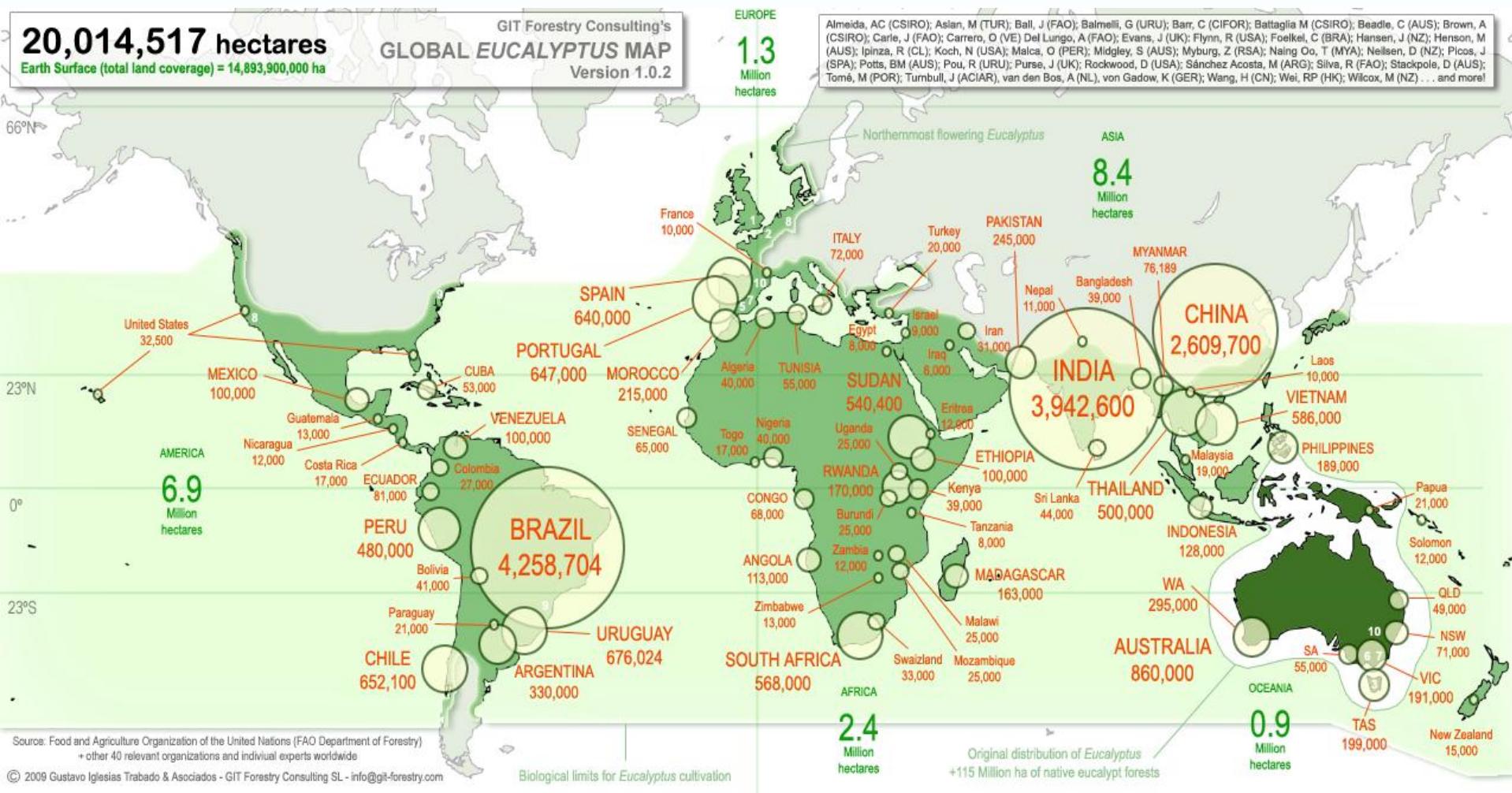
Background

- 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

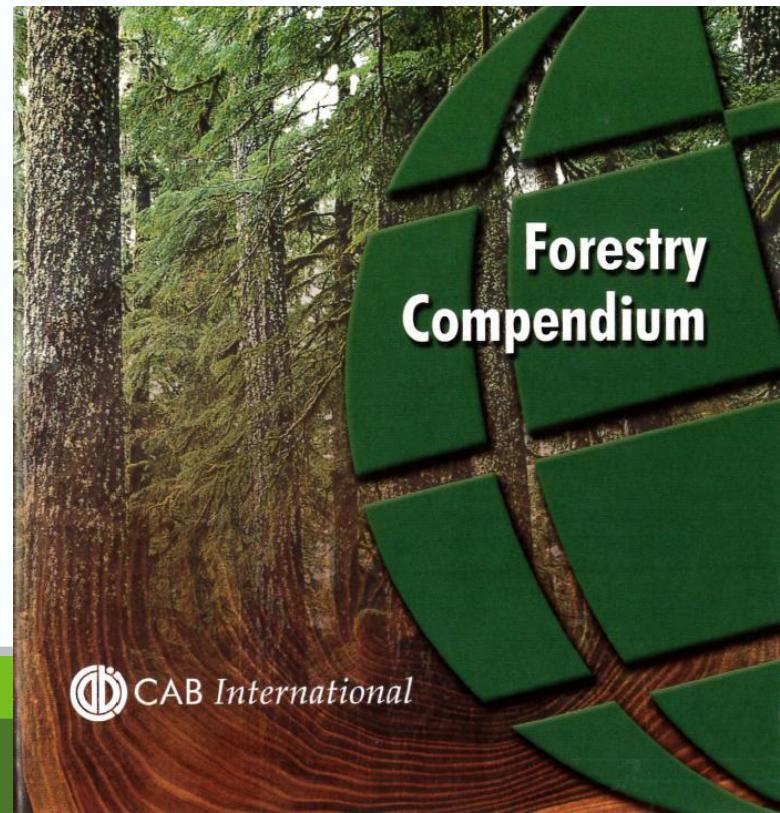
Mean max T hottest month 20 to 28°C

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



CAB International

Atlas of Living Australia – *E. nitens*

ATLAS OF LIVING AUSTRALIA sharing biodiversity knowledge

Home Dashboard Save session Log in Search

Add to Map Tools Import Export Help

 E. nitens   

 Eucalyptus nitens   

Map options

Highlight occurrences on the scatterplot that are in an area

Clear

Eucalyptus nitens

Precipitation - annual (Bio12): 1,174.00 - 1,850.57

Temperature - annual mean (Bio01)

1,800
1,700
1,600
1,500
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500

7 8 9 10 11 12 13 14 15 16

Northern Territory
Queensland
Australia
South Australia
Great Australian Bight
New South Wales
Victoria
Adelaide
Sydney
Brisbane
Gold Coast
Australian Capital Territory
Melbourne
Tasmania
Coral Sea
Tasman Sea

200 km
100 mi

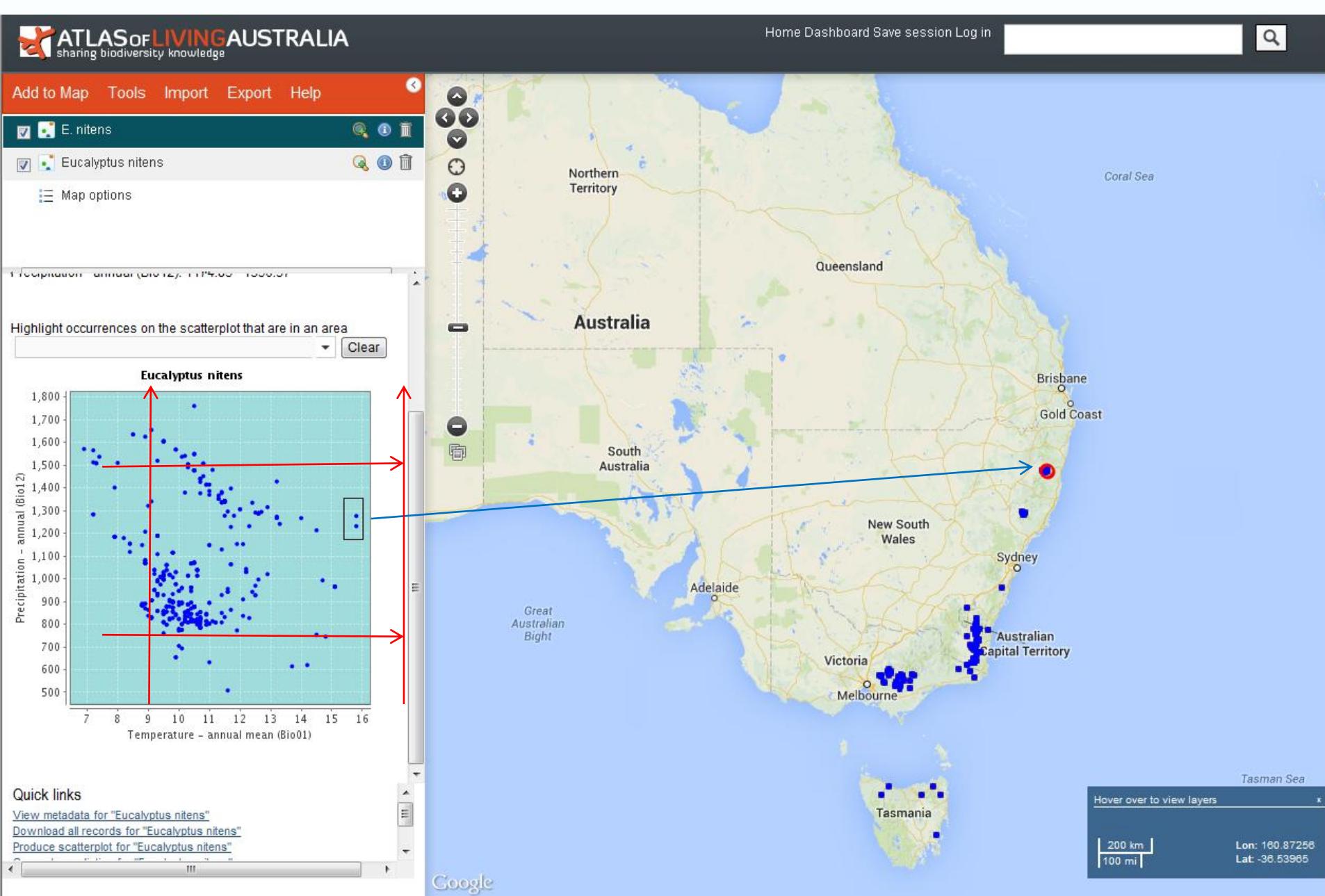
Lon: 160.87256
Lat: -36.53965

Hover over to view layers

Quick links

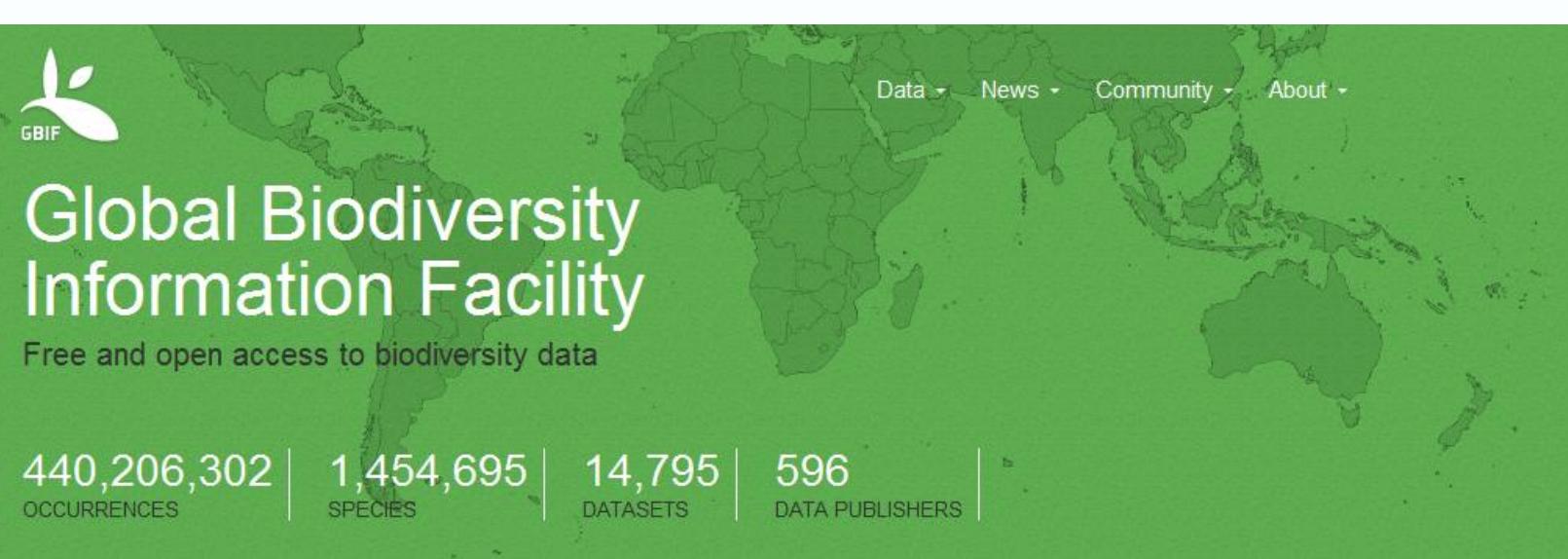
[View metadata for "Eucalyptus nitens"](#)
[Download all records for "Eucalyptus nitens"](#)
[Produce scatterplot for "Eucalyptus nitens"](#)

Google



Global Biodiversity Information Facility

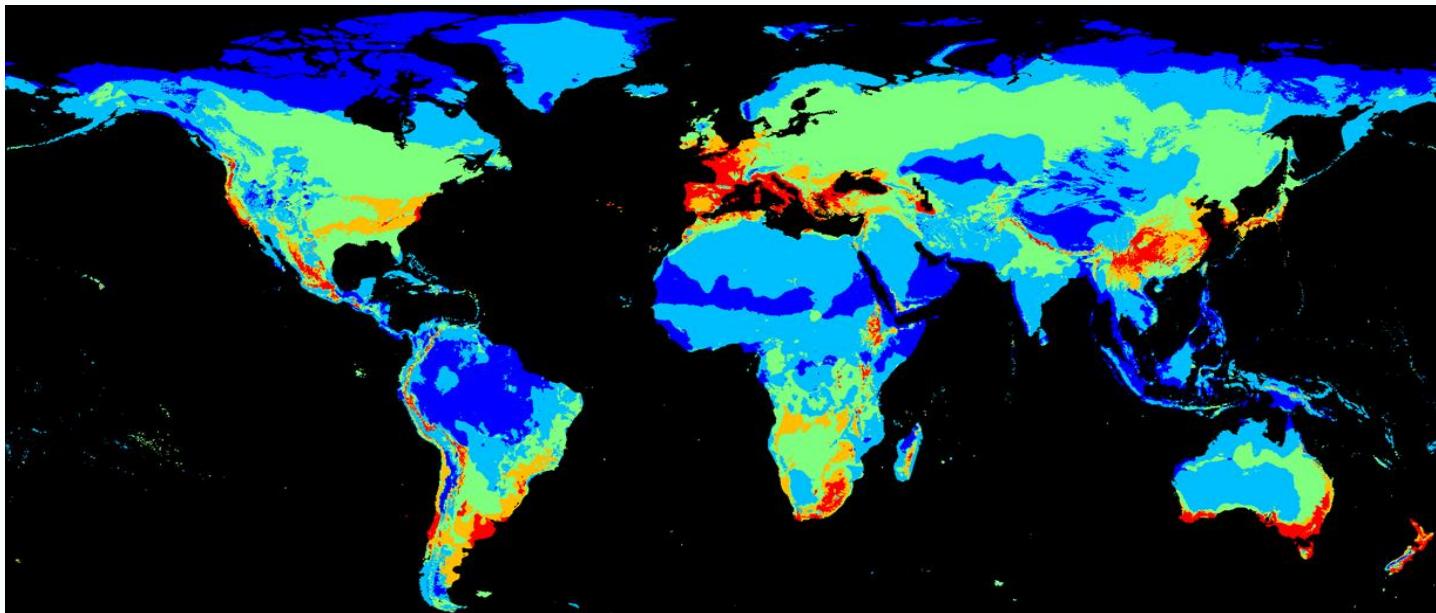
- *E. nitens* occurrences - Australia 413 (from ALA), Spain 33, Chile 1, New Zealand 5, USA 2, South Africa 1
- Old & new interfaces



E. nitens - GBIF data – analysed in ALA

The screenshot shows the ATLAS of LIVING AUSTRALIA interface. At the top left is the logo and navigation bar: "ATLAS of LIVING AUSTRALIA" and "sharing biodiversity knowledge". The top right has links for "Home", "Dashboard", "Save session", "Log in", and a search icon. Below the header is a red toolbar with "Add to Map", "Tools", "Import", "Export", and "Help". On the left, there's a sidebar with two entries: "E nitens - Spain only" (with a checked checkbox) and another entry below it. It also includes "Map options" and a "highlight occurrences on the scatterplot that are in an area" dropdown with a "Clear" button. Below this is a scatterplot titled "E nitens - Spain only" with "WorldClim: Precipitation annual" on the y-axis (500 to 1,350) and "WorldClim: Temperature - annual mean" on the x-axis (100 to 170). The plot contains numerous blue dots representing data points. To the right is a map of the Iberian Peninsula and surrounding regions. A blue arrow points from the scatterplot to the location of Seville on the map. The map shows major cities like Madrid, Barcelona, and Lisbon, along with geographical features like the Bay of Biscay and the Alboran Sea. A legend at the bottom right says "Hover over to view layers" and shows scale bars for 100 km and 100 mi.

E. nitens – GBIF niche & CABI (2005)



GBIF incl.
ALA data

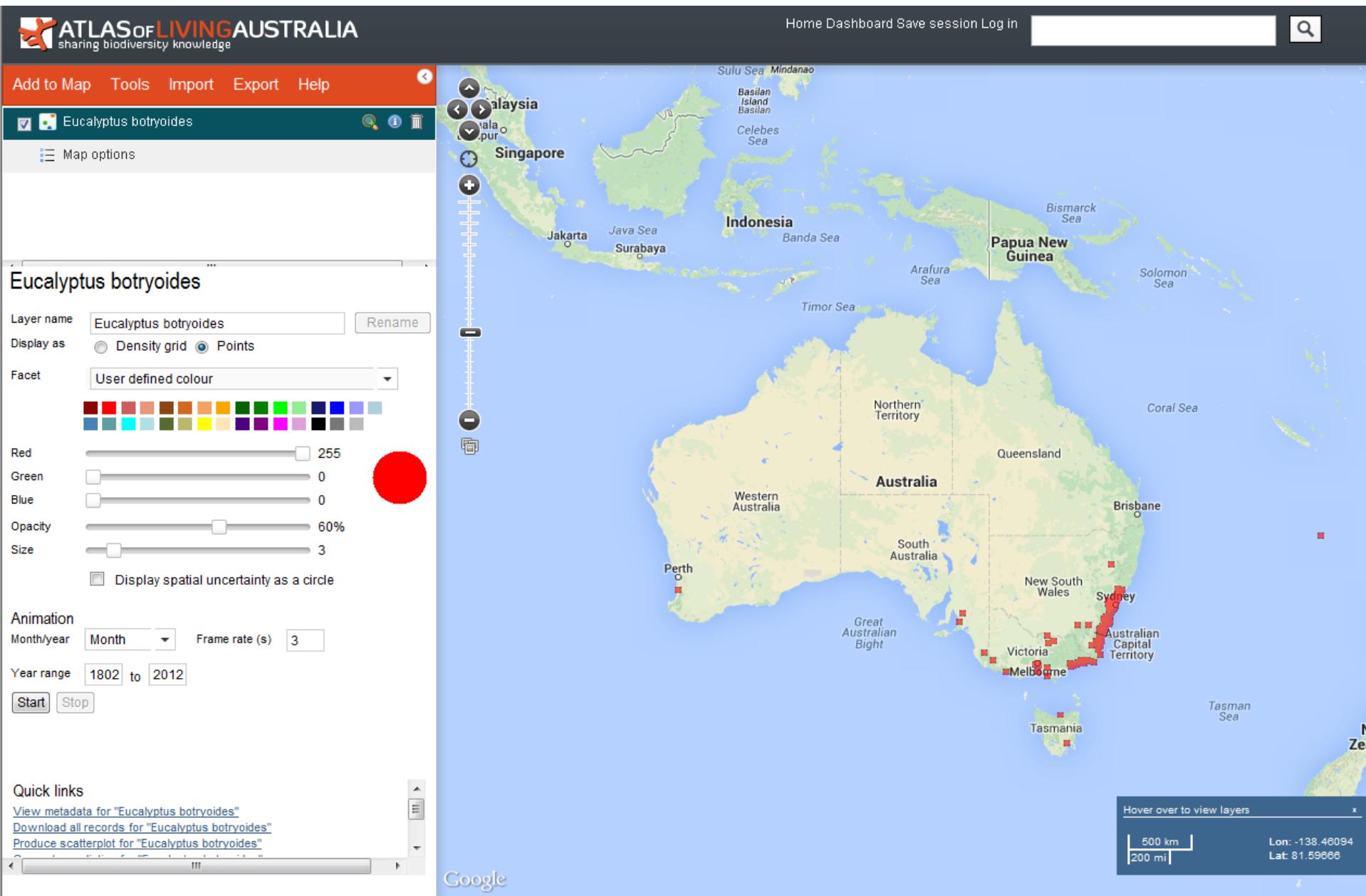


CABI –
Booth
& Pryor
1991

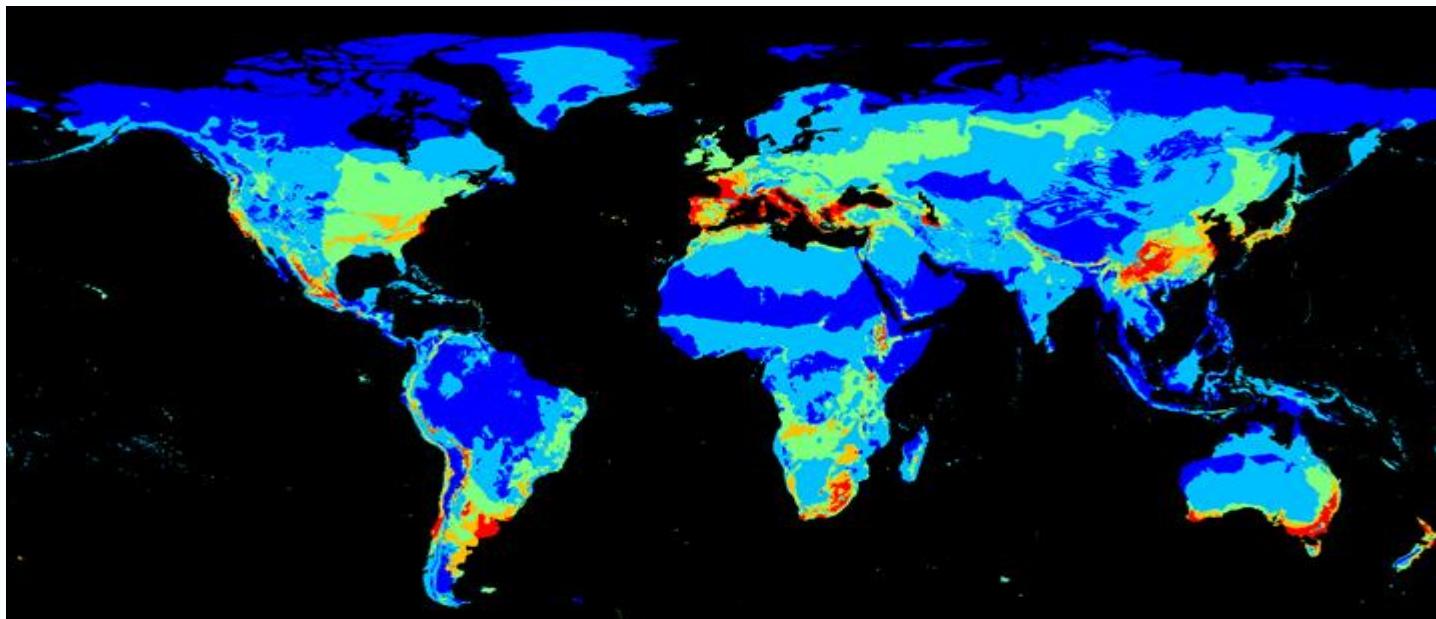
Red -
most
suitable



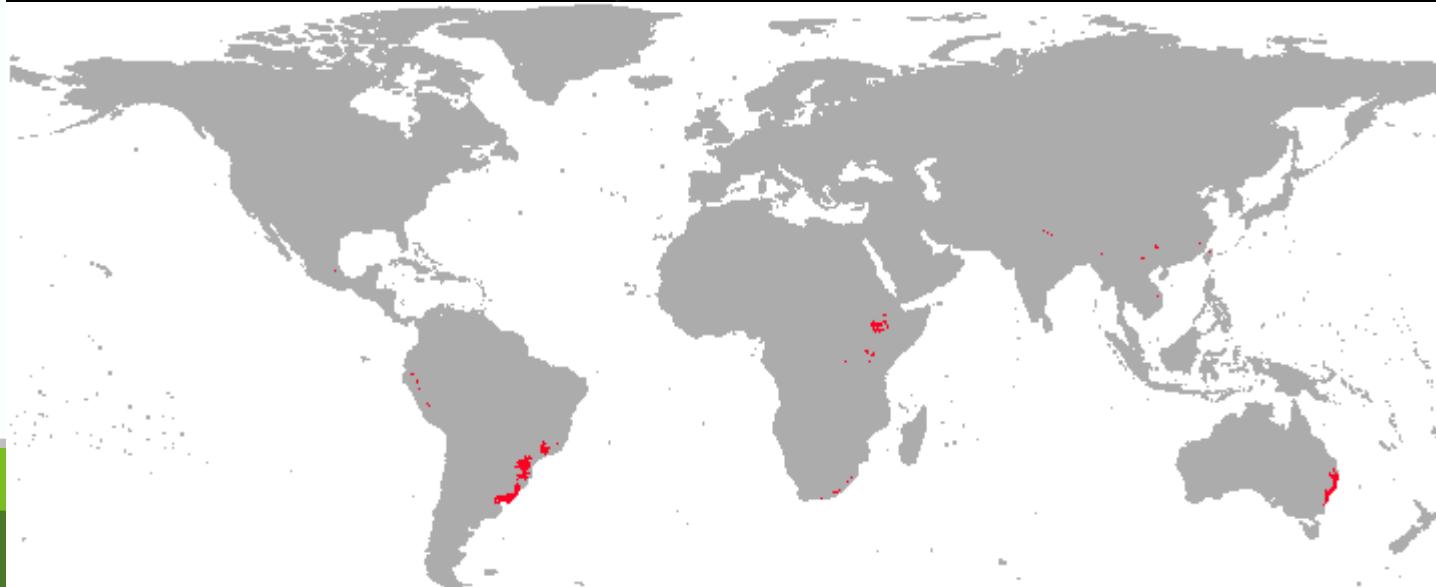
E. botryoides – a lesser-known eucalypt



E. botryoides – GBIF niche & CABI (2005)



GBIF incl.
ALA data



Red -
most
suitable

CABI



Acacia mangium

ATLAS OF LIVING AUSTRALIA
sharing biodiversity knowledge

Home Dashboard Save session Log in Search

Add to Map Tools Import Export Help

Acacia mangium Edit

Acacia mangium Edit

Map options

WorldClim: Precipitation - annual (254.502 - 455.040)

SELECT records with missing values (9)

Highlight occurrences on the scatterplot that are in an area Clear

Acacia mangium

WorldClim: Precipitation - annual

WorldClim: Temperature - annual mean

Quick links

[View metadata for "Acacia mangium"](#)
[Download all records for "Acacia mangium"](#)
[Produce scatterplot for "Acacia mangium"](#)

Home Dashboard Save session Log in Search

Map controls: zoom in/out, pan, etc.

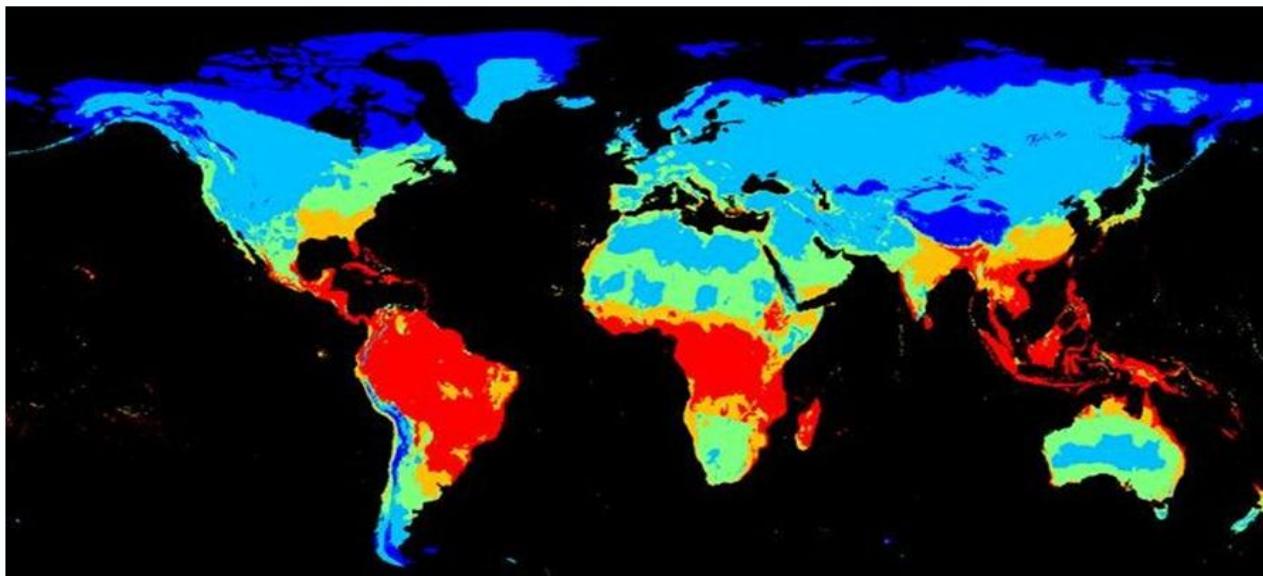
Map view: Southeast Asia and Australia. Labels include: Bangkok, Vietnam, Cambodia, Ho Chi Minh City, Andaman Sea, Palawan, Philippines, Sulu Sea, Mindanao, Basilan Island, Basilan, Celebes Sea, Indonesia, Banda Sea, Jakarta, Surabaya, Singapore, Kuala Lumpur, Papua New Guinea, Bismarck Sea, Solomon Sea, Northern Territory, Western Australia, Perth, South Australia, Great Australian Bight, Queensland, Brisbane, New South Wales, Sydney, Victoria, Melbourne, Australian Capital Territory.

Scatterplot legend: Hover over to view layers

Coordinates: Lon: 165.15723 Lat: 23.84262

Scale: 500 km

Acacia mangium – GBIF niche & Expert



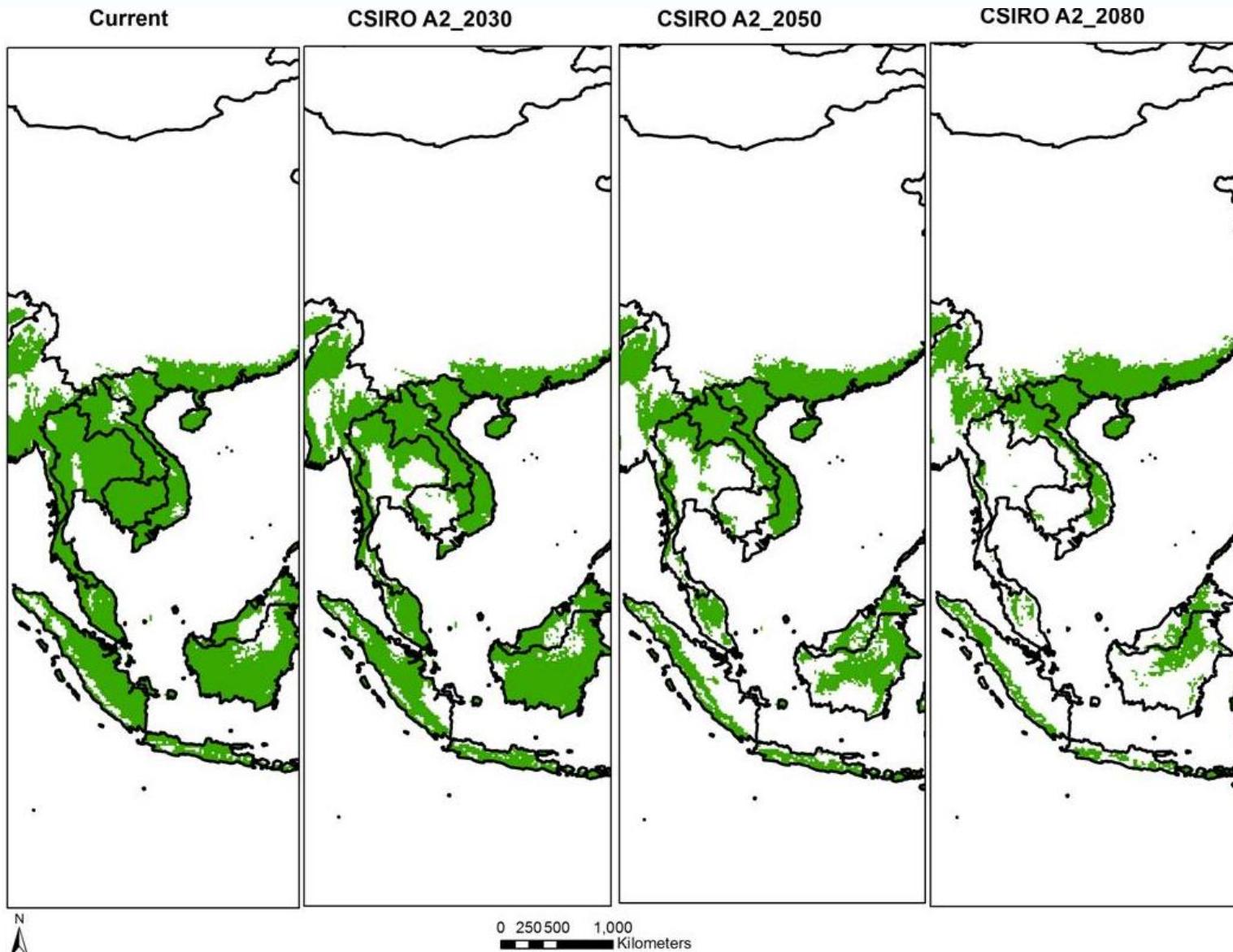
GBIF incl.
ALA data



Harwood

Acacia mangium – plantations – CliMond

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



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

w www.csiro.au

ECOSYSTEM SCIENCES

www.csiro.au

