Climate Ready Revegetation

A project idea to be developed by YAN landcare groups?

Plant survival in climate change

(a) Populations of plants with a current wide distribution into hotter areas may be more likely to be able to survive changed conditions

(b) Those plant populations with greater genetic diversity are more likely to survive changed conditions due to a greater ability to adapt

What can we do?

When undertaking revegetation we can aim to use plants that are

(a)currently widely distributed into hotter areas and

(b) that have good genetic diversity (come from large populations)

Basic idea….

- Find suitable sites for revegetation
- Find suitable species for survival under climate change
- Acquire optimum climate–ready seed (some probably from outside region)
- Plant and monitor

Events to date

- YAN acquired $5000 from Yass Valley Council in 2018 for a project called Seeds for the Future

- Two workshops were held in Oct Nov 2018 - anyone could attend
  - Seed collection
  - Climate Ready Revegetation

- This led to a ‘ Seed Interest Group’ with a strong interest in ‘Climate Ready Seed’

Project proposal idea:

- **Aim:** To assist the survival of native plant species during climate change in the Yass Valley Region through judicious selection of seed provenance to enhance genetic diversity.

- **Potential collaborators:**
  - Yass Area Network of Landcare Groups (about 6 groups including Murrumbateman, Yass, Sutton, Bookham-Bowning etc)
  - Greening Australia
  - Nola Hancock
  - Others?

- **Funding:** To be actively sought

Proposed Project Plan for Climate-Ready Revegetation
(idea only at this stage!)

Several parts to proposed project:

1. Identify interested landholders with sites suitable for viable climate- ready revegetation, and ongoing plant regeneration.
2. Develop seed collection capability in the YAN region (plant ID and site assessment).
3. Use an admixture seed collection strategy for identified species in the YAN region (including taking climate predictions into account)
4. ?Partner with GA to appropriately acquire, store and distribute seed as an admixture for YAN region.
5. Work with YAN landcare nurseries to improve seed acquisition processes and appropriate use of material.
6. Establish plants from collections at revegetation sites and establish monitoring methods

Part 2: develop seed collection capability in the YAN region

- The aim is to develop skills in interested people to collect high quality seed from local properties
- YAN has already got some funding and has had 2 workshops related to seed collection
- Ongoing learning through activities in landcare groups and identification of populations of plants suitable for seed collection
- Under the goal of ‘climate-ready revegetation’, some seed will be suitable to use locally, some will be suitable for other areas to use

Part 3. Use an admixture seed collection strategy for identified species in the YAN region (including taking climate predictions into account)

Climate-ready revegetation

A guide for natural resource managers. Version 2

Overview

This Guide represents a first attempt at compiling online tools available to assist natural resource managers incorporate the inherent uncertainties associated with climate change when planning revegetation activities. The information in the Guide is based on the premise that survival and resilience will be enhanced for species and local populations with large, genetically diverse populations. Species differ in their vulnerability to climate change. Species that cannot evolve and adapt to new environmental conditions *in-situ* as fast as the climate changes, or disperse to more suitable climes, will be more vulnerable than those with the evolutionary potential and/or the capacity to disperse. In theory, plants with wide distributions are more likely to cope with climate change than those with narrow distributions. However, even if a species' distribution indicates that it is able to tolerate a broad range of climate conditions, survival of local populations is not guaranteed. Small populations may require genetic rescue (incorporating non-local genetic material) to boost their capacity to adapt to a rapidly changing environment.

The Guide provides step-by-step instructions on where to find and how to use climate projections and how to consider the suitability of species and provenances for revegetation projects (Figure 1). The consideration of factors other than climate change to determine the suitability of species and provenance selection (e.g. soil characteristics, topography and aspect) are covered in other publications and are not addressed in this Guide (e.g. the Standards for the Practice of Ecological Restoration in Australia (SERA) http://www.seraustralasia.com/pages/standards.html, or look for regional examples such as www.biodiversitygateway.com.au/SWSR_Guide/home.html).

Presented at YAN workshop late 2018

Please cite as: Hancock, N., Harris, R., Broadhurst, L. and Hughes, L. 2018. *Climate-ready revegetation. A guide for natural resource managers.* Version 2. Macquarie University, Sydney. Accessible from: **http://anpc.asn.au/resources/climate_ready_revegetation**

http://anpc.asn

Part 3. Use an admixture seed collection strategy for identified species in the YAN region (including taking climate predictions into account)

Using the ‘Climate–Ready Revegetation’ desktop guide, the basic steps are

1. Determine the predicted climate for Yass region

2. Identify a list of suitable species for study regarding climate readiness
(?20 from 3 Landcare nursery lists)

3. For each plant, assess current distribution and climate envelope

4. Assess whether the plant is likely to survive in the predicted climate - YES or NO.

-If YES. Use admixture seed collection strategy.

-If NO, consider another species with a similar ecological role
(could be from another region)

Previous climate across YAN region (1961-1990)

	Temperature				Rainfall			
Location *=BOM station	Annual Range (Average Min-Average Max)	Absolute Min	Absolute Max	Days Frost (average <0°C)	Annual Rainfall (average)	Absolute Min Annual	Absolute Max Annual	Days Rain >1mm (average)
CBR Airport* Sutton	6.5-19.6°C	-10.0°C	42.2°C	63 days	623.2mm (654.9mm at Anchorage)	262mm	977mm	74 days
Harden* Bookham	7.5-21.8°C	-7.5°C	41.8°C	46 days	611mm	299.6mm	876mm	76 days
Yass* Murrumbateman	7.0-20.5°C	-8.8°C	41.2°C	46 days	681.6mm	285mm	983mm	79 days

*1 Jan 1961 to 31 Dec 1990 or closest available, BOM Climate Data, Monthly Main Statistics Report. Sites: Sutton - Canberra Airport (1960-1990 temperatures and rainfall) , BOM station number 070014 35.3S149.2E, elevation 578m (NB: The Anchorage in Sutton site is 725m); Murrumbateman – McIntosh Circuit BOM site 070344 34.9S149.0E, elevation 600m (OR Yass/Linton instead as data only from 1985 onwards); Bookham – Harden (East St) (1967-1980 temperatures, 1960-1980 rainfall) BOM site 073016, 34.6S148.4E, elevation 430m ; Yass (1965-1990 temperatures, 1960-1990 rainfall) - Linton hostel 070091 BOM site, 35degS, 149 E, elevation 520m; Burrinjuck Dam --BOM Site 073007, 35.0S148.6E, elevation 390m.

Not all towns have BOM sites (*).

Gradient across YAN region

How do these compare to your own records?

Predicted climate for Canberra region

CANBERRA TEMP AND RAIN PROJECTIONS UNDER CO2 EMISSION SCENARIOS (uncertainty not included)

EMISSIONS	2030	2050	2090
LOW	T +1C R 0%	T +1C R 0%	T +1C R -10%
MED	T +1C R 0%	T +1C R 0%	T +2.3C R -5%
HIGH	T +1C R 0%	T +2.3C R -5%	T +3.7C R -10%

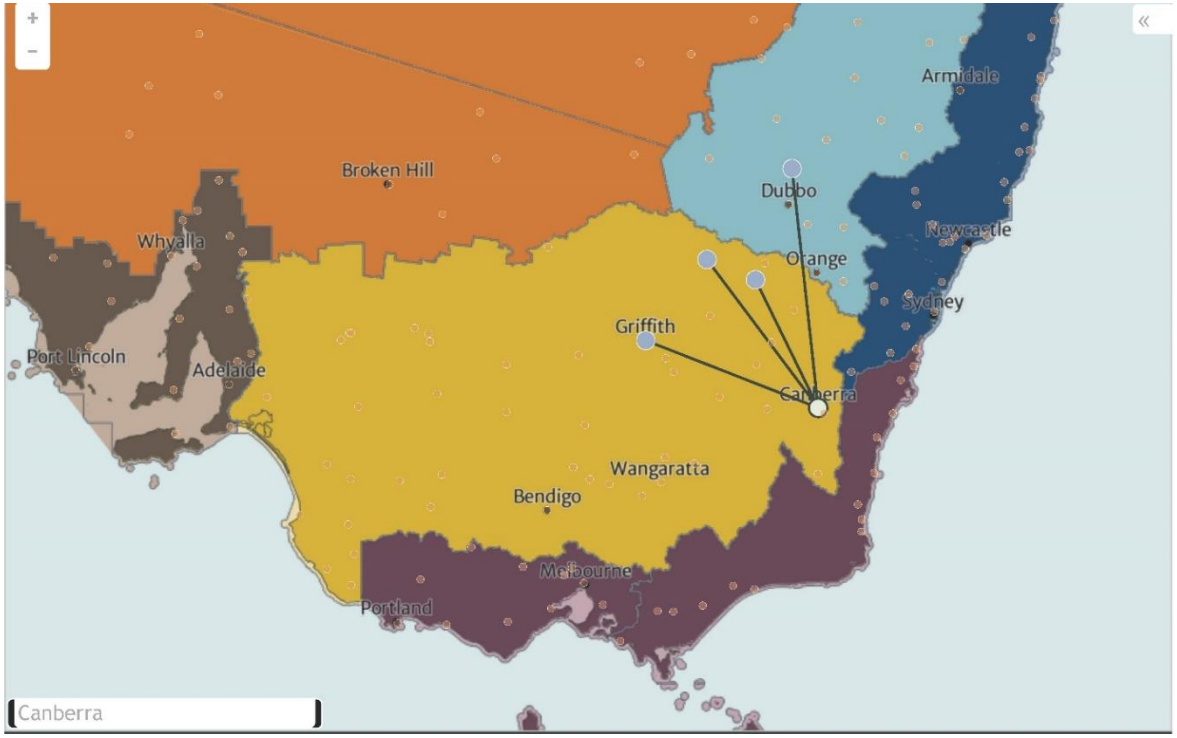
Source: NRM, CSIRO, March 2018

BUT likely less rain in spring and more in autumn and more extreme days of both heat and cold.

Source SE Tablelands Report:
https://climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/Climate-projections-for-your-region/South-East-and-Tablelands-Climate-Change-Downloads

High Emissions Climate Predictions Canberra, 2090

Canberra will be like Gilgandra, Condobolin, Forbes, and Griffith are today



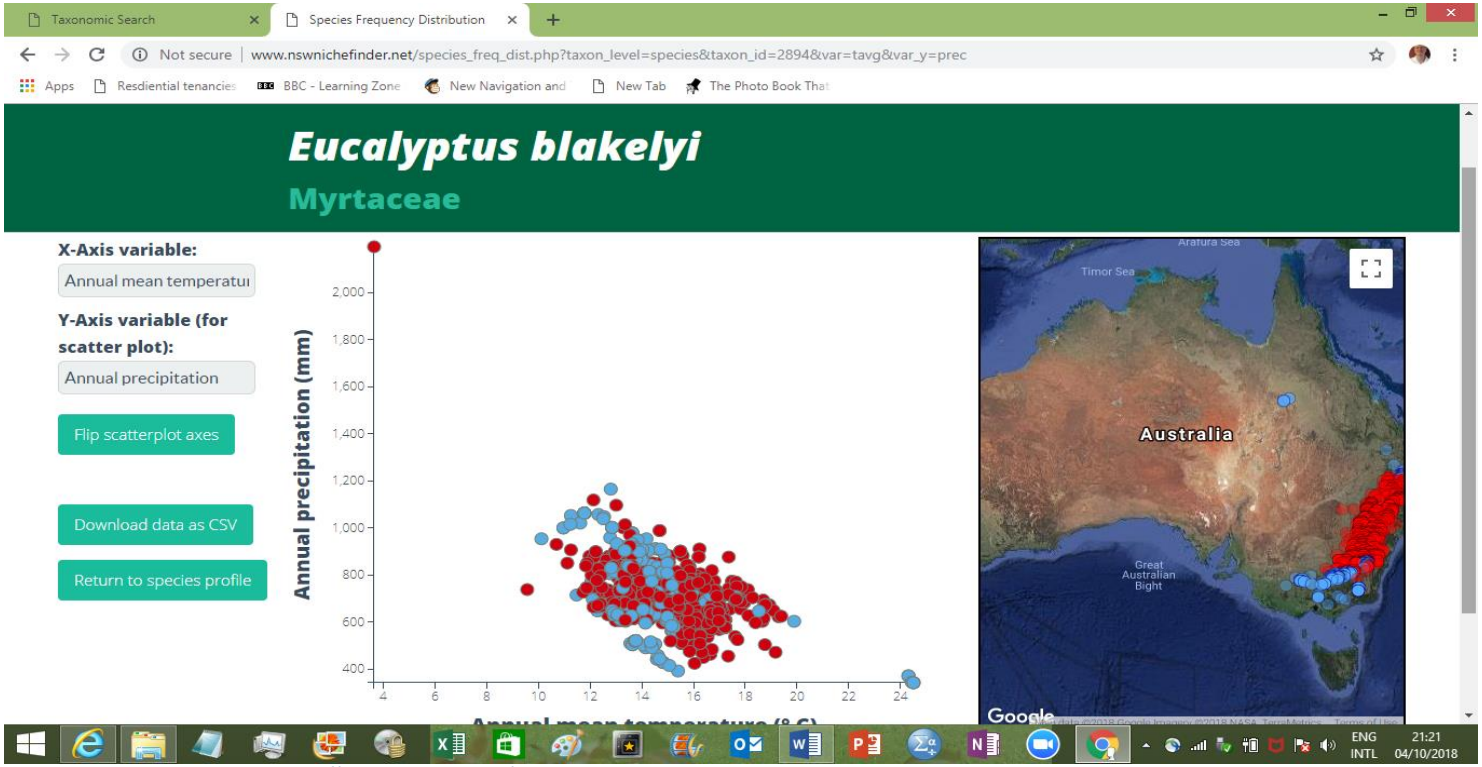
Our climate changes as if we move west and north over time.

Climate Analogues for Canberra, with Hottest and Driest Projections and RCP of 8.5 from CSIRO and Bureau of Meteorology, Climate Change in Australia website (http://www.climatechangeinaustralia.gov.au/)

2. Identify a list of suitable species for study regarding climate readiness
(?20 from 3 Landcare nursery lists)

3. For each plant, study the current distribution and current climate envelope

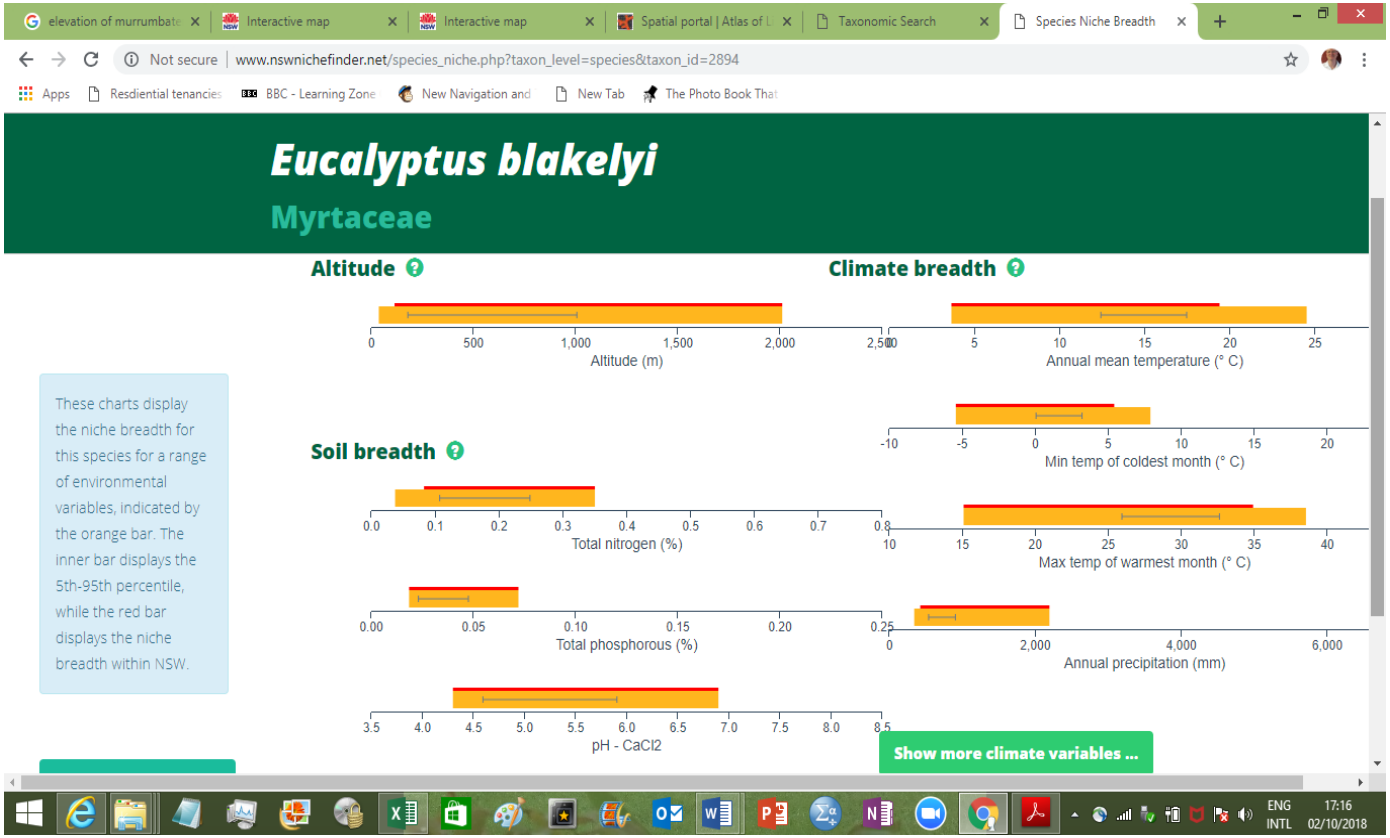
For example, Blakely's Gum, *Eucalyptus blakelyi*



http://www.nswnichefinder.net/species_niche.php?taxon_level=species&taxon_id=2894

Can place Yass region as a spot in this envelope
(Current annual temp approx. 7.5 min and 20max, rain 681mm)

Consider other essential factors e.g. frost days, soil type



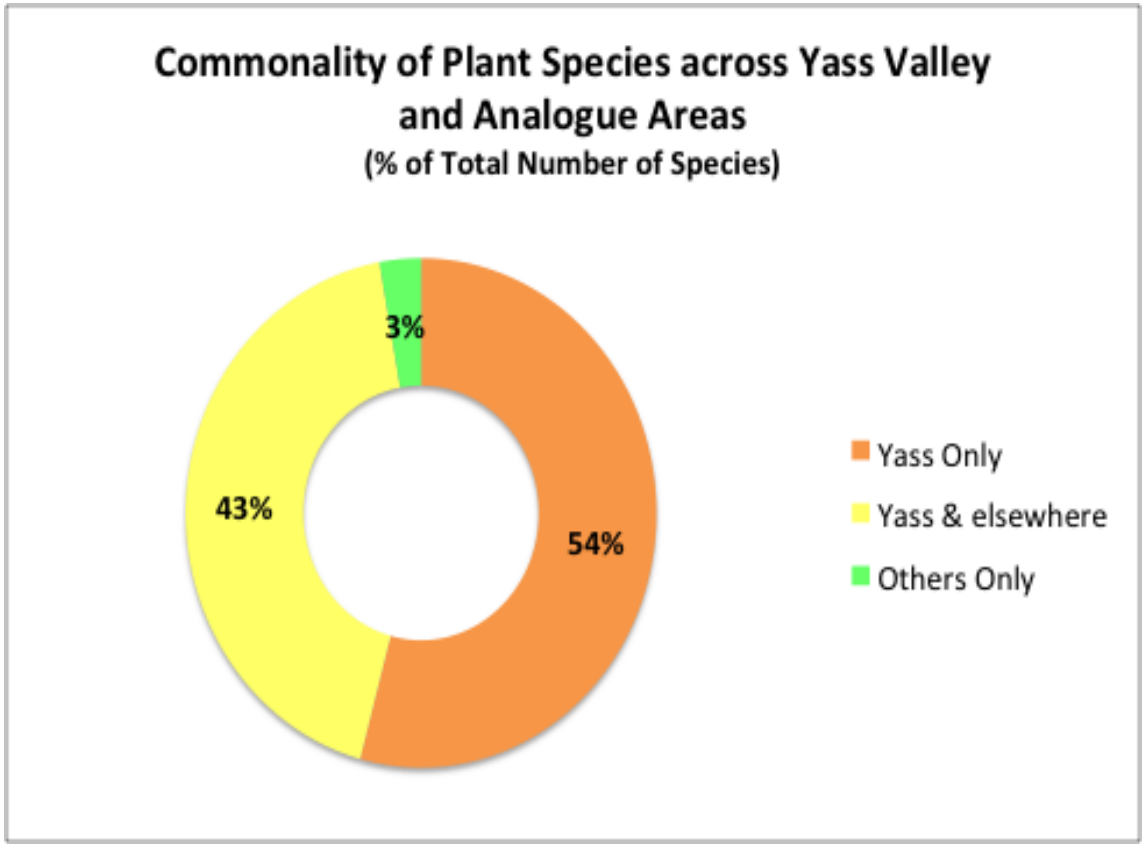
http://www.nswnichefinder.net/species_niche.php?taxon_level=species&taxon_id=2894

Assess whether the plant is likely to survive in the predicted climate

If YES use admixture seed collection

If NO substitute another species

Another view of suitability of species



If less than half our plant species adapt to climate change, what will our landscape be like?

The proposed project is about helping to manage this

Note: Charts based on collation and comparison of plant species identified as present in the Yass Valley with those of Bathurst, Cootamundra, Forbes, Gilgandra and Lachlan LGAs as published on www.nswnichefinder.net on 2 Feb 2019. Nichefinder includes only point occurrence data for all plant species in NSW. These were accessed from digitised, vouchered herbarium specimens held within the Australian Virtual Herbarium (AVH).

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