

## **NCCARF Progress Report 2011 - Nola Hancock**

### **Overall aim of research**

Worldwide, restoration projects are increasing and accurate seed sourcing guidelines are urgently needed for a wide range of species. Climate change, fragmentation and the fact that demand for seed frequently outstrips supply, makes the question of where to source seed for restoration projects urgent and complex. Traditionally, seed has been sourced locally, within a 5 km radius of the restoration site, to “preserve” the genetic integrity of the replanted site. Local populations are perceived to be better adapted to local conditions resulting in superior survival, faster growth rates and increased restoration success. Recent studies, however, have shown that in some cases, population size is more important for restoration success than geographic distance when selecting source material. Despite this new research and scant evidence that “local provenance is best”, there is a reluctance by practitioners to accept this new paradigm. This project aims to provide a more rigorous scientific basis for restoration activities by investigating how to optimize the collection of source material to improve the long-term success of restoration projects.

The following details the work that has been completed and the anticipated due dates for submission of journal papers and the completion of the thesis:

### **Chapter 1: General introduction**

The general introduction will be written at the completion of all the chapters, towards the middle of 2012.

### **Chapter 2: Local provenance: site and species specificity challenge the “local is best” paradigm**

This experiment aims to test the “local is best” paradigm by comparing the survival and growth rates of local provenance plants to non-local provenance in a common garden experiment. The Cumberland Plain is used as the local provenance and the performance of six species, typical of a Cumberland Plain Woodland community, are compared to those same species from four different provenances.

To date, three of the six species (*Eucalyptus crebra*, *E. tereticornis* and *Hardenbergia violacea*) have been harvested with the remaining species (*Themeda australis*, *Acacia falcata* and *Bursaria spinosa*) expected to be harvested during the months of May – July 2011. I anticipate having this paper ready for publication by the second quarter of 2012.

### **Chapter 3: Is local provenance still relevant in a world with higher CO<sub>2</sub>?**

This experiment compared the survival and growth rates of plants from different provenances when grown under elevated CO<sub>2</sub> and high temperatures. Two species, *Acacia falcata* and *Eucalyptus crebra*, each with seed from three provenances were compared. Once again, seed sourced from the Cumberland Plain was used as one of the provenances. Specifically, this experiment investigated which provenance gives an indication of superior performance for future restoration projects.

All plants from this experiment have been harvested. This data is currently being analyzed and it is anticipated that this paper will be ready for submission by early 2012.

**Chapter 4: The adaptability of local provenance under high temperature stress.**

To investigate if the local provenance is the best suited seed source for future restoration projects, I test the “local is best” paradigm by comparing the performance of plants of local provenance to those collected across the geographic ranges of the species, under temperature conditions that are expected in western Sydney by 2050. *E. tereticornis* and *Themeda australis* were subjected to ambient + 2-4 ° C during the summer of 2010/11. This coincides with a forecast rise of mean daily minimum and maximum temperature increases of between 1.5 and 3 ° C for the region by 2050.

The plants from this experiment are currently being harvested and a journal paper should be ready for submission the second quarter 2012.

**Chapter 5: Local provenance survey**

This chapter will contain a survey of practitioners regarding their use and knowledge of provenance issues, both under current conditions and future climate change scenarios. A survey was started some years ago by a former student and this will form the basis of the new study. I anticipate starting this survey towards the end of 2011 and finishing mid 2012.

**Chapter 6: Conclusion and submission of thesis**

The conclusion and submission of the thesis are anticipated to be finished by September 2012.

**Time line for completion of thesis**

	<b>2<sup>nd</sup> Q2011 Ap-Jun</b>	<b>1<sup>st</sup> Q 2012 Jan-Mar</b>	<b>2<sup>nd</sup> Q2012 Ap-Jun</b>
<b>Chapter 2</b>			
Harvest remaining 3 species			
Analyze data & write paper			
Submit paper for publication			

<b>Chapter 3</b>	<b>2<sup>nd</sup> Q2011 Ap-Jun</b>	<b>3<sup>rd</sup> Q 2011 Jul-Sep</b>	
Analyze data			
Analyze data & write paper			
Submit paper for publication			

<b>Chapter 4</b>	<b>2<sup>nd</sup> Q2011 Ap-Jun</b>	<b>1<sup>st</sup> Q 2012 Jan-Mar</b>	<b>2<sup>nd</sup> Q2012 Ap-Jun</b>
Harvest species			
Analyze data & write paper			
Submit paper for publication			

<b>Chapter 5</b>	<b>3<sup>rd</sup> Q 2011 Jul-Sep</b>	<b>4<sup>th</sup> Q 2011 Oct-Dec</b>	<b>1<sup>st</sup> Q 2012 Jan-Mar</b>	<b>2<sup>nd</sup> Q2012 Ap-Jun</b>
Prepare survey				
Administer survey responses				
Analyze data & write paper				
Submit paper for publication				

<b>Completion of Thesis</b>	<b>3<sup>rd</sup> Q 2012 Jul-Sep</b>
<b>Chapter 1</b>	
Write introduction	
<b>Chapter 6</b>	
Write conclusion	
<b>Submit Thesis</b>	

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