Collecting and Propagating Local Provenance Plants©

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INTRODUCTION

Increasingly, local provenance plants are being requested to be used in local remnant restoration projects. This presentation will focus on what we as a nursery see as our contribution to the best possible outcome for restoration projects, the supply of an increasing number of species sourced from local provenance material.

LOCAL PROVENANCE

Local provenance plants are desirable as it is likely that locally adapted populations will have a higher survival and reproduction rate in their local environment than plants from the same species sourced from further away. Hereford (2009) reviewed many papers looking at local adaptation and showed that on average, plants from a local area will have approximately 1.5 times greater survival and reproduction compared to foreign populations of the same species grown at the same location.

Secondly the use of local provenance plants conserves local genetic diversity and reduces the risk of genetic pollution. The risk being that hybridisation between local and nonlocal types may reduce survival and reproduction in future generations (Hufford and Mazer, 2003).

Defining just how local is local enough is strongly debated. Often geographical proximity is suggested with various distances from a restoration site being advocated (e.g., Krauss and Koch, 2004). However, geographic proximity is unlikely to be suitable in all cases as we observe significant changes in vegetation over very small distances on the Swan Coastal Plain, most often associated with the soil type and topography.

Florabank <www.florabank.org.au/> recommends that provenance be considered in the following manner when collecting seed for revegetation and I think this applies equally well regardless of what propagation material is being collected.

1) Get the taxonomy right first.
2) Get the physical and genetic quality right.
3) Only collect from large populations or pool multiple collections from smaller populations.
4) Store seed under best conditions from collection right through to use.
5) Match the site conditions.

COLLECTING PROVENANCE PROPAGATING MATERIAL

In the majority of cases we like to collect propagation material from the actual remnant site or from other nearby sites containing the same species and site conditions. We aim to collect from healthy, vigorous populations containing a significantly large population size to avoid potential inbreeding problems that may occur in some remnants.

We produce local provenance plants from seed, cuttings, or divisions collected from wild populations. In Western Australia, this requires two separate licences

from the Department of Environment and Conservation (DEC), one to collect from private property and other to collect from Crown land. These licenses require the land owners or managers permission and returns for all material taken must be submitted quarterly to the DEC.

Seedlings. Raising plants from seeds is often the cheapest and most efficient way and is very successful for many of the most widely used plants in restoration including *Acacia*, *Eucalyptus*, *Melaleuca*, *Banksia*, *Hakea,* etc. Locating, collecting, extracting, cleaning, treating, and germinating seed from the diverse range of plants that occur in our area [southwest Western Australia (WA)] ranges from being relatively straight forward through to having one or more of these steps being totally limiting.

One of the biggest challenges is to produce plants of suitable size on time. We have a very small window for restoration planting in WA, when it rains the plants have to be ready to go. However, by the time some seed are ripe for collecting it is too late to grow them to sufficient size for planting. So, for these species seed from the previous season needs to be sown early to ensure it is ready for planting. For example, *Ancanthocarpus priesii* requires months of warm stratification to germinate and thus seed collected in the current season would never be ready in time.

The actual amount of seed we require is relatively small so it is much better for us to collect and store seed when it is available. We find it most important to record locations and timing of seed collection as it can be incredibly frustrating to find seed too immature to collect on one trip and then shed on your next trip.

There is no doubt that this is more expensive and difficult than just buying seed of unknown provenance and that the increased cost must be passed on to the client.

Many of the seed collected require elaborate extraction and germination pretreatments before sowing and for many species some trial and error is required before a suitable method is established. We also find that the temperature over summer in our nursery (when we need to germinate the seed) is too hot for many species to germinate consistently and an incubator set at 15 °C is required for best results.

Cuttings. We also grow a lot of plants for restoration by cuttings. In most cases this is from wild collected material however stock plants from some species from various provenances have been established in our nursery where continual collection from the wild is unfeasible.

Most of the cutting collection that we do is for species which are difficult or inconsistent from seed. These include *Myoporum*, *Eremophila*, *Grevillea*, *Hemiandra*, *Pimelea*, *Leucophyta*, *Hibbertia*, *Atriplex*, *Carpobrotus*, and *Spinifex*. As with seed collecting it is our aim to collect some cuttings from as large as number of plants as possible, always looking for the healthiest individuals and rejecting anything with signs of pests or disease.

Collecting cuttings has the advantage over collecting seed of being available when we need it (over summer), however has the disadvantage of having to be carefully handled especially as we are often collecting it at the hottest time of the year in Perth. We collect as early as we can in the morning, filling foam boxes lined with wet newspaper with the cuttings and getting them back to the nursery before the heat of the day sets in. We find cuttings collected in this manner and stored wrapped in damp newspaper can last well in a fridge up to weeks if required.

As the cuttings are wild collected, extra care and attention is paid to any signs of pest or disease when processing and any suspect material is rejected. Cutting ma-

terial should then be washed and surface sterilised prior to treating as per normal cutting propagation.

Divisions. For some monocots, no reliable method of seedling production is currently available and for these species division is the best bet. We have used this method to propagate many species otherwise considered difficult including species of *Lepidosperma*, *Hypolaena*, *Lomandra*, *Dianella*, *Agrostocrinum*, *Machaerina* (syn. *Baumea*), and *Schoenus*.

This is a long-term project and plants are not generally available for several years. The ideal situation is to get some provenance-correct seed to germinate. We find that if we sow enough seed and wait long enough (well over a year sometimes) we can raise some seedlings. Vigorous individuals are then selected as stock for future divisions.

These juvenile plants can be manipulated in pots to multiply and regular divisions can lead to a bulking of material over time, similar to multiplying plant shoots as done in tissue culture. This is a relatively slow process to begin with and it may be years before numbers are high enough to begin to sell plants. Then, of course a proportion must be kept each year to ensure stock for the following year.

Another method we have used although I prefer not to, is to initiate wild-collected rhizomes into pots. We have successfully done this with five species of *Lepidosperma* (*L. gladiatum*, *L. longitudinale*, *L. squamatum*, *L. angustatum*, and *L. gibsonii*) and with species of *Machaerina* and *Schoenus*. Although this can be quite successful for some species there are several reasons why it is not recommended. Firstly it can be a lot of hard work retrieving wild rhizomes in the first place especially *L. gladiatum*. Then there is the possibility of damaging both the plant you are collecting from and other surrounding plants, with the disturbance you are causing damaging what may already be a fragile remnant. Finally there is the possibility of spreading soil-bourn pest or disease.

We have developed a protocol which we believe addresses these concerns but should only be used after it is determined that obtaining seed-raised stock plants is not possible. Our method involves firstly only collecting from sites believed to be free of *Phytophthora*. Secondly new actively growing rhizomes are targeted and cut from the adult plant with a minimum amount of soil disturbance. If done correctly these are similar to a rooted cutting. All soil is washed from collected rhizomes on site and then treated as if cuttings for the purposes of transport.

Back at the nursery, any old leaves and roots are removed and new leaves are trimmed. The rhizomes are then completely submerged in disinfectant before being rinsed and planted. Surviving plants can then be divided in subsequent years.

CONCLUSIONS

Regardless of the method of propagation, all plants to be planted in restoration projects being sold by our nursery are treated with the highest degree of hygiene. By following the nursery accreditation guidelines we are doing our utmost to ensure that we are not adding to the problems of our remnant vegetation by introducing weeds or any other pests or diseases. By supplying provenance-correct plants we are increasing the likelihood that they will survive and reproduce in the remnant and not contribute to potential genetic pollution in future generations.

LITERATURE CITED

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