

## Report to the Arcadia Fund

### The Rainforest Conservation Project – Year 4 of 5

Reporting period: November 2015 – October 2016

#### Year 4 progress

The past year has seen remarkable progress in the Rainforest Conservation Project (the Project). Of particular note is that the Royal Botanic Gardens (RBG) is now considered the foremost rainforest conservation institution in Australasia and one of the few active and effective teams operating anywhere in the world. We are now approached by and included in national and international collaborative projects that have long-term conservation outcomes.

We have consolidated our leadership in the field throughout the year. Here are some of the highlights that have helped us achieve this position:

- We organised and hosted the first National Seed Science Forum in March 2016. It was attended by 145 scientists and restoration practitioners from around the world. Rainforest Conservation was a particular focus of the Forum and several national/international collaborations were initiated.
- We sponsored a Malaysian rainforest researcher to attend the forum.
- The Australian Threatened Species Commissioner launched the 'National Standards for Ecological Restoration' at Australian PlantBank in March 2016. This is the first of its type in the world.



The Federal Threatened Species Commissioner Gregory Andrews launches the 'National Standards for Ecological Restoration' at Australian PlantBank in March 2016.

- Plants grown on from germination experiments are now being incorporated into nationally significant collections in other botanic gardens, including the Australian National Botanic Gardens (Canberra).



*Parachidendron pruinosum*



*Uromyrtus australis*



*Daphnandra johnsonii*

Seedlings generated during the rainforest conservation project donated to the National Botanic Gardens Canberra, in 2015.

- Our Rainforest Conservation Scientist Karen Sommerville was again successful in gaining a RBG Foundation and Friends scholarship to intensively study cryopreservation techniques at the USDA National Center for Genetic Resources Preservation thus increasing our capacity to store recalcitrant species.
- We were invited to participate in a workshop sponsored by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Perth in October to develop international standards for seed trait research – our contribution was on rainforest seeds.
- Two PhD students completed their studies on conservation of the flagship rainforest species Wollemi pine.
- We received scholarship funding through the National Endangered Species Program (NESP) for a PhD student to commence work on conservation of Myrtle rust susceptible rainforest species in early 2017.
- Dr Cathy Offord is the associate editor of a seed-focused issue of Australian Journal of Botany. This issue will feature a review of rainforest resources of the Australasian region and identify knowledge gaps (due for publication 2017).
- Advances in an on-line training module for seed conservation in rainforest-rich countries and development of in-country training in progress.
- High appreciation in the general community of the project including significant articles in the Sydney Morning Herald.
- Two significant grant applications were submitted this year including an application to the Australian Research Council for a Linkage Grant, with international collaborators, focussed on cryobanking technology for recalcitrant species.

- Discussions were initiated with the Australian Macadamia industry to conserve natural resources of this indigenous crop that originates from Australian rainforest and includes threatened species and populations.
- Contributions to the NSW 'Save our Species' programs for saving threatened species, a five year project initiated in 2016 by the New South Wales Office of Environment and Heritage.

## Achieving outcomes

### Outcome 1:

*The Royal Botanic Gardens and Domain Trust (the 'Trust') aims to study 50 rainforest species from Eastern Australia each year in order to predict the optimal ex situ conservation options. The Trust will prioritise species that face imminent risk of extinction targeting a small number (around 3-5) each year for intensive study. The Rainforest Seed Conservation Project (the 'Project') will ensure that species currently under threat in the wild are safeguarded in an ex situ collection or that they have the potential to be conserved ex situ should the need arise. The Trust's long-term target is to conserve 75% of threatened species from rainforest habitats in New South Wales ex situ by 2020.*

Numerous collections of rainforest species were made this year from across New South Wales with the majority of these species tested to assess their germination requirements, storage limitations and expected longevity. Thirty-eight new collections were tested for their ability to germinate after drying, after cold storage, and after being exposed to 47% relative humidity to test their tolerance to partial drying.

To assess whether freezing is a suitable method of storage for rainforest species, a number of collections, including some made prior to the commencement of the Project, have been assessed for their ability to germinate after freezing. Ninety-two collections have been tested this year, including a number of *Brachychiton* species which are routinely refrigerated at the Australian PlantBank instead of frozen. Testing has now revealed that total germination of these species is not greatly decreased by freezing and therefore seeds may be transferred into a colder environment, increasing their expected survival time in storage.

In some instances the germination of these species was not assessed before storage and there is little or no information available on their germination requirements or storage behaviour. These tests will greatly increase our understanding of the capacity of rainforest seeds to germinate after cold storage.



Seedlings of *Brachycton acerifolius* and *B. discolor* germinating after cold storage.

As expected germination responses varied between species with some found to be tolerant of both drying and freezing (orthodox, e.g. *Ficus fraserii*), some tolerant of drying or partial drying but not freezing (intermediate, e.g. *Aphananthe philippensis*), and some intolerant of drying (recalcitrant, e.g. *Davidsonia pruriens*). Some species have proven difficult to germinate, such as *Cayratia clematidea* and *Elaeocarpus holopetalus*; these will require further research to identify ideal germination conditions before they can be assessed for storage behaviour.



*Davidsonia pruriens*



*Meiogyne stenopetala*



*Cayratia clematida*

Some of the rainforest species successfully raised from seeds in 2016.

Ten species with reasonable levels of fresh germination were also exposed to a number of different post-freezer treatments including high humidity and/or heat conditions. This trial aimed to identify treatments that could increase total germination after freezing which can be problematic in rainforest seeds with high oil contents.

Outcome 2:

*The program will also include commonly occurring species, and it is anticipated the program will result in a total of 250 new rainforest seed collections held at the NSW Seedbank (including threatened species), which will be available for research purposes.*

## Consolidating our collections

Field collecting trips were conducted across the diversity of rainforest habitats in New South Wales including sub-tropical, littoral, dry and cool temperate rainforest.

The focus of the collecting program this year was to increase the number of less common species, collect more seeds to supplement earlier small collections or to provide enough material to continue to test seed storage behaviour and longevity, but also to replace older seed collections or collections with low seed viability. Staff working on the Project work closely with staff of the seed collection team at the Australian PlantBank to identify species for recollection.

Additionally, in line with collection requirements of other collaborative projects the Trust is currently partnered in, collection targets included tree species as part of the

'Global Trees Campaign' and the Office of Environment and Heritage 'Saving Our Species' program which targets threatened species.

In 2016, commonly occurring rainforest species were added to the seed and plant collections which included species subsequently identified as orthodox or recalcitrant. A number of species identified as threatened in New South Wales were collected, such as *Parsonsia lilacina* (rare) and *Acronychia littoralis* (endangered). Fortunately, both species have been identified as orthodox increasing the number of conservation options available for them.

The Project is further supporting the development of the rainforest collection at the Australian Botanic Garden (ABG). It is recognised that the plants produced are a significant resource for conservation and science. We will contribute to the forthcoming 'Landscape management plan' in 2017 which proposes to develop an extensive rainforest gully and interpretive walk.

Scientific Officer Zoe-Joy Newby accompanied a field trip to Gloucester Tops and Barrington Tops National Park in June and was able to make a small collection of the rainforest species *Psychotria daphnoides* and a large collection of *Tasmannia purpurascens*, a vulnerable species which occurs in only three locations across New South Wales and only above 1200 metres. Half of the collection was sent to Kew as part of the Millennium Seedbank Partnership, while the remainder has been stored at the Australian PlantBank and reserved for testing.



*Phychotria daphnoides* and *Tasmania purpurascens*, rainforest species from which seed collections were made in 2016.

Another species donated to the collection this year from collaborators at Lismore Rainforest Botanic Gardens was *Micromelum minutum*. Now understood to be recalcitrant, this species is endangered and believed to be extinct in New South Wales as it has not been seen occurring naturally since 1911. As such it makes a very special addition to the living collection for the Trust and will be trialed in tissue culture in an attempt to maximise plant material.



Fruits and seedlings of *Micromelum minutum*.

As in 2015, the Trust 'Save a Species' program raised funds this year for the collection of a number of threatened species which included two rainforest species *Alloxylon pinnatum* (Dorrigo Waratah) and *Quassia* sp. Mooney Creek (Mooney Quassia, endangered). Funds raised allowed for the collection of seeds and/or cutting material to ensure the survival of these species.





The 2016 'Save a Species' walkers having reached the end of their respective 100km journey. The team from the Australian Botanic Garden (in orange) included Scientific Officer Zoe-Joy Newby who works on the Rainforest Conservation Project.

Many new seedlings are produced as a result of the ongoing testing of rainforest species as part of the Project. These continue to supplement the living collections of the Trust providing a means of ex situ conservation for many species as well as research, display and educational material. Over 1,100 rainforest seedlings have been raised this year in the nursery facilities at the ABG; some will be retained until suitable storage methods can be identified (tissue culture, cryopreservation or otherwise), while some will be planted out. Some seedlings have already been passed on to other conservation organisations in Australia, such as those that recently went to our collaborators at the Australian National Botanic Garden, Wollongong Botanic Gardens and Lismore Rainforest Botanic Gardens.



Horticultural staff responsible for maintaining seedlings grown as part of the Rainforest Conservation Project, and now planted into one rainforest section of the Australian Botanic Garden.

### Outcome 3:

*The Project will enable significant advances in the area of rainforest biodiversity conservation and collaborative ecological restoration.*

### Seed longevity in storage

We have continued our testing of seed longevity this year. To increase our understanding of the survival of rainforest seeds in storage, 13 species including *Wollemia nobilis* (Wollemi Pine, critically endangered) were artificially aged and germinated at PlantBank. Honours student Martina Taylor, co-supervised by Scientific Officer Karen Sommerville, worked on assessing 12 of these species. Martina simultaneously evaluated the efficacy of  $\alpha$ -tocopherol quantification as an alternative method of seed longevity testing. It was found that of the Australian rainforest species tested, storage longevity was shorter than many orthodox dryland species and that the  $\alpha$ -tocopherol method was not as reliable for the assessment of rainforest species as the rapid aging protocol.

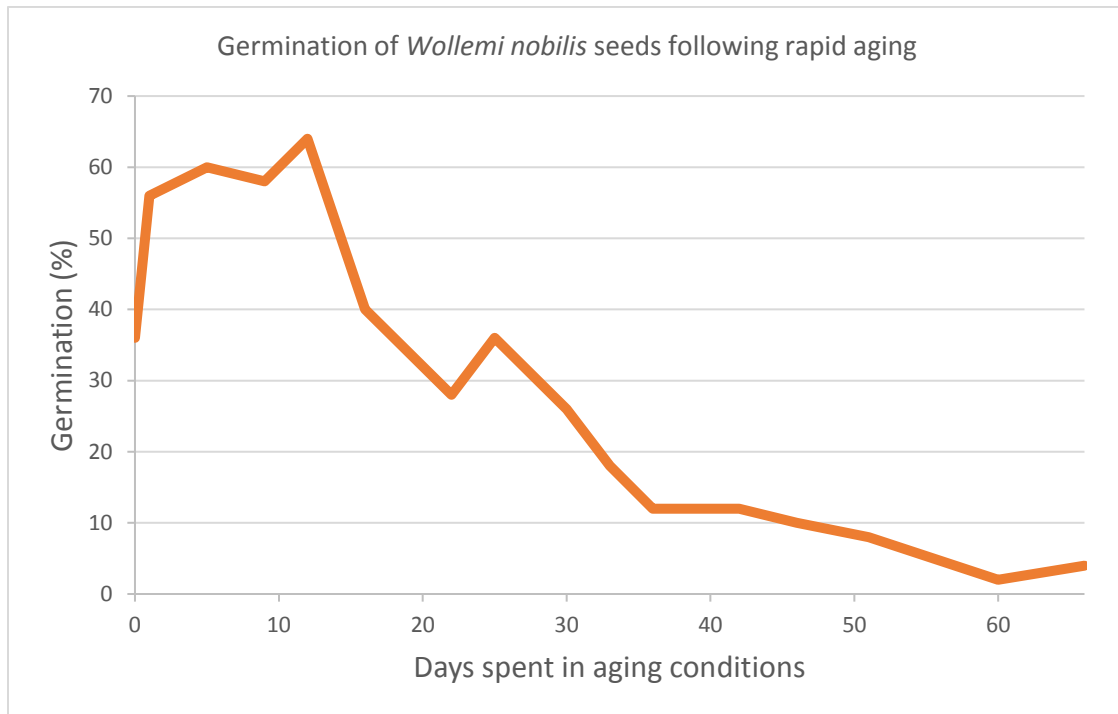


The University of Sydney honours student Martina Taylor inspects petri dishes for germinating seeds – Image Karen Sommerville.

An additional 13 species are currently being tested in the rapid aging conditions taking the total number of rainforest seed longevity tests to 38.

The Wollemi Pine (*Wollemi nobilis*) is an iconic Australian rainforest tree that is critically endangered in the wild, yet little is known of its seed storage behaviour. This is largely the consequence of a small population of plants and low rates of seed production. However, the summer of 2015-2016 in Australia proved ideal for *W. nobilis* seed production and a collection of over 2,000 seeds was made from trees growing at the Blue Mountains Botanic Garden. Supplementing this, a collaboration with the National Arboretum Canberra (NAC) has allowed access to an additional 8,000 seeds, which are now being held at PlantBank.

Consequently it has become possible to comprehensively assess the germination and storage requirements of this species. We have now confirmed that seeds germinate well after freezing and, as mentioned above, seed survival in storage has also been assessed. A second experiment is being run at PlantBank to assess how a range of different day and night temperatures influence germination and a third experiment is assessing how different ambient conditions influence germination. The latter experiment is being conducted across all three Trust sites, and is being replicated at NAC. Seedlings generated in these experiments are being maintained by Trust staff and will be used to support the ongoing conservation of this species.



Changes in the germination of Wollemi Pine seeds after storage under rapid aging conditions.

### Difficult-to-store species

As the Project continues to identify recalcitrant species, we continue in our endeavour to identify alternate storage means. Research and technical staff at Australian PlantBank have continued to work on methods of cryopreservation of recalcitrant rainforest species in 2016. This endeavour was bolstered this year when Scientific Officer Karen Sommerville was awarded a Botanic Garden Foundation & Friends scholarship to receive training in the handling of difficult-to-store species at the USDA *National Centre for Genetic Resources Preservation* in Fort Collins, Colorado. Over a period of three weeks, Karen learned how to use differential scanning calorimetry and lipid extraction to assess what happens inside a seed when it is frozen and thawed.

While at the NCGRP, Karen applied these techniques to 22 freezing-intolerant Australian rainforest species and discovered that the poor germination after freezing was due to the behaviour of oils inside the seed during freezing and thawing. Seed of these species will now be stored in the cool room rather than the freezer while research on finding ideal storage conditions continues.

During her visit to NCGRP, Karen also learned how to extract the embryonic axis from recalcitrant seeds and methods for rapidly drying and preserving the axis in liquid

nitrogen rather than the whole seed. On her return to Australia, she began research with several recalcitrant species to see if the techniques could be adapted for rainforest species. The research will continue as seed becomes available in 2017. The visit to Colorado also provided Karen with the opportunity to present the work on the Project to staff of the NCGRP which led to increased awareness of the work of the Trust and Australian PlantBank, and opened the way for future collaborations.



Karen Sommerville being trained by staff at the USDA National Centre for Genetic Resources Preservation in seed preservation techniques – Image Jennifer Crane.

Technical Officer Amanda Rollason continues to persevere with the alternative storage methods of recalcitrant species and has now trialled 68 species in tissue culture since the beginning of the Project. Amanda's trials have been successful with 28 species and 10 of these have also now been planted out, adding to the living collections. Work continues to trial different growth media, to increase the survival of some of the more difficult species in culture. Amanda is also working closely with Karen Sommerville, developing methods for the preparation of seed and plant samples for cryopreservation. Their efforts this year have focused on four recalcitrant species which they are currently able to revive following the sample preparation process.



Some of the tissue culture collection of rainforest plant on display at the Australian PlantBank (left) and Amanda Rollason preparing rainforest tissue samples for cryopreservation (right).

#### Outcome 4:

*Ongoing and new collaborations with organisations will be developed in the Asia- Pacific region including training and upskilling opportunities for the Trust's counterparts.*

#### **Asia-Pacific Capacity Building**

In May of 2016 the Australian Botanic Garden hosted the first National Seed Science Forum (SSF). As part of capacity building and collaboration initiatives we sponsored Khadijah Awang from the *Genebank and Seed Centre* in Malaysia to travel to Australia and attend the forum. Khadijah is working in the area of genetic resource and germplasm conservation management for the Malaysian government and was introduced to the research facilities at the Australian PlantBank and given the opportunity to network while at the forum.



Khadijah Awang and Zoe-Joy Newby at the National Seed Science Forum, May 2016.

Following the networking opportunities of the SSF, we were approached by the *Identification & Naming* team (Asia) of the Royal Botanic Gardens Kew to work on a collaborative project with The University of Papua. RBG Kew's proposal is for our staff to deliver a training program to researchers in Papua in 2017. With the content delivered by Trust staff, the workshop would be similar to those conducted in Laos, Vietnam and Cambodia previously. Kew has applied for a grant from the *Newton Institutional Link* project and expects to hear of the outcome in December 2016. Should the grant application not be successful, we will proceed with a rainforest seed training workshop in Australia, in 2017.

Another important outcome of the SSF was the opportunity to collaborate with other researchers on a review of rainforest seed conservation in the South Pacific. This review, led by Scientific Officer Karen Sommerville, includes contributions from researchers working in conservation in Australia, New Zealand, Fiji, Vanuatu and other islands in the South Pacific. The review will provide a basis for future capacity building and seed conservation in the region.

Scientific Officer Zoe-Joy Newby is also in the process of developing an online educational course on Rainforest Seed Biology. The course is intended to reflect workshops delivered in the Asia-Pacific in 2015 by Trust staff, but presented in an online format, potentially making it accessible to more rainforest and seed conservation practitioners around the world.

The course is currently being built in Eliademy (eliademy.com), and intended to incorporate a basic understanding of seed biology with information on rainforest seeds, and the conservation of recalcitrant species – information which has been generated as part of the Project.

Outcome 5:

*Throughout the Project, scientific findings will be collated and synthesised to achieve greatest impact and practical application. These findings will be made available free of charge to the widest audience.*

We continued to publish in peer-reviewed journals and general community-focussed publications on rainforest-related work.

### Peer-reviewed Articles

#### In Preparation

We have been steadily publishing informational articles through the course of the Project, however, the major publications arising from the Project are in preparation will be submitted to open access journals in 2017. They include:

- Sommerville, K.D., Errington, G., Newby, Z-J and Offord C.A.. Long live seeds! – comparative longevity of rainforest seeds in storage. Target journal – PloS One. 2017 <http://journals.plos.org/plosone/static/publish>
- Sommerville, K.D., Errington, G., Newby, Z-J and Offord C.A.. Banking rainforest seed – seeking clarity from complexity. Target journal – AoB Plants 2017. [http://www.oxfordjournals.org/our\\_journals/aobpla/about.html](http://www.oxfordjournals.org/our_journals/aobpla/about.html)

#### Invited Publication

- Sommerville, K.D., Clarke, B., Keppel, G., McGill, C., Bone, R., Offord, C.A. Saving rainforest seeds in the South Pacific. To be published (by invitation) in the Australian Journal of Botany, 2017. <http://www.publish.csiro.au/bt/forauthors/openaccess>

#### Recent Publications

- Zimmer, H.C., Offord, C.A., Auld, T.D and Baker, P. J. (2016). Establishing a new population of a shade-tolerant rainforest conifer. PLoS One <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0157559>



- Greenfield, A., Yap, S., van der Merwe, M., McPherson, H., Delaney, S., Offord, C.A., and Rossetto, W. (2016). Using innovative whole-chloroplast barcoding techniques to fine-tune the preservation of a highly charismatic but critically endangered species, *Wollemia nobilis* (Araucariaceae). Australian Journal of Botany <http://dx.doi.org/10.1071/BT16105>

## General Articles

- The Gardens (Spring 2016) Unlocking the Secrets of Seed (see RBG website).
- The Rainforest Challenge – Testing the ‘Unstorable Seed’ Assumption. Australasian Plant Conservation. 25:2, 10 (see RBG website).
- Saving rainforest species one seed at a time (3rd June, 2016) The Sydney Morning Herald. <http://www.smh.com.au/environment/conservation/meet-karen-sommerville-the-woman-saving-nsw-rainforests-one-precious-seed-at-a-time-20160523-gp1cv2.html>
- Fungal threat: Secret Wollemi pine population offers hope for species’ survival (26th August, 2016) The Sydney Morning Herald. <http://www.smh.com.au/technology/sci-tech/fungal-threat-secret-wollemi-pine-population-offers-hope-for-species-survival-20160823-gqyzju.html>
- The Australian PlantBank. (28th April, 2016) The Planthunter. <http://theplanthunter.com.au/botanica/plant-bank/>
- Back from the Brink: Hope for Saving the Wollemi Pine. (2nd September, 2016). Wild. <http://wild.com.au/news/wollemi-pine-back-from-brink/>

## Associated Publications

- Rigg, J.L., Offord, C.A., Singh, B.K., Anderson, I.C., Clarke, S. and Powell, J.R. (2016). Variation in soil microbial communities associated with critically endangered Wollemi pine affects fungal, but not bacterial, assembly within seedling roots. *Pedobiologia* 59: 61–71 <http://www.sciencedirect.com/science/article/pii/S003140561630004X>
- Rigg, J.L., Offord, C.A., Zimmer, H., Anderson, I.C., Singh, B.L., and Powell, J.R. (2016). Conservation by translocation: assessing how microbes associated with the critically endangered Wollemi pine shift during establishment in novel environments. *Plant and Soil*. <http://link.springer.com/article/10.1007/s11104-016-3010-2>

- Rigg, J.L., Offord, C.A., Singh, B.L, Anderson, I., Clarke, S. and Powell, J.R. (submitted). Soil microbial communities influence seedling growth of a rare conifer independent of plant-soil feedback. *Ecology*  
<http://onlinelibrary.wiley.com/doi/10.1002/ecy.1594/full>

### Conference Presentations

- Offord, C. A. (2016). Connecting seed science with the community: the Australian PlantBank experience. First Australian Seed Science Forum, Sydney, 14-16th March 2016.
- Offord, C. A. (2016). 200 years of seed science of the Royal Botanic Gardens. Australian Garden Historical Society. Canberra, October 2016.
- Offord, C. A. (2016). The Australian Rainforest Conservation Program. Friends of the Australian National Botanic Gardens, Canberra, July 2016.
- Sommerville, K., Errington, G., Newby, Z.-J., and Offord, C. (2016). The rainforest challenge – testing the ‘unstorable’ paradigm. First Australian Seed Science Forum, Sydney, 14-16th March 2016.
- Sommerville, K., Errington, G., Newby Z-J. and Offord, C. (2016). The rainforest challenge – testing the ‘unstorable’ paradigm. Australian Museum and the Royal Botanic Garden and Domain Trust Forum.
- Sommerville, K., Errington, G., Newby Z-J. and Offord, C. (2016). Traits associated with limited storability of rainforest seeds. Public Symposium, Seed Traits Workshop, Perth, 3rd October 2016.
- Sommerville, K., Errington, G., Newby Z-J. And Offord, C. (2016) Saving sensitive seeds. 11th Australasian Plant Conservation Conference, Melbourne, 14-18 November 2016.
- Sommerville, K., Errington, G., Newby Z-J. and Offord, C. (2016) Seedbanking for Myrtle-rust sensitive species. Myrtle-rust working group, The Australian PlantBank, 25 November 2016.

## Measuring Impact

Collection	Annual Outputs	Project Target	Cumulative Output	Outcomes
Total number of species to collect.	38 collections (37 species)	250	225	Contributed to the Trust's 2025 target.
Number of threatened species collected.	3 collections	100	42*	Contributed to the Trust's 2025 target
Data collection on public databases.	38	250	241	Information was uploaded to PlantNET and the Atlas of Living Australia
Collect herbarium vouchers.	35	250	239	Contributed to the collections of The National Herbarium of NSW.
Research				
Diagnostic evaluation of species for orthodox seed storage. Number of species.	92 (38 completed)	250	239	This process requires a series of consecutive tests that can take a long time to complete. 92 samples tested after freezing 38 tested as fresh seed, dried seed and frozen seed.
Investigate storage longevity for orthodox species	26 completed	30 by end of project	38	Range of ages identified, but generally shorter than non-rainforest species. Another 13 in testing currently
Investigate alternative conservation options for recalcitrant species.	38 initiated into TC 3 progressed to deflasking stage 4 recalcitrant species trialled in cryopreservation	75	68 species initiated into TC, 28 species successful. 10 species to deflasking stage	Alternative protocols for storage are being developed. Four species in cryopreservation surviving vitrification, working to improve cryopreservation step
Priority species targeted for intensive study resulting in effective conservation ex situ.	7	20	23	Short-lived seeds, and seeds only partially tolerant of drying and freezing, were tested for tolerance of cryopreservation. Development of cryo protocols commenced for several desiccation sensitive species
Enable collaboration on ecology, genetics and other biological research.	1 PhD study 1 honours project	20	5 PHD, 4 Honours projects, 9	New collaborations with Melbourne

	5 new collaborations		other collaborations	University on Myrtle Rust project; new collaboration with Chris Walters, NCGRP, on intermediate seeds; new collaboration with CSIRO, Uni SA, RBG Kew, Massey Uni NZ on seed conservation in the South Pacific; new collaboration with ANBG, Arboretum and BMBG on germination of Wollemi Pine; new collaboration with Australian and international researchers on seed trait paper.
<b>Germplasm Storage</b>				
Store orthodox seeds.	28	175	129	Contributed to target outlined in the 'collection section'.
Store species in tissue culture, cryogenics or living collection.	41 added to living collection	Up to 75	111	Contributed to target outlined in the 'collection section'.
Contribute duplicate orthodox seed collections to the MSB. Number of species.	9	175	113	
<b>Training</b>				
Deliver intensive training as part of the Trust's Asia-Pacific Capacity Building program.	4 people receiving ongoing training from 1-3 days per week in 2016	10	22	
Deliver undergraduate training and work experience (days).	2	50	163	Raise awareness of issues with conservation.
Deliver training to post-graduate students and academics.	145 delegates at SSF **	20	158	Raise awareness of issues with conservation. ** 2 hr Workshop on seed science delivered to 145 delegates at 2016 National Seed Science Forum
Integrate rainforest conservation issues into post-graduate thesis projects.	4	15	13	Conduct rainforest species research.

<b>Communication</b>				
Conference presentations.	7	5	15	Communicated project results to peers, and exchanged ideas and knowledge.
General publications.	5	10	13	Gain recognition of the value of research and communicate scientific findings.
Interpretation.	Australian PlantBank rainforest interpretation successfully delivered.			Raise public awareness and buy-in.
Electronic media articles.	7	5	14	Raise awareness of conservation issues.
Website on the RSCP.	Revised 2016.	Construct.	Constructed	Website and media updates
Social media.	Facebook, Twitter, and Instagram Trust accounts	Engage	Facebook = 63,125# Twitter = 11,833# Instagram = 35,704#	Raise public awareness. # total number of visits to Trust sites over the 2015-2016 financial year. Figures equate to a 40% increase on the previous financial year
<b>Partnerships and Collaborations</b>				
Support the Australian Seedbanking partnership.	Representation continued.	Represent on the National committee.		Establish the Trust as the centre of excellence for rainforest germplasm.
Maintain seedbanking partnerships with the Millennium Seed Bank (MSB).	Continued engagement Funding received from MSB for the Global Tree Project focusing on rainforest species.			Build and maintain linkages with the global native seed repository; capacity building for both organisations.
International Seed Trait workshop	Contributed to workshop event and consultation process	Consult on assessment of rainforest seed ecology		Collaborative project with 25 researchers from Germany, Brazil, UK, USA

\* Continued efforts have been made to target threatened species, however limitations exist in the ability to locate rare species and whether or not they have fruit and/or seed that is suitable for collection. Rainforest and threatened species remain priority species of 2017 collection trips.

## Impact Highlights

### Impact 1:

*Having mapped storage potential of NSW rainforest species by 2018 predictions for conservation actions can be shared with seedbanking institutions worldwide.*

One of the major highlights for the Trust this year was the success of the first conference to be held at the Australian PlantBank, the 2016 first National Seed Science Forum. With 145 delegates from nine countries, the three day program included workshops and oral or poster presentations in the areas of seed dormancy and germination, seedling establishment and management, seed storage conservation and utilisation, and seed ecology. All of the members of the Project team were able to partake in the forum, having the opportunity to network, learn and even teach. The latter include a presentation by Scientific Officer Karen Sommerville on some of the Project findings.

There were a number of key messages evident throughout the program, directly relevant to the Project which included the need for:

- Making research findings readily available to the general public
- Greater communication and knowledge transfer between research organisations, practitioners and commercial bodies
- Testing of seeds from across the whole of a species distribution
- Improving genetic quality of collections
- Further investigation into cryopreservation, seed longevity, moisture and longevity relationships, non-destructive longevity testing
- The importance of seedbank managers remaining abreast of current research
- Repeated checking of banked collections

Some of the research currently being completed as part of the Project is reflected directly in these themes and as such will continue to supplement seed and rainforest conservation not just in Australia but around the world.

### Impact 2:

*By making well-researched information and high quality documented plant material available, the Trust hopes to make a significant impact on plant conservation globally.*

One of the challenges of the Project has been to identify where rainforest occurs in Australia, not because it's difficult to find, but because there isn't a single definition of what constitutes a rainforest. As such, the boundaries between species that are endemic to rainforest, occur at times within them, or occur on the boundaries are also unclear. As such, there is no clear definition of how many species occur in rainforest in Australia. This issue is something currently being addressed as part of the Project.

By using a combination of databases and resources Scientific Officer Karen Sommerville has been able to identify that there are approximately 8,000 species occurring in vegetation community classified as rainforest and vine thicket (as identified on the Atlas of Living Australia); however, this list also includes weed species, algae, and estuary species from locations where rainforest habitats merge with waterways. The focus is now to filter the data to only those native species that truly occur in rainforest habitats.

By clearly defining how many species occur in Australian rainforest it will be possible to determine what proportion of species we have assessed, what proportion are recalcitrant and therefore need alternate storage methods other than seed banking. This information will allow for the generation of clear conservation targets for research but also for environmental management. It is hoped that the outcomes may be available in 2017 and provide a means by which others may assess biodiversity of their own rainforests.

### Impact 3:

*By providing roadmap information and support, the Trust hopes to positively influence other biodiverse countries to invest in conservation initiatives.*

In October of this year, Cathy Offord and Karen Sommerville were invited to attend the International Seed Traits Workshop in Perth, Western Australia. The event was a meeting of 25 international seed research scientists with the goal of defining an international standard for testing seed traits important to both ecology and conservation. Armed with the results of the Project findings, Cathy and Karen were able to positively contribute by advising which traits were useful for the identification of recalcitrant and intermediate species.

Part of the workshop program was to participate in the delivery of a free public seminar on seed traits which was intended for seed researchers and practitioners. Approximately 80 guests attended.

The outcomes of the workshop are currently being drafted into a written form which will be published in 2017 by all those involved in the initial discussions.

### Impact 4:

*By offering training and sharing expertise, the Trust hopes to provide strong leadership for plant conservation in the Asia-Pacific region.*

Cathy Offord was also invited to speak about the Project findings to the Friends of the Australian National Botanic Gardens in July of this year. The talk, providing an overview of the Project and its findings, was attended by approximately 80 people. The National Arboretum Canberra has also expressed an interest in hearing about the Project and in particular the work on the Wollemi Pine, as many of these volunteers were involved in the collection and sorting of the Wollemi seeds sent to the Australian PlantBank.

In 2017 we also hope to host a Myrtle Rust research workshop as part of the annual Ecological Society of Australia conference. The training module in development will have significant positive impact on rainforest conservation in the region (due 2017).



## Financial Information

### 2015 – 2016: Projected Expenses vs Actual Expenses (in AUS\$)

EXPENDITURE	PROJECTED	ACTUAL	COMMENTS
Salaries (including on-costs)	300,566	305,212	Scientist (Training & Communications) position now employed five days per week.
Travel	15,600	6,998	Reduced travel requirement for project for this period and some field collecting costs covered by recurrent funding.
Laboratory & Other Fees	5,200	2,439	Increased costs for National Seed Science Forum conference organisation and attendance.
Asia-Pacific Capacity Building	10,000	3,047	Travel and subsistence costs for colleague from the Genebank and Seed Centre (Malaysia) to attend the National Seed Science Forum.
<b>Total</b>	<b>331,366</b>	<b>317,696</b>	
INCOME			
Arcadia Fund	121,340	154,939	
Private Donations	124,280	90,555	
Corporate Support (TransGrid & HSBC)	85,746	72,202	
<b>Total</b>	<b>331,366</b>	<b>317,696</b>	

### 2016 – 2017: Projected Budget (in AUS\$)

INCOME SOURCE	BUDGET ITEM	YEAR 5
Arcadia Fund	Scientist	111,340
	Asia Capacity Building	10,000
	<b>Subtotal</b>	<b>121,340 (approx.)</b>
Foundation & Friends and private donations (including funds already pledged from donors)	Collector	91,612
	Travel	10,400
	Scientist	22,268
	<b>Subtotal</b>	<b>124,280 (approx.)</b>
Corporate Support (HSBC and TransGrid)	Technical Officer	75,346
	Laboratory	5,200
	Travel	5,200
	<b>Subtotal</b>	<b>85,746 (approx.)</b>
<b>TOTAL PROJECT COSTS</b>		<b>331,366</b>