Field assessment of native grasses occurring at Springvale Station and seed drying and storage options.

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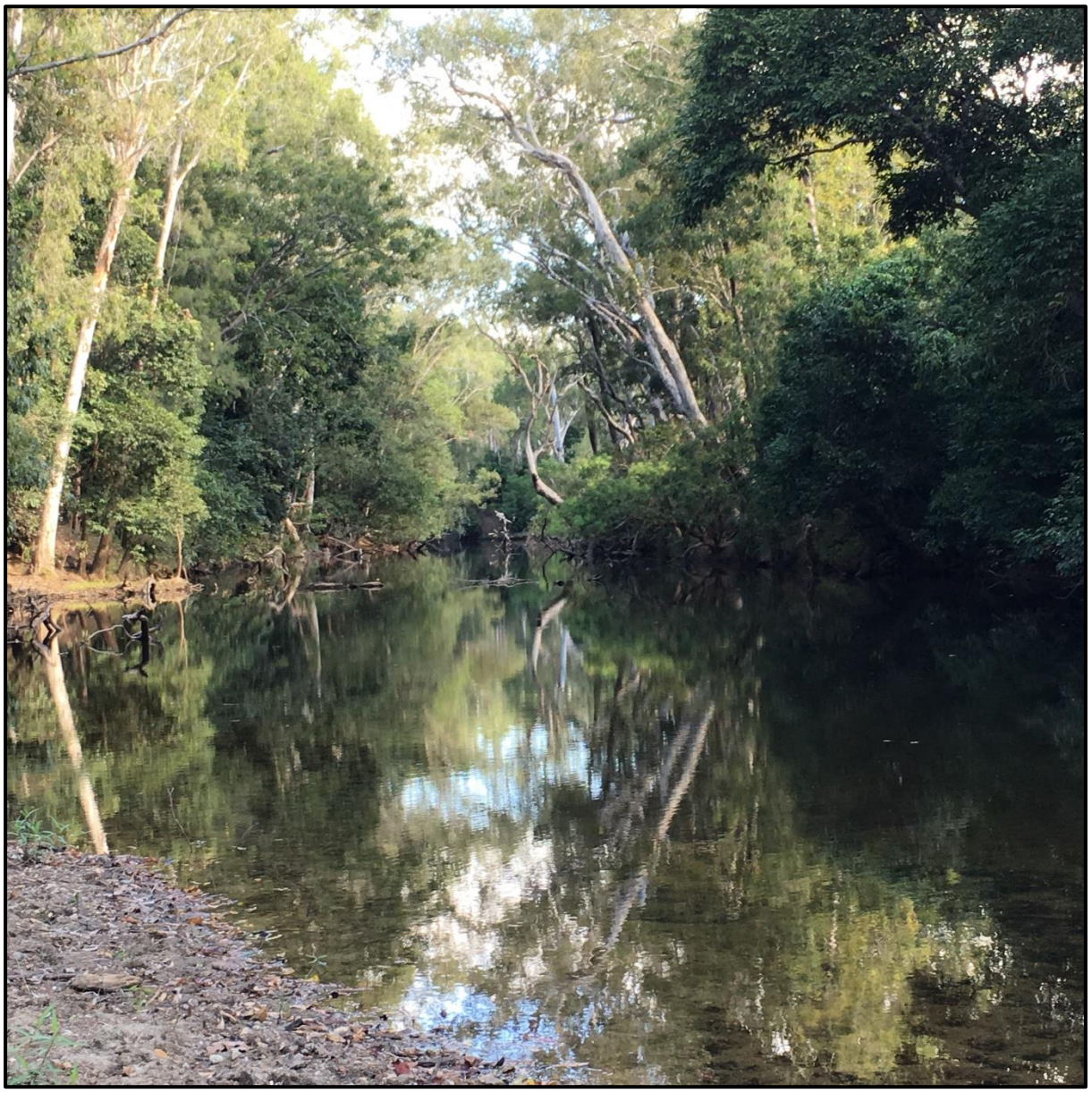

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Disclaimer

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Acknowledgement

DES funded the report to respond to recommendations in the Springvale Station Erosion Management Plan. The report will to help inform future operational management of Springvale Station, in the context of legislative and government policies at the time and will support the management intent of protecting the property's important natural and cultural values and contributing to improving the water quality within the Normanby River catchment.

Citation

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Contents

Introduction.

In 2016 the Queensland government purchased Springvale Station to reduce sediment run-off entering the Normanby River and on to the Great Barrier Reef. As part of the Springvale Station Erosion Management Plan report delivered to Queensland department of Environment and Science (EHP 2017), remediation works will require a revegetation component. Native grasses have been recommended to assist in the remediation of gully complexes. Acquiring adequate amounts of native seed on Springvale is not guaranteed given the prior land use. Sections of Springvale had been heavily grazed up until 12 months ago when cattle were removed from the property. The Department of Environment and Science have engaged the services of a botanist, Dr James Hill to estimate the potential grass seed volumes that could be collected on Springvale, and identify potential seed drying and storage options.

Scope of works

Field assessment of Springvale station.
A botanical survey was conducted at Springvale station between 24th July – 26th July 2018. The aims of the survey were to;

1) Identify populations of grass species that could provide adequate quantities of seed to assist in rehabilitating gully complexes;
2) Identify other plant species that could be used for rehabilitation;
3) Assess structural assets on the station that could be utilised for either seed cleaning and drying purposes, and/or seed storage.

If the aims listed above could not be reached at Springvale alternatives were recommended. As part of the recommendations two workshops were conducted at Wujul Wujul and the Western Yalanji office, Mareeba. The workshops were aimed at educating interested traditional owner groups on the identification and collection of native grass seeds.

Grass species populations.

The grass species that were the focus of the botanical survey are outlined in the Springvale Station Erosion Management Plan (Table 1). As the survey occurred at the start of the dry season, the presence of some grass species may have been overlooked as there were no reproductive structures visible. For example, Cockatoo grass (*Allteropis semialata*) produces seeds in December – January. No individuals were observed during the survey however it is likely that the species does occur at Springvale.

The survey was limited to areas that was accessible via a series of tracks throughout Springvale.

Table 1. The list of grass species that were targeted in the botanical survey at Springvale.

Species	Common name
Themeda triandra	Kangaroo grass
Sarga plumosum	Sorghum
Heteropogon contortus	Giant Spear grass
Heteropogon triticeus	Black Spear grass
Mnesithea rottboelloides	Northern canegrass
Chrysopogon filipes	Native Vetivar
Imperata cylindrica	Bladey grass
Arundinella nepalensis	Reed grass
Alloteropsis semialata	Cockatoo grass

The abundance of each species at each site was catagorised as either High, Medium or Low.

- High - 10kg or more seed could potentially be harvested;
- Medium - 5kg of seed could potentially be harvested and;
- Low - 1kg or less could potentially be harvested.

The results of the survey are documented in Table 2

Table 2. The GPS co-ordinate and abundance of grass populations located during the botanical survey at Springvale.

Waypoint	Latitude	Longitude	Species	Abundance
4	-15.856008	144.960928	*C. filipes*	Low
6	-15.902007	144.987467	*M. rottboellioides;* *I. cylindrica*	Medium Medium
7	-15.938319	145.00704	*M. rottboellioides*	Medium
9	-15.97522	145.040405	*M. rottboellioides* *H. triticeus* *H. contortus* *T. triandra*	Medium Low Medium Medium
10	-15.988203	145.050355	*I. cylindrica*	High
11	-15.760653	144.878555	*C. filipes*	Low

12	-15.755222	144.877935	*A. nepalensis*	Medium
25	-15.750467	144.875588	*M. rottboellioides* *H. triticeus* *T. triandra* *S. plumosum*	Low Medium Medium High
26	-15.732673	144.870148	*M. rottboellioides* *H. triticeus* *S. plumosum*	Low Low Medium
27	-15.730009	144.874104	*H. triticeus*	Medium
28	-15.77613	144.893384	*I. cylindrica*	Medium
29	-15.773361	144.906123	*H. contortus*	Medium
31	-15.751102	144.903578	*H. contortus*	High
32	-15.737544	144.903192	*C. filipes*	Low
34	-15.784386	145.057749	*I. cylindrica*	Medium
35	-15.798398	145.064231	*M. rottboellioides* *H. contortus*	Low Medium
37	-15.82717	145.073579	*M. rottboellioides* *I. cylindrica*	High Low
38	-15.839312	145.080889	*M. rottboellioides*	Medium
39	-15.816927	144.944733	*H. triticeus* *T. triandra*	Low Medium
40	-15.818321	144.947035	*H. contortus*	High
43	-15.822452	144.974643	*H. contortus*	High
46	-15.860625	144.920092	*H. contortus*	High

Summary

The majority of sites that contained adequate populations of desired grass species were located in remote areas of the property. Of the nine species listed in Table 1 only seed from three species, Northern cane grass, Black spear grass and Bladey grass could provide adequate quantities of seed. This may change overtime as species colonise areas, that in the past have experienced high grazing pressure. Access to these areas may also be problematic as all species tend to produce seed during the wet season and access may be restricted.

Seed collection options for DES to consider include;

- inviting members of the Yalanji joint venture to collect seeds on Springvale.
- Utilising current seed collection programs delivered by CYNRM.

Ideally both options could be accepted to guarantee seed quotas are met for the beginning of the project. This could be revised at a later date as the capacity of Yalanji to collect large volumes of seed increases. Also it is expected that greater volumes of seed could be sourced from Springvale in the future as grass populations recover post grazing.

Other potential species for rehabilitation.
Other plant species besides grasses will be required to assist with the rehabilitation of the gully complexes. These include trees, shrubs and potentially forbs. In determining species that are appropriate for use the following guidelines were used to select species;

- Species must produce seeds that are able to be stored for an extended period of time (i.e. no desiccation-sensitive seeds).
- Species must occur on Springvale or within the general vicinity of the property
- Populations must be large enough so that adequate seed volumes can be collected
- Seed collecting can be achieved without the use of machinery (i.e. elevated platforms etc.) and with a pruning pole.

Ten species were selected based on the above criteria (Table 3). All but one species, *Acacia umbellata*, were observed during the survey. Where adequate population densities were observed, the gps location and potential quantity of seed that could be collected was estimated (Table 4).

Table 3. A list of proposed plant species that could be used to assist in remediation work on the gully complexes.

Scientific name	Common name	Stratum
Petalostigma banksii	Quinine	Shrub
Acacia umbellata	Wattle	Shrub
Acacia orana	Wattle	Shrub
Pandanus spiralis	Pandan	Shrub
Melaleuca veridiflora	Broad leaf paperbark	Shrub
Melaleuca stenostachya	Hard bark paperbark	Shrub
Lophostemon grandiflorus	Swamp Mahogany	Canopy
Corymbia clarksoniana	Clarkson's bloodwood	Canopy
Corymbia confertiflora	Cabbage leaf gum	Canopy
Eucalyptus platyphylla	Poplar gum	Canopy

Table 4 The GPS co-ordinate and abundance of plant populations located during the botanical survey at Springvale.

Waypoint	Latitude	Longitude	Species	Abundance
5	-15.857697	144.962078	*P. banksii*	Medium
29	-15.773361	144.906123	*P. spiralis*	Medium
30	-15.757866	144.901482	*C. clarksoniana* *C. confertiflora*	High High
33	-15.777883	144.909063	*M. veridiflora* *M. stenostachya*	High High
42	-15.822732	144.971691	*C. clarksoniana* *E. platyphylla*	High High

45	-15.825254	144.978393	*L. grandiflorus*	High
47	-15.861725	144.922353	*L. grandiflorus*	Medium

Summary

There is adequate canopy trees on Springvale for the collection of seed. The Swamp Mahogany is present in most seasonal creeks with a small grove located adjacent to a dam (WP 45). This species is ideal for gully remediation as its preferred habit is along riparian strips where it assists in bank stabilisation (Figure 1). There are two paddocks that have been previously cleared that contain native regrowth of other canopy trees (WP30 & WP42). At the time of the survey individuals did not exceed 5m in height and hence seed pods would be accessible with a pruning pole. Many individuals were observed fruiting and it is expected that these areas would produce sufficient seed for the project (Figure 2).

In contrast, there were fewer sub-canopy and shrub populations observed on Springvale. Two locations were observed where seed collection activities could occur but otherwise this stratum was represented by scattered individuals. DES may consider adding mid-canopy and shrub species to existing community seed collection programs.

Legumes and forbs.

Introduced legumes were commonly observed during the survey. Stylo (*Stylosanthes* sp.) and Rattlepod (*Crotalaria* sp.) were the most abundant. Whilst these species have the ability of nitrogen fixation they can also outcompete native species. It is likely that the seeds of these species will present in the top soil adjacent to gully complexes and will readily colonise after works have been completed. It is recommended that remediated gully complexes be monitored so that these species do not become dominant and impede natural rehabilitation.

At the time of the survey forbs were not observed. These species generally appear during the wet season and die back shortly afterwards. Collecting adequate seed quotas from forbs is difficult and time consuming. Ideally forbs would be omitted from the seed collection program with the intent that this group of plants will colonise rehabilitated gully complexes in the future.

Weed species

Weed species were commonly encountered during the survey. Some introduced grasses may be difficult to distinguish from native grass species that have been selected for seed collection. For example, Grader grass (*Themeda quadrivalvis*) can

have a stunted habit if growing on poor nutrient and often skeletal soils. The stunted habit may confuse seed collectors who mistake it for a native Themeda (i.e. *Themeda triandra* or *T. arguens*). Similarly, the presence of Itch grass (*Rottboellia cochinchinensis*) could be confused with Northern cane grass (*Mnesithea rottboelloides*) as they share similar fruiting structures. DES should consider training seed collectors on Springvale in correct identification of these grasses.

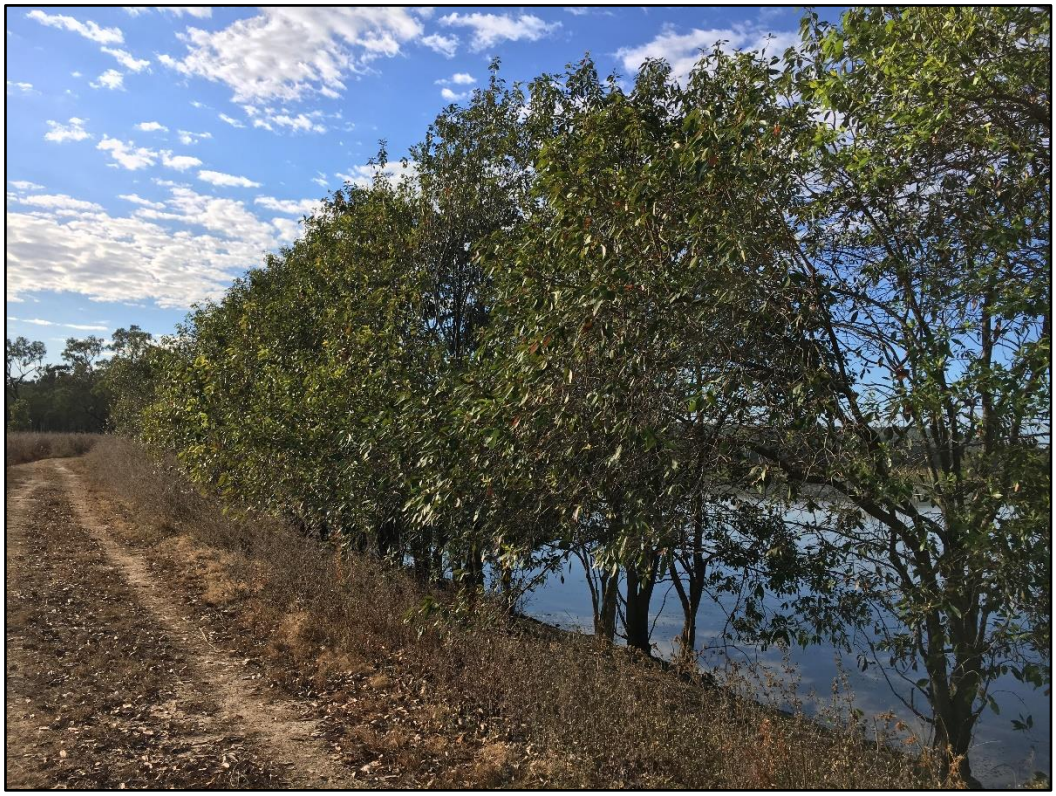

Figure 1. A grove of Swamp Mahogany adjacent to a dam. The low height of the trees allows pickers to access seeds.

Figure 2. Paddocks of Eucalyptus and Bloodwood regrowth provide ideal areas for the collection of canopy tree seed.

Seed cleaning and drying areas

Seed drying and cleaning areas require the following;

- an area that is protected from the rain
- an area that is well ventilated
- an area that is secure from pests (i.e. rodents and insects)

For seed that is sourced from Springvale it would be ideal if seed drying and cleaning facilities are located on the property. There are several buildings on the property where this could occur;

1) “Outstation North” building

This building is suitable for seed drying with only minor modifications required. At the time of inspection there was evidence of rodent occupation. Controlling and securing the building from rodents would be required (Figure 3).

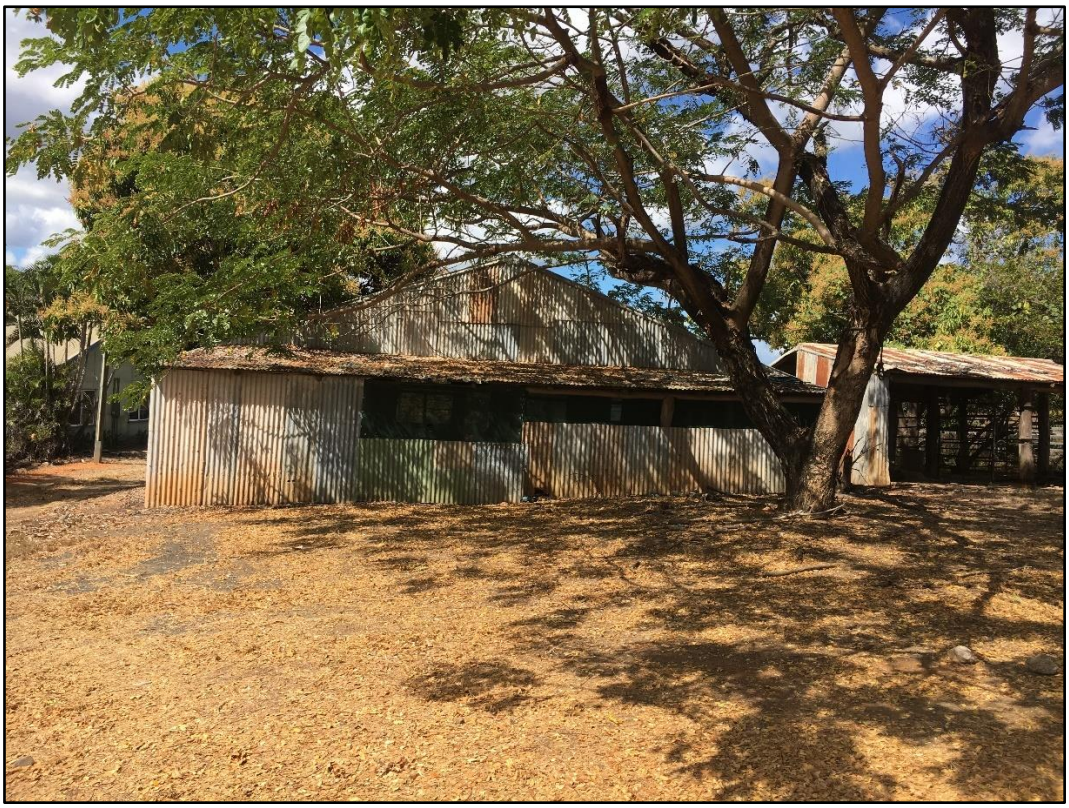

Figure 3. The “Outstation north” building is adequate for seed drying and cleaning and requires minimal

2) 5-bay Ex-machinery shed

This building would require substantial works for it to become a seed drying area. At present the floor is dirt and the shed not secure. Construction of a concrete floor and securing the shed would be necessary. Furthermore, fans would need to be installed so that there is adequate ventilation (Figure 4).

Figure 4. The five bay shed would require a concrete base and enclosed before considering it for seed drying or storage area.

3) Hay Shed

The benefits of this building are that it is large enough to contain both a seed drying and seed storage area (Figure 5). Part of the shed could be enclosed into a seed cleaning and drying area with the remainder of the shed consisting of refrigerated shipping containers. The site has a large level area at its entrance that could be utilised as a carpark for staff and/or a plant propagation area. The shed would require access to power and water and also be sufficiently secured to prevent pests entering.

4) Community collectors

An alternative to infrastructure at Springvale is to engage community groups to collect the seed quotas. As a condition all seed receipted would have to be dry and clean.

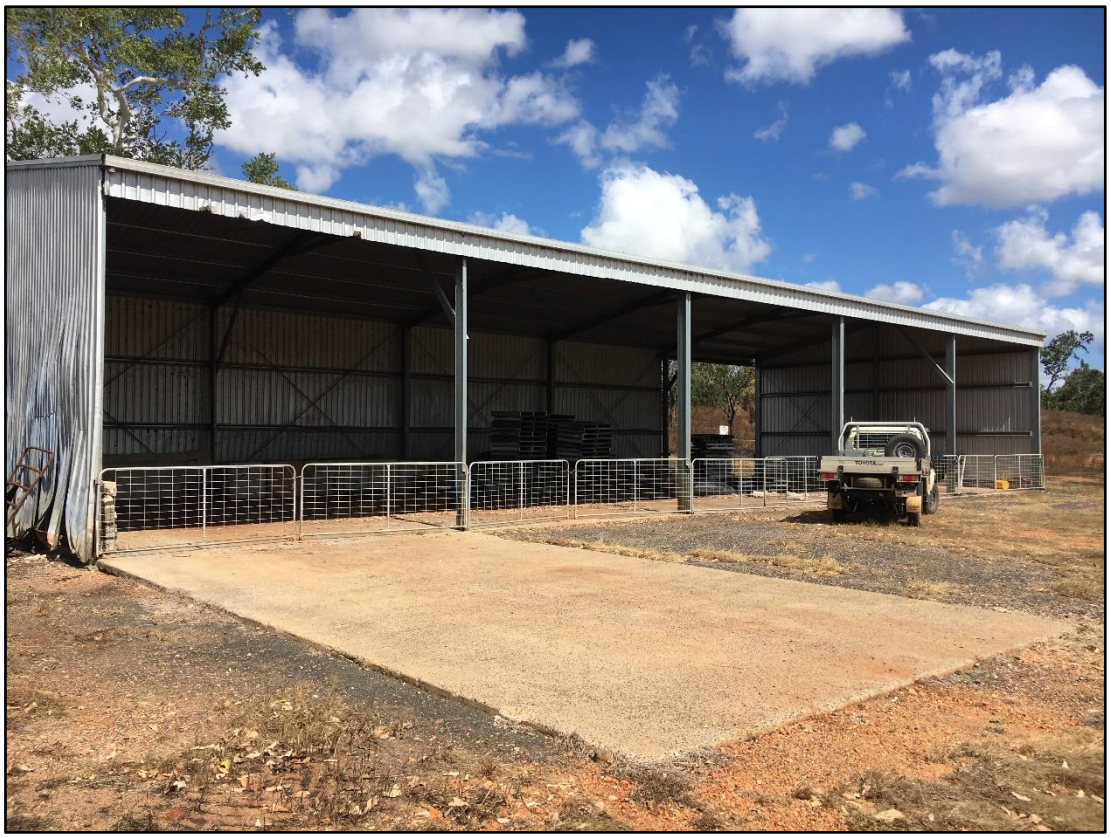

Figure 5. The hay shed could be converted into both a seed drying/cleaning area and used for seed storage.

Seed storage areas

The purpose of a seed storage facility is to ensure collected seed remains viable for an extended period of time. Seed viability decreases with age for the majority of plant species and it is expected for this project that seeds will only be stored for a maximum of 2 -3 years. Ideally all seed should be used annually.

When establishing a seed storage facility, the following should be considered;

- Type of storage unit required (i.e. refrigerated shipping containers, coolrooms etc.)
- The development of protocols for the receipting, drying and storage of seed.
- Insurance
- Staffing

The storage area should maintain a constant temperature within a range between 18°C - 22°C (optimal being 20°C). Relative humidity should also remain constant and below 50%RH. The size of the area needed will be determined by how much seed is

required to be stored. Two air-conditioned shipping containers should be sufficient for the project. The conditions inside the facility should be constantly monitored and would require regular visitation. For this reason, it is recommended that the location of the storage facility remain on site at Springvale station.

There are several options regarding seed storage.

1) Existing Cool room

There is a disused coolroom located adjacent to the old home. It could be considered for seed storage depending on the amount of seed required. The cool room would be too small to store grass seed but could be used for canopy tree and shrub seeds (Figure 6).

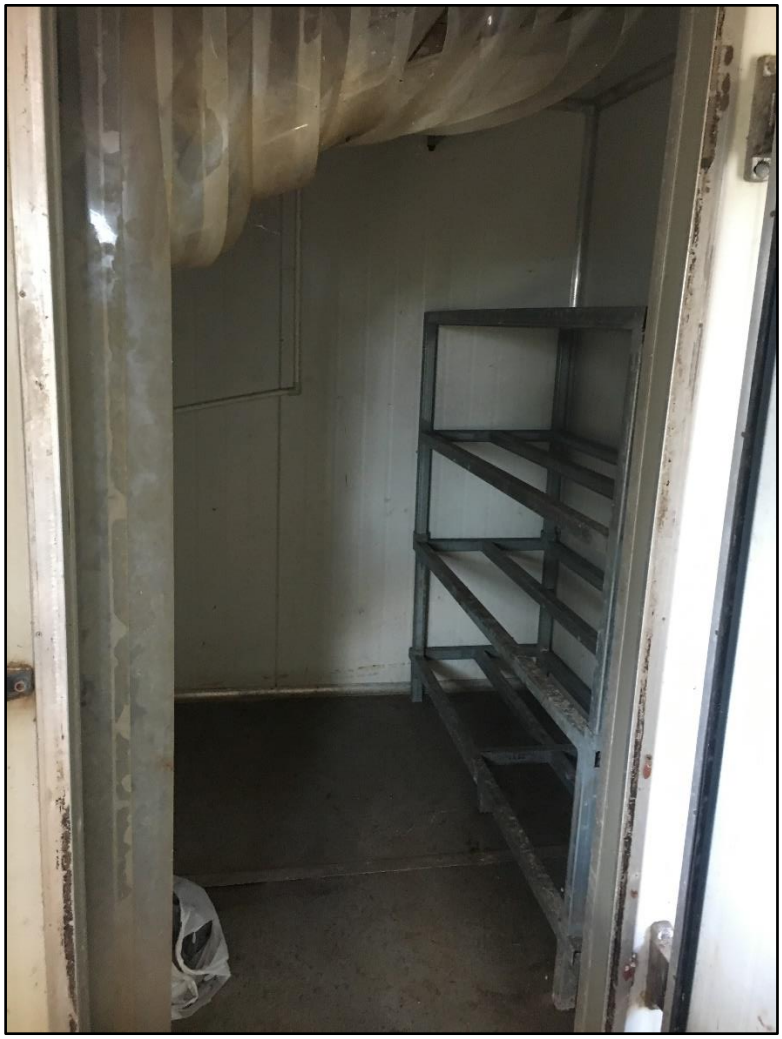

Figure 6. The cool room could be repaired and used for the storage of canopy and shrub seeds.

2) Hiring air-conditioned shipping containers.

There are several areas shipping containers can be placed. The area adjacent to the machinery shed contains a large concrete pad that could fit two shipping containers. There is a power source nearby and is close to other buildings where seed drying could take place. The site is situated next to a large palm tree that provide shade from the afternoon sun. Providing natural shade will assist in the temperature regulation of the storage facility. (Figure 7).

The 5 bay shed and the hay shed could also be considered. Both have reasonably level floors, good access and covered..

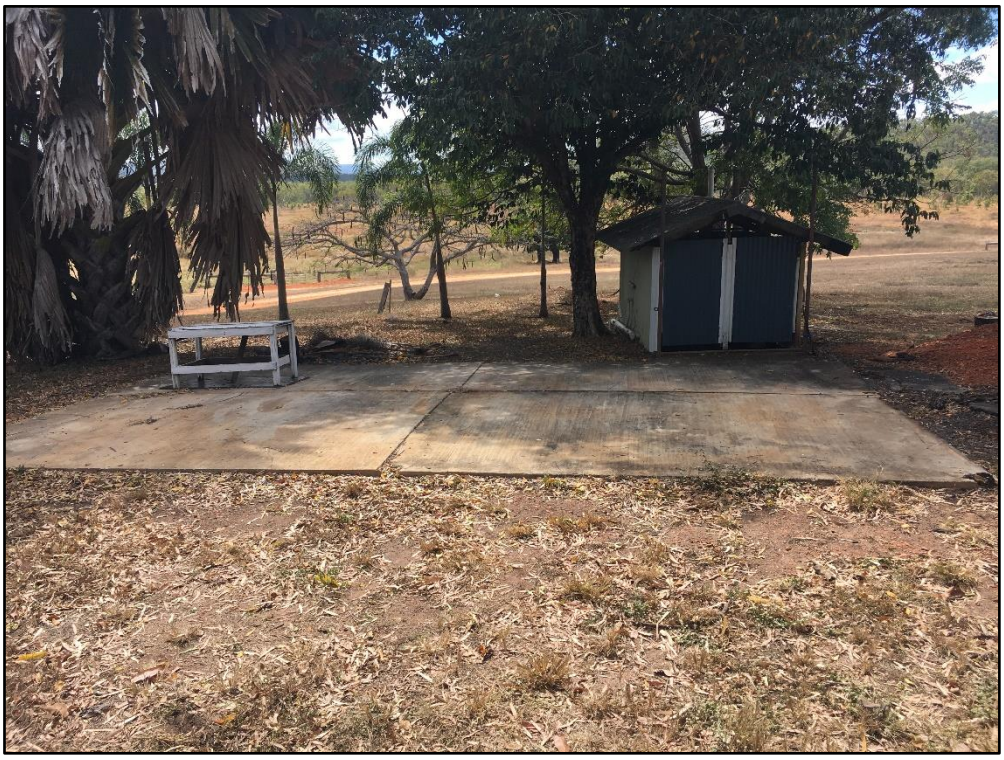

Figure 7 This large concrete pad could accommodate two air-conditioned shipping containers that could be used for seed storage.

Recommendations

1) Whilst some quantities of seed can be sourced from Springvale, it is unlikely that all seed quotas will be met. An alternative method of collection would be to source seed from neighbouring areas. In 2018, CYNRM established a seed collection program that visited the local communities of Laura and Hope Vale, and also indigenous members of Cooktown and members of Western Yalanji. The program was a success with greater than 100 community members collecting seed. The Department of Environment and Science (DES) may want to consider allocating seed quotas to the CYNRM seed collection program. To ensure both Eastern and Western Yalanji are represented within the seed collection program it is recommended that the community of Wujul Wujul be included.

2) Native vetiver (*Chrysopogon filipes*) occupies an important niche to waterways within the area. It is often located on stream banks where it provides stream bank stability whilst acting as a sediment barrier (Figure 8). These qualities make Native vetiver an ideal candidate to use for rehabilitating gully complexes. Unfortunately, it will be difficult to source adequate seed stocks due to the restricted distribution and abundance. To maximise the use of this species DES may consider using propagated material. Individuals could be grown either by seed or by removing culms from existing individuals. It is unlikely that nursery outlets would provide this species, alternatively they could be grown in a small nursery on Springvale or nearby. Western Yalanji have indicated they are prepared to establish a nursery within the area.

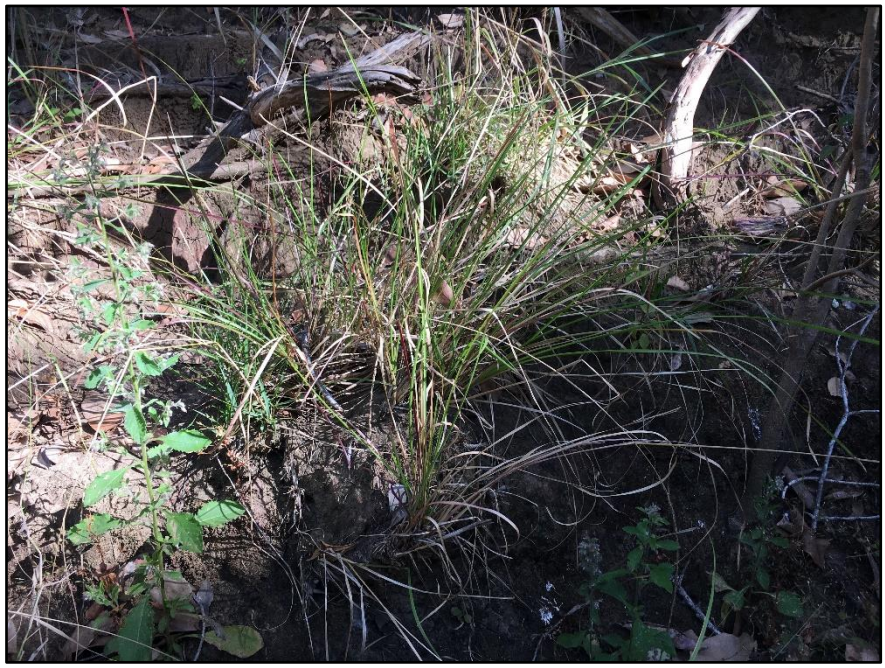

Figure 8. Native vetiver growing on the riverbank of the West Normanby River.

3) It is often difficult to obtain seeds from Bladey grass for two reasons. Firstly seeds are wind dispersed and hence have a small seed mass and secondly the timing of seed production is variable. Population wide seed production often occurs after fire and when there is adequate soil moisture for growth. In areas where Bladey grass is abundant, DES may consider controlled burning to initiate a population wide reproductive event. It would be expected that after the first rain/storm event individuals would resprout and initiate reproduction 4-6 weeks afterwards.

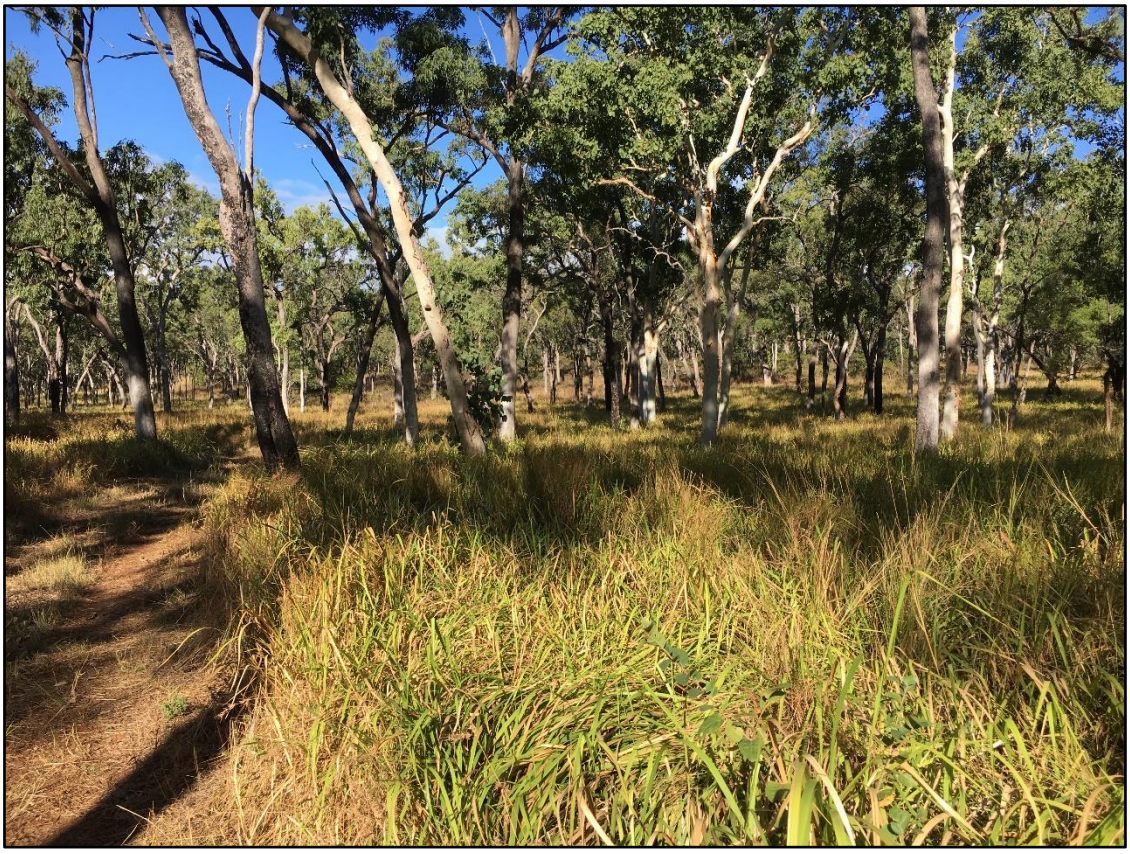

Figure 9. A dense patch of Bladey grass that will require a controlled burn to maximise seed production.

4) Community wide seed production is often influenced by climatic drivers. In the tropics those drivers are moisture availability (i.e. rainfall) and irradiance (i.e. sunlight). Both vary annually however during extreme events such as El Niño seed production can be reduced. There is a high probability that throughout the lifetime of the gully remediation project that the project will encounter extreme climatic conditions. DES may consider storing enough seed for the project to cover two years of work. This would insure suffice seed stocks are available for years of low seed production.

Seed collection workshops

Two workshops were held at Wujul Wujul and at the Western Yalanji office, Mareeba.

The aim of the workshops was to;

- Introduce the CYNRM grass seed collection program
- Grass species that will be used for the rehabilitation of gully complexes at Springvale and surrounding areas.
- Grass seed collection methods.
- The chronology of grass species seeding times.
- How grass seed should be dried and stored.
- OHS hazards when picking grass seed and PPE that would decrease the risk of hazards

Western Yalanji workshop

The Western Yalanji workshop was conducted on 17th December 2018. The workshop was attended by 12 participants and overall most were enthusiastic. Subsequent visits to the Western Yalanji office (January 7th and 21st) have involved field trips to identify specific grass species and how to visually determine seed ripening.

Wujul Wujul workshop

The Wujul workshop was conducted on the 19th December 2018. A more informal approach was used as no one attended the venue for the workshop. The Mayor of Wujul Wujul, Desmond Tayley, was extremely enthusiastic about the seed collection program. The Mayor accompanied CYNRM staff in approaching community members about the program. The community were informed of what species to collect and where it could be found in the local area.

Subsequent visits to Wujul have not yielded substantial quantities of seed. CYNRM sent a team to Wujul in early January, taking community members to areas where seed could be sourced and showed members how to collect seed.

References.

EHP. (2017). Springvale Station Erosion Management Plan. Brisbane: Department of Environment and Heritage Protection, Queensland Government.