INFORMATION NOTE 1: PLANTING & MAINTENANCE

TREAT's replanting and restoration efforts are focussed on the Atherton and Evelyn tablelands, in the Wet Tropics of Far North Queensland. The predominant vegetation type here is rainforest, although there are also areas of wet sclerophyll and heath. These notes are written for revegetation of rainforest habitat by TREAT members on the tablelands.

For further information download:
'Repairing the rainforest' (2013) 2nd ed by S Goosem and N Tucker. WTMA & Biotropica.

PLANNING TO PLANT

Planning and preparation are just as important as planting. Before you start planting, talk to TREAT and QPWS staff about your project.

There are some things that are important to know when planning your project, requesting trees and selecting suitable species to plant.

What are the features of the site?
Rural number or street address
Plan No and Lot no (get this from the rates notice)
Map of the site showing north and scale (metres) and any relevant features such as access, property boundaries, services, watering points, fence lines, creeks, erosion gullies, and remnant vegetation
Slope*:* Which direction does it face? – this indicates summer heat and prevailing winds
Climate (frosts, rainfall), altitude and soil type: these determine species selection
Area (square meters): can be measured from the map
Current vegetation: weeds, remnant forest, grass

What are the project objectives?
These can include:

- linkages between forest fragments;
- habitat;
- landscape stabilisation and erosion control;
- windbreaks, shelter for livestock; and
- aesthetic considerations.

Is planting needed?
For remnant vegetation protection (such as fencing) and weed control may be all that is required. 'Verdict' is a grass only herbicide that can be used to remove grass weed competition from rainforest seedlings regenerating naturally. You will need to learn to distinguish native from exotic species.

Proposed planting area
Stick to something manageable (300 – 500 trees) if this is something new for you, fewer if you will not be using herbicides. If the planting is next to existing forest leave a generous space (10 m for example) to avoid damaging roots and introducing disease. In any case, seedlings do not thrive in competition with existing trees. To avoid exposure to wind and weed incursion the shape should not be too narrow. A wider planting will provide a better corridor for wildlife use.

What site preparation is needed?
The importance of good site preparation cannot be over-stated. A minimum lead time of several months is needed.

Weed control
Weed control on sites with a dense cover of woody weeds (such as lantana and tobacco bush) or guinea grass needs to begin 6 to 12 months before planting. This is hard physical work requiring slashers, handsaws and brush-hooks. Cut and paste larger woody weeds or basal bark stumps and when plants are growing vigorously. 'Vigilant' is effective — apply to both cut ends. Application in the drier months leading up to the wet season is less effective. Leave dead weeds standing to provide perches and leave logs and stumps for habitat. Native recruits often come up through lantana, which can be over-sprayed. Allow two years to remove lantana and release rainforest tree seedlings.

Grasses such as Brachy (*Urochloa decumbens*), *Setaria sphacelata*, and Guinea grass compete strongly with young trees. They can be controlled using glyphosate – allow time for two applications, the second at least two weeks before planting to allow time for the grass to dry out and create mulch (don't burn it).

Anyone proposing to undertake revegetation without using herbicide should keep tree numbers small (fewer than 50 trees) because controlling weeds by hand weeding, mulching or mechanical means is time consuming and requires constant vigilance. Allowing weeds to swamp and eventually kill young rainforest trees is wasteful – not only of the cost of site preparation and planting but also the time spent in the nursery growing them to planting out size.

Erosion control
Logs and branches may be sufficient to disperse and slow water flow but where contour swales or rock gabions are required these will need to be installed in the dry season. Where weeds are stabilising slopes, it might be advisable to leave contour lines of weeds (with a 1 m wide buffer zone) until planting is established.

Fencing
Wildlife friendly fencing may be needed to keep out neighbouring stock — this needs to be done before planting and putting out straw mulch!

Watering points
Supplementary watering may be needed in the first year to prevent plant losses. Localised watering at the base of trees may be sufficient, but on many sites it encourages wildlife such as bandicoots or scrub fowl to dig. Watering the whole site by overhead sprinklers that simulate a rain event is ideal. Plan for temporary irrigation of new planting if feasible and needed.

Access
Plan how equipment, plants and people will be delivered.

Planting holes
Consider how easy will it be — depending on soil type, rocks and tree roots — and how long will it take to dig planting holes. TREAT members who have attended the planting workshop may apply to borrow the tree auger. Ideally holes are dug the same day (or the afternoon before) to minimise soil drying out before planting.

How will the site be maintained?
The site will need to be maintained for three to five years after planting. Your maintenance plan needs to formulated well in advance — who will do it, what is needed (such as grass and other weed control, fertilizer application, irrigation frost guards). Will you be undertaking it yourself or hiring a contractor? How will the cost be met?

Grasses and broadleaf weeds will swiftly outcompete trees, especially when the weather is warm and wet. Exotic tropical grasses are especially aggressive and, if unchecked, will win the the battle for light, water and nutrients. Lack of regular weed control is the main cause of revegetation failure in the Wet Tropics.

What species should be used?
Selection of suitable endemic species (plants native to your area) is determined by the regional ecosystem and site aspects. For large plantings (thousands of trees), you will need to plan a couple of years ahead to contract out propagation from a supplier or to grow the plants yourself.

How will the plants be obtained?
TREAT members of more than one year's standing may apply for up to 300 trees. More than this at the discretion of QPWS. Trees or can also be purchased from or contract grown by the TRC nursery.

How many plants will be needed?
The number of trees needed depends on spacing (1.6 – 2.0 m is recommended, 1.7 – 1.8 m optimal) and the area to be planted. This equates to 2500 to 3900 trees per hectare. Also determine the number of trees to be planted along the edge or along any watercourses or in swampy or erosion prone areas.

What will be the cost?
TREAT can advise on estimates of costs. Costs include weed control equipment, chemicals, fertilizer and may also include plants and contract labour for large planting sites. Grants may be available for areas of special significance, and TREAT can also advise on this aspect.

How long will it take?
The logistics of preparing the site, digging holes just before planting and providing irrigation means that 3000 is the upper limit for the number of trees planted at one time. For large or complicated sites, planting may need to be in two tranches — one early and one late in the wet season, with planting staged over a number of years.

Timing:
FEBRUARY TO APRIL is ideal. Planting in autumn risky – there may not be enough rain, and growth slows in the cooler months so that plants are not sufficiently established to cope with any hot dry weather before the following wet season.

PREPARATION

Installing fencing, watering points and irrigation equipment, and weed control, slashing and delivery of mulch all need to be carried out in good time before planting. Allow for periods of inclement weather. Herbicide application of grass needs to be carried out at least three weeks before planting, more if a second application is needed.

Organise materials, equipment and labour

Chipping:
It is easier to mark out the location of the planting holes first — either by chipping or using a spray marker. Remove dead grass and weeds from a 30 cm circle where the auger is to be placed to prevent the cutting edge from clogging.

Holes:
Holes should be dug to one and a half times the pot depth (30 - 40 cm) and spaced about 1.5 – 2 m apart (1.8 m is ideal). TREAT uses a Stihl earth auger with a 150 mm bit to dig holes. If digging holes by hand, use a spade. If you use a mattock, break up clods with a spade so that there are no air pockets. Ideally holes are dug just before planting but for large plantings it may be necessary to start the afternoon before. Soil spoil will dry out and the sides of the walls hole will harden if holes are dug too far in advance.

Trees:
Plants should be sun-hardened and well-watered. If possible, soak pots in a 'Seasol' solution overnight prior to planting. Certain species benefit from pruning (seek advice). Trees to be planted along the edge or in gullies should be kept separate. Distribute trees in trays so that species are mixed and so that pioneers are at the correct rate (10 – 15%).

Watering:

If supplementary irrigation is indicated you will need to organise hoses and fittings, sprinklers, pump, fuel before planting. Sprinkler spacing is critical to avoid dry patches – seek advice if you are not experienced.

Mulch:
If there is insufficient mulch on site, straw bales can be bought. One rectangular straw bale will mulch 20 – 25 trees (half a biscuit per tree). Round bales are cheaper but difficult to handle.

Labour:
A small number of workers can plant up to 1200 trees in a day. For larger numbers, consider a community tree planting event. A request will need to be made with enough time for it to be included in the planting calendar. (TREAT's planting calendar is determined in late December.) Organise sufficient helpers so that the task can be completed in less than three hours. There should be at least some experienced planters, including some who can supervise, partner or coach those less experienced. Provide enough trowels and gloves. Cold water, first aid supplies and hand-washing facilities should be available. Reward volunteers with a BBQ or morning/afternoon tea and use this opportunity to explain the objectives of the planting, and to thank all those involved including those providing funding and materials.

Reinforce that quality not quantity is needed — take the time to plant each tree carefully. All the years and expense of growing the tree and preparing the site will be wasted if the tree dies because its roots are damaged or it is planted too high or too low.

Digging holes, setting out trees and adding fertilizer to planting holes can be done the afternoon before.

PLANTING

Planting:
Work systematically along a row. Devise a system (such as leaving tubes next to the planted tree) so that each tree is watered after planting.

Fertilizer:
About 200g (a generous handful) of organic fertilizer (such as 'Katek super growth') mixed with soil from planting hole.

Water crystals:
Add one cup of hydrated water crystals to the base of the planting hole. This should be done on the morning of planting so that moisture is not withdrawn from the planting hole.

Planting technique:

		
1. Check that the hole matches the size of the root system so that the top of the pot is just below natural soil level.	2. Mix the fertilizer with the soil at the base of the planting hole.	3. Knock the pot off the seedling by tapping the top of the tube with the trowel. Minimize squeezing and pulling at the tree.
		
4. Centre the tree in the hole and start to back fill, making sure that the finished soil level is the same as the level of the potting mix in the tube.	5. Stop about halfway to firm the soil at the bottom of the hole using a vertical action. Continue back filling and firming on top to create a dish shape to catch water.	6. Place a generous layer of mulch around the tree. Leave tube on top of mulch to show that the plant needs to be watered.
7. Water the tree and pick up the grow tube.		

Watering:
Watering to the point of saturation is ideal to ensure the soil settles around the root system and to eliminate air pockets around the root system. At least 10 litres per plant is recommended. Light drizzle rain is not enough to do this. If you are unsure, a finger poked about 7 cm into the planting hole is a good way of checking soil moisture. Watering as soon as possible after planting gives the best results.

Protecting young trees:
In some areas, trees will need to be protected from predation by pademelons or agile wallabies. Small plantings can be temporarily fenced with wire. Alternatively, individual trees can be protected with tree guards. Species such as *Homolanthus novoguineensis*, *Ficus leptoclada* and *Ficus crassipes* are particularly sought after — whole seedlings can disappear overnight. Protection needs to be in place immediately after planting. Do NOT stake trees.

MAINTENANCE & MONITORING

The planting site needs to be monitored — more frequently just after planting — to assess the need for supplementary watering, and to check on plant damage or disruption by animals and weed growth.

Need for watering:
Lack of rain, extreme heat, dry winds and signs of wilting are indicators of the need for supplementary watering. You may have to water every three or four days in the first few weeks, and then once a week depending on rainfall and temperatures. Supplementary watering may be needed again in dry periods (such as October to December) before the wet season. For more established plants, occasional deep watering encourages deeper root systems whereas frequent shallow watering (short timing) encourages surface roots that are more prone to drying out.

Fertilizing:
Fertilize again just before the end of the wet season, and then feed again at the end of the cool season (in spring). In general, fertilizing at the start of the wet season and again in spring is adequate, but fertilizing again at the end of the wet season will give better results. Sprinkle a large handful — two handfuls for those with small hands — (about 200g) around the drip line of the tree or about 400-500 mm from the stem.

Weed control:
Grasses in particular compete with trees for moisture and nutrients and will supress plant growth and health if not kept in check.

There is no formula for weed control — it is on ‘as needed’ basis. Conditions that make trees grow also make weeds grow. In the early stages on a site without natural recruitment (native tree seedlings growing without being planted) a general non-selective herbicide is recommended (choose one that is safe for waterways).

Where grasses are the main weed, a grass specific, selective herbicide (such as 'Verdict 520') can be used. This will not harm trees or native tree seedling recruits.

Spraying before weeds produce more seeds will reduce the need for future spraying. As the site becomes shaded by the growing trees weed growth will be suppressed. This is called 'canopy closure' and should occur after about three years if trees are spaced appropriately and weeds are controlled. Trees that do not have to compete with a grass understorey will shade out the ground more quickly and effectively.

Frost guards:
If the planting is in an area where frosts occur, frost susceptible species (such as *Alstonia scholaris, Dysoxylum mollissimum, Homalanthus novoguineensis, Elaeocarpus grandis, Melicope elleryana, Syzygium australe* and *Terminalia sericocarpa*) in lower lying areas are best protected by frost guards.

Infill planting:
It would be wonderful if every tree planted survived, but some losses (up to 10 %) are usual. Often plants look dead but reshoot from the base. Sometimes they simply lose their leaves (check if the stem is flexible and doesn't snap).

SYMPTOM	SOLUTION
Poor health	Choose healthy stock, if root system is poor, don't plant it!
Poor planting technique	Better training and supervision
Too dry	Supplementary irrigation
Weed competition	Weed control
Exposure	Inappropriate species selection
Frost	Tree guards
Ring barking, predation	Tree guards

OPTION 1. Replace before end of wet season OPTION 2: Replace next wet season with fast growing species that can catch up /compete with its neighbours, or with as species that benefits from shade and shelter or OPTION 3. Leave the gap and keep it weed free, and let nature take its course by allowing the neighbouring trees to grow into the gap, or natural regeneration to fill the gap.

Enhancement:
After the canopy has developed, add extra species such as shade-loving understorey species, vines, gingers and groundcovers to give a more compete structure. Add forest furniture such as small log piles for fungi, reptile and insect habitat. Pioneer tree species will naturally provide some of this woody debris when they start dropping limbs after five to ten years.

RIPARIAN SITES

Gullies can be protected from erosion using straw bales pinned in place. Contour lines of weeds can be retained to help stabilize steep slopes**.** *Lomandra* establishes quickly and helps stabilize steep slopes and prevent flood erosion. Species recommended for steep slopes include Glochidions, *Homolanthus* and *Ficus* species (especially Ficus *congesta*) QPWS can suggest other species for your particular site.

Species recommended for riparian areas include *Ficus congesta*, *Melicope elleryana*, *Cryptocarya hypospodi*a, *Syzygium australe*, *Syzygium gustavioides*, *Melaleuca viminalis* and *Lomandra* but again, seek the benefit of QPWS expertise.

RINGTAIL CROSSING PHOTOS