TREAT Newsletter Dry Season July - September 2010

Field Day - 21st August

This field day is at Mark and Angela McCaffrey's property on Kenny Road between Tarzali and Millaa Millaa, starting at 2pm on Saturday 21st August. Angela has written about their 'Ringtail Crossing' Nature Refuge property in an article below. An afternoon tea will follow a walk to look at what has been achieved and all are welcome. Look for the TREAT signs at Kenny Road.

Annual General Meeting

The **28th AGM** will be held on **Friday 27th August** at the Yungaburra Community Hall commencing at **7.30pm**.

John Kanowski will be our guest speaker and his talk will be '**Private nature conservation by AWC in northern Australia: what we do and why we do it**'. John moved to the Atherton Tablelands in 1994 to conduct a PhD on rainforest possums and tree-kangaroos. In 2000, he moved to Griffith University to conduct research on the biodiversity values of replanted rainforest. In 2008, he took up the position of 'Regional Ecologist - north-east Australia' with the **Australian Wildlife Conservancy**. When not in the field, John lives at Malanda with his wife Cath and two daughters.

Annual reports by the President, Treasurer and Nursery Manager will be followed by the election of TREAT office bearers and committee members for the next year. Members are reminded that they must be financial when voting for the new committee. Subscriptions will be accepted at the AGM.

A General Meeting follows the AGM. The evening concludes with a supper and plate contributions are appreciated. Everyone is welcome to attend.

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Complete Beginners on a Steep Learning Curve

Angela McCaffrey

Mark and I bought our block of land in 2003 shortly after moving to the Tablelands from NSW, with the intention of building and living there. Plans have since changed but our intention to create a wildlife corridor across it has remained firm.

You only have to glance at an aerial photograph to realize that a huge patch of forest stretching over a dozen or more private blocks is separated from joining with the World Heritage Forest over the Dirran Creek by a swathe of agricultural land the length of Kenny Road. A small corridor has already been completed further up the road but it seemed clear to us that if we could revegetate the cleared area of our block it would create a broad connection between these areas and this became our goal.

We first approached CSIRO in Atherton for information on revegetation and by chance met a man from the Wet Tropics Management Authority who sent us to TREAT. We went there immediately (on a Wednesday) and we were shown around the nursery by Syb who patiently explained how the nursery worked and increased our enthusiasm. We turned up full of hope and plans on the Friday morning but to be honest our excitement was soon tempered. No, we could not buy trees, but we could have 10. No, TREAT could not take it on as a project because it was the wrong type of forest (not Mabi or Hypsi) and we had no funding lined up. Everyone was deeply engrossed in potting and seed cleaning and politely nodded and smiled when we showed our aerial photo and explained what we wanted to do, but we went away slightly deflated. Of course now we understand why and how the group works.

We soon realized that we would need to learn enormous amounts of information: about our type of forest, the species of trees and their growing characteristics, about seed collection and propagation if we were to grow our own trees, about the preparation of land for plantings and their maintenance afterwards to ensure their survival, and we would need to learn how to apply for funding for such a large area. Undeterred, we started to come to TREAT regularly and made many friends with people who kindly shared their experiences in revegetation, and their knowledge of how they had found the answers to all these questions. They proudly showed the results of their efforts and we were both amazed and reinvigorated. The only problem was, they all had different viewpoints and different ways of dealing with the problems. It became clear that whilst all information was gratefully received, we would have to learn the hard way by trying things for ourselves and find out what worked for us.

We started modestly in January 2004 with a TREAT planting of 500 trees, followed by another 500 later in the same wet season. More substantial plantings followed in Jan 2005, Feb 2007, Jan 2008, Dec 2008, Feb 2009, Dec 2009 and most recently, Feb 2010. Some of these were community plantings and some were done with the help of Conservation Volunteers Australia. Additional plantings were done by ourselves for infill, margins and creek banks to create 'stepping stones' of trees across the cleared area. Now, seven years on, with a lot of help from friends and volunteers we have over 10,000 trees put in the ground.

We have had both successes and failures and continue to learn new techniques, still refining our methods and learning which species perform best in particular situations, and still tracking down the elusive future funding. Many obstacles have presented themselves, such as Cyclone Larry and last winter's extreme dry conditions. This has been balanced by the good fortune of being part of the Vegetation Incentives Program, becoming a Nature Refuge, and accommodating a global lightning measuring system for an American company which pays rent, providing us with a good chunk of money towards future plantings.

Our field day on Saturday 21st August will highlight what worked and what didn't work for us, and where we continue in the next few years and beyond. Although it's a long way off, I feel so deeply connected to this little piece of FNQ I can't wait for the time when we can actually say the forests link up with at least some sort of canopy.

It's a thrill to see the plantings being used by wildlife. I would dearly love to see a cassowary there. We found a couple of old scat piles when we first bought the property, but nothing since, despite them being seen nearby both north and south of our place. We called our Nature Refuge 'Ringtail Crossing' because of the hope that Green Ringtails, Herbert River Ringtails and Lemuroid Ringtails along with many other animals, birds and plants, will all use it to move both ways from one large remnant to the other and thereby strengthen their genetic base and increase their chance of survival in the face of climate change and the many other threats they face. We look forward to sharing our experiences with you in August.

Wildlife - Habitat, Care and Rescure

Bronwyn Robertson

Many TREAT members would know the sense of satisfaction and achievement from seeing trees you have planted yourself growing into a healthy sustainable forest. After 10 years revegetating our block, my husband and I have reached this point ourselves. We bought 5 acres of degraded, weed infested, cleared land near the Hallorans Hill Conservation Park in Atherton in 1999. After much hard work, we are finally achieving our aim of re-establishing the original Mabi forest habitat on our land.

During this time, we have noticed significant changes in the wildlife on our property. Originally, the odd Scrub Turkey would venture onto our place from the adjacent Conservation Park, but even they found little of interest in the 10-foot-high guinea grass and soon moved on. Slowly though, as our trees matured, they started spending more time on our place, until today there are 4 active nest sites. Then, 6 years ago we saw our first echidna. A couple of years later, we noticed a pair of Orange-footed Scrub Fowl, who are now regular visitors. The range of birds we see now has completely changed from the few open-country species which survived here when we first bought the place. We regularly see Cat Birds, Whip Birds and Trillers through the older planted areas. Finally, a few years ago, we noticed the first Green Ringtail Possums living on our block and feeding from trees we had planted.

I had always had an interest in native wildlife and, after observing the interesting changes in animal movements as the habitat improved on our place, decided to join Far North Queensland Wildlife Rescue to learn more about our local wildlife and hopefully contribute to the rescue and recovery of injured and orphaned wildlife. Since joining, I have had the privilege of caring for and releasing hundreds of different birds as well as many quolls, possums, wallabies, kangaroos, pademelons and bandicoots. I feel extremely lucky to have had the opportunity to see these animals close up and to get to know their behaviour patterns and feeding techniques. I am also very thankful that my 2 young children are able to grow up in a household where they understand and respect the importance of wildlife and their habitats. One of the greatest thrills I get is releasing an animal and seeing it thriving in the habitat we have created on our block.

The busy Spring/ Summer period for wildlife carers will again soon be here, but there are calls for wildlife all year round. If anyone finds injured or orphaned wildlife, call Far North Queensland Wildlife Rescue's 24 hour phone on 4053 4467. The most important thing to remember is that the animal will need to be kept somewhere warm, quiet and dark and assessed by a vet or wildlife carer as quickly as possible. The animal may often appear calm and quiet, but this is normally a symptom of severe stress.

For anyone interested in obtaining more information about FNQ Wildlife Rescue, becoming a member or volunteer or even caring for native wildlife, visit the web site at or call the centre on 4053 4467.

Library Resource

Over a dozen volumes of "**Flora of Australia**" have been donated to the Atherton library by Helen Irvine. These are a great reference resource for students and other people interested in the detail of various plant species.

Is the Cassowary Really an Effective Seed Disperser?

Matt Bradford (CSIRO Atherton)

The cassowary is an iconic species in Northern Australia and is currently listed as endangered in Australia. It is perceived as important, if not essential, for the dispersal and establishment of many rainforest plant species. However, this perception comes mainly from anecdotal information.

CSIRO Tropical Forest Research Centre in Atherton has been studying the role of the cassowary as a seed disperser in the wet tropical rainforests since 1995. Most studies have been located in upland continuous and fragmented forest, with some work done in lowland forest and in the various wildlife parks in Far North Queensland. This adds to, and complements important research done by CSIRO and others in the 1970s and 1980s.

There are three species of cassowaries, the Dwarf cassowary (*Casuarius bennetti*) and Single-wattled cassowary (*Casuarius unappendiculatus*) found in New Guinea, and the Southern cassowary (*Casuarius casuarius*) found in New Guinea and Australia. Up to eight subspecies of the Southern cassowary are recognised with only *Casuarius casuarius johnsonii* present in North Queensland. In Australia the species primarily occurs between Townsville and Cooktown, with additional populations on Cape York. It is a resident of closed forest but is known to use adjacent seasonally inundated swamps, woodland, mangroves, and agricultural land.

Its diet is predominately fruit, consisting of a wide range of species which it swallows whole. The diet is also supplemented by small amounts (< 1%) of protein-rich birds, small mammals, reptiles and fish. The cassowary deposits seeds in large clumps, often containing hundreds if not thousands of seeds.

We have no data on the amount, or volume of fruit that a cassowary consumes in the wild. This data is extremely hard to obtain as it is difficult to predict which tree a cassowary will visit, and challenging to observe a bird without disturbing it. However, judging by the number of droppings found in the rainforest and the number of seeds in those droppings, we can presume that many seeds are consumed during a day.

From published and unpublished data, we have compiled a list of 240 plant species that have been found in cassowary droppings, the vast majority of these being fleshy-fruited species. This list is continually growing. These species cover the full range of fruit types, sizes and colours found in North Queensland rainforests. From this we can presume that the cassowary will eat almost any fleshy fruit. We also conducted a study of droppings in the eastern Tableland (Bartle Frere) area and found 56 plant species over two years. Cassowaries showed a preference for particular species, with *Aceratium doggrellii* and *Acmena divaricata* contributing 36% of all fruit. Large seeded-fruit were over-represented in the diet, but cassowaries showed no preference for any fruit colour.

Fruit production in the Wet Tropics of Australia shows a strongly seasonal pattern. Most fruit is produced in the months leading up to the wet season. This results in the cassowary needing to survive on little fruit or having to travel large distances to forage the rest of the year. Not surprising then, we found significantly fewer droppings during the periods of low fruit production. This could also be due to males not feeding while sitting on eggs during the middle part of the year. A study by Joan Bentruppenbaumer at Mission Beach found that each year, 50% of males sit on eggs for up to 50 days.

Seed dispersal

Seed dispersal by any frugivore can be measured by both quantitative and qualitative components. The quantitative components deal with the amount of seeds eaten and removed from a parent plant, as well as the number of species in the diet. Qualitative components deal with the quality of dispersal such as: dispersal distance, gut processing, deposition pattern, and post dispersal survival.

Dispersal distance

The distance that a seed is dispersed by an animal is a function of the time that the seed stays in the gut and the distance the animal moves. We passed the seeds of eleven species through cassowaries in wildlife parks in Far North Queensland. The mean gut passage time for all species was 309 minutes. No seeds were passed under 60 minutes, while some stayed in the gut for over 24 hours. These times are extremely long for an avian frugivore. We also captured and radio-tracked a number of cassowaries and mapped their movements. The resulting gut passage and movement data showed a mean seed dispersal distance of 240m. When the daily feeding and movement behaviour is taken into account (cassowaries rest at night and eat more in the early morning and late afternoon) the mean seed dispersal distance increased to 340m.

Gut processing

You will sometimes hear the phrase 'rainforest seeds will not germinate unless they have passed through a cassowary'. But is this true? We examined the germination of 17 rainforest species that had passed thorough a cassowary and compared it to seeds that had not been passed. Seven of the 17 species showed a significant increase in germination probability after gut passage, although all but one species exhibited some germination without gut passage. No species showed a decrease in germination probability. Five species showed a decrease in time to germination while one showed an increase. These results are consistent with a similar study done in New Guinea.

Deposition pattern

A feature of cassowary dispersal is that seeds are deposited in large clumps surrounded by faecal material. Studies from around the world have shown that clumping of seeds; 1) attracts seed predators, 2) inhibits germination, and 3) causes competition amongst seedlings. Faecal material surrounding seeds can be beneficial by acting as fertilizer and maintaining moisture, or be detrimental by being a medium for infection and rotting. Our research showed that being in a clump generally reduced the germination probability of a seed and increased the time to germination.

Post dispersal survival

We have followed a seed as it is carried away from the parent tree, been processed, then deposited on the forest floor. However the story does not end there. The seed must germinate and the seedling must ultimately survive to establishment. A cassowary deposited seed has three potential fates: 1) germination, 2) predation *in situ*, 3) secondary dispersal. Predation is obviously detrimental, and studies have shown that almost all seeds that undergo secondary dispersal are eventually predated. We monitored the fate of 11 species in cassowary droppings for one year and compared their fate to seeds that simply fell under the parent tree. After one year approximately 40% of seeds still remained intact in droppings, although there was much variation amongst species. In addition, a seed had a higher probability of remaining intact in a dropping than as a single fruit under the parent.

So if we compile a report card for the cassowary, does it pass as an effective disperser?

1. We can presume that it eats a large number of fruit. A+
2. It certainly eats the fruit of a large number of species and prefers large-seeded species. A+
3. It has a large dispersal distance compared to other frugivore species in the Wet Tropics and is the only species capable of long distance dispersal of large-seeded fruit. A+
4. It promotes the germination of a minority of species. B
5. Deposition of seeds in clumps can inhibit germination and establishment. C-
6. Cassowary deposited seeds have a better chance of surviving to germination than if they fall under the parent. B+

I think we can conclude that the cassowary is an effective disperser of seeds in the rainforests of the Wet Tropics.

Field Day at Galaji

Geoff Errey

The field day at John and Marion Clarkson's property was one of TREAT's best-attended events for many years. Perfect weather encouraged around 90 people to visit Galaji, the Clarksons' 40 hectare place on Topaz Road.

A luncheon for Nature Refuge landowners was held prior to the field day walk, with TREAT catering for this as well. This gathering was deemed very successful with 45 people representing 21 Nature Refuges, and there was an overwhelming desire by the attendees to hold a similar annual Nature Refuge gathering.

TREAT members and other visitors were joined by interested representatives from the Eacham Historical Society for the field day walk.

The Nature Refuge section of Galaji will form a corridor from the small neighbouring Topaz Road National Park through to the Wooroonooran NP. John and Marion led their visitors on walks over two sections of the property, explaining that most of the work they have done since 2003 has been in clearing back lantana *Lantana camara* and guinea grass (and keeping it back) to allow natural regrowth of rainforest species to begin, particularly on existing forest edges. It has only been in the past couple of years that they have also begun a replanting program to supplement this. John demonstrated a couple of his aids - a "splatter gun" (see Weeds - Lantana for more information) for accurate spraying of the lantana, and a narrow shovel for quick opening up of the soil to allow tube stock to be dropped in without the need for the back-filling required by the usual shovel or auger hole method. John explained that they have also done some direct seeding.

John is also experimenting with the new "deep planting" technique to outwit his bandicoots. He has established a plot where taller tube stock is planted well below the root ball, with most of the trunk buried. Each deep-planted tree has a traditionally-planted companion of the same species beside it for control purposes, and this planting is being monitored and recorded every weekend. This demonstration generated much interest among the group and we look forward to seeing what results John has over the next few years.

John and Marion explained that they have largely done their work here on weekends only (which led most people to look around to see where the slave quarters were). While there are still weed-covered areas to be regenerated, an enormous amount has already been achieved.

After a break for refreshments, John took most of the visitors to see the remains of an historic water race constructed in the 19th century to divert water from the Johnstone River catchment to the Lady Olive gold mine on the Russell River headwaters. This tunnel runs for 150m under Topaz Rd and provided another highlight of a most interesting and informative day.

On the field walk

Tunnel under Topaz Road

Nursery News

Peter Snodgrass

How wonderful it's been to be amongst the ongoing enthusiasm of TREAT volunteers. The nursery continues to be maintained beautifully, from the sterilising of pots, potting on, through to weeding, sizing and consolidating. Thanks to the diligent efforts of all involved throughout the nursery, we continue to keep the quality of stock at a high level. The healthier our planting stock is the better chance the trees have of survival and faster growth within our revegetation sites. Nice work everyone!!!

Plantings and Site Reports

The persistent wet weather hampered site maintenance in most areas but this is now back on track. "The Tony Irvine Memorial Planting" has been treated and is doing extremely well with some trees growing up to 6 metres high since they were planted in January 2009.

The 2010 Peterson Creek planting adjacent to the Curtain Fig National Park, on the Williams' property, is doing well, with weeds under control. An additional 150 trees were planted with the assistance of Simon, a student from Malanda High School, during his work experience period (June 21 to 25) with QPWS. It's great to see our youth holding an interest in conservation.

This year's planting on the Mete's property is also looking good with the weeds now under control following the rainy period. Even though the weeds were stiff competition for the trees, they have established well in the damp conditions and suffered very few losses.

The other sites on the Mete's property are doing well through the maintenance efforts of the Tablelands Regional Council Revegetation Unit. Many thanks to their field staff for keeping those sites as clean as they have, and for their work on the Williams' property in very trying conditions. Nursery staff experienced some of those conditions at the waters edge planting on Williams', where there has also been great success achieved.

QPWS staff have planted an additional 1700 trees and other plants around the MAMU canopy walk parking area, and carried out direct seeding on steeper batter areas. The areas planted in 2008 with the assistance of TREAT and other volunteers from the local community, are looking fantastic with the majority of the site under a closed canopy. It is now possible to walk underneath a large proportion of that canopy.

Dates are still to be confirmed for other QPWS 'on park' projects, such as Tarditi at Tully, and Mossman Gorge when upgrade works there have been completed.

Tree Applications

The nursery has plenty of local stock in hand at the moment. Members who would like to carry out plantings during the next wet season are encouraged to submit their applications early and plant out at the beginning of the season.

Thanks again to all for the great effort in the nursery carrying out the very necessary maintenance of plant stock. Keep up the good work!!!

Helen Adams

Compiled by Bronwyn Robertson, with information supplied by Tina Poole and Jax Bergersen

Earlier this year, one of the Tablelands' most passionate conservationists, Helen Adams, sadly passed away. Helen bravely battled heath complications for several years after a serious 4-wheel motorbike accident in Cooktown. Helen was a dedicated volunteer with many groups across the Tablelands, including TREAT, Tolga Bat Hospital, Barron River Catchment Care and Envirocare.

Born on the 9th December 1952 in Brisbane, Helen moved to Tolga with her family when she was just 1 year old. She spent her life living and working on the Tablelands. In 1979 she married her husband, Kevin, and together they had 3 children, Shane, Rachel and Linda.

When her children left home, Helen enrolled at James Cook University. After graduating with an Honours degree, Helen coordinated the first Wet Tropics grants. After this she became coordinator of the Barron River Catchment group. She was instrumental in many innovative and valuable projects throughout the catchment, but for Helen, it was never a 'job'. Her deep love and respect for the natural environment were her life. She volunteered at TREAT, joined many groups and organised or took part in many, many tree plantings. She loved helping at the Tolga Bat Hospital and worked many dry seasons rescuing babies from the paralysis tick.

In 2004, Helen was awarded the Unsung Hero Cassowary Award by the Wet Tropics Management Authority. These awards are to recognise individuals' outstanding contributions to conservation and Helen's non-confrontational, farmer-friendly approach to land management projects was commented on when she was presented with her award.

Everyone liked Helen - you couldn't help but like her. She was a great leader, not by 'being the boss' but by putting forward options and urging you to choose the right course. She didn't tell you to do things, she showed you how and you could follow - if you had the energy to keep up with her. Helen had a unique way of approaching life. As Joe Miller said, "Some people think outside the square some of the time, but Helen didn't even know there was a square!"

Helen gathered a great deal of knowledge over her lifetime. Often when we lose someone we lose their knowledge with them, but not so with Helen. Helen was a great communicator and shared everything she knew with those around her.

Helen was always a gardener. She loved flowers and trees and grew plants from seed or cuttings. She knew the magic of the seeds. If you asked a question about a plant, Helen usually knew the answer. To back it up, she'd give you the plant or a similar one next time she saw you.

On April 24 this year, over 60 of Helen's family and friends gathered for a memorial tree planting. Around 150 trees were planted along Priors Creek, off Grove Sreet in Atherton. The tree planting was over quickly but it was a wonderful morning to share happy memories of Helen's full and meaningful life. Helen's gentle, generous, inclusive nature has left a wonderful legacy, inspiring all who met her to continue the steady progress of conservation work and to simply live better lives.

Helen's husband Kevin, and sister Tina, planting a kauri pine, one of Helen's favourite trees

Building Restoration Knowledge Workshop

Integrating science and practice to fill knowledge gaps about restoring rainforest

Kylie Freebody

The workshop was held on 22nd April 2010 in Cairns, and was attended by 45 practitioners, managers and researchers who have a strong interest in ecological rainforest restoration in the Wet Tropics. The aims of the workshop were to:

- consider the current state of knowledge and research;
- identify important knowledge gaps (at both site and landscape scales);
- identify and discuss gaps which need collaboration between researchers and practitioners.

The workshop organisers were Carla Catterall (Griffith University), Kylie Freebody (Griffith University and Tablelands Regional Council), Debra Harrison (Griffith University and Terrain NRM) and Travis Sydes (Cairns Regional Council). Wendy Neilan (Griffith University) helped compile outcomes.

The Workshop was hosted by the Regional Landscape Repair and Resilience Working Group (Wet Tropics) and sponsored by the Marine and Tropical Sciences Research Facility (Project 4.9.5 - Restoring Tropical Forest Landscapes), Reef and Rainforest Research Centre, FNQ ROC and Terrain NRM.

The first two hours of the workshop consisted of an introduction and seven 15-minute talks by experts (practitioners and researchers) in the field of tropical rainforest restoration, who had been invited to present their views on the state of current knowledge and key information gaps. The aim was to set the context for subsequent workshop discussions.

The presenters and their topics were:

- Carla Catterall (Griffith University):
Why are we here? - the challenge of restoring rainforest
- Bill Laurance (James Cook University):
The scientific debate over secondary forests
- Dan Metcalf (CSIRO):
Species turnover in fragments and restoration plantings
- Kylie Freebody (Griffith University/Tablelands Community Revegetation Unit):
Rainforest revegetation projects- techniques and outcomes
- Peter Erskine (University of Queeensland):
Identifying cost-effective reforestation approaches for biodiversity conservation and carbon sequestration in the Australian tropics
- Colin Hunt (University of Queeensland):
Thinking outside the box: capturing the value of carbon in NQ restorations
- John Kanowski (Australian Wildlife Conservancy):
Two decades of rainforest restoration: what have we learnt?

Following the talks, participants then broke into six small pre-allocated groups for Workshop 1 discussions (about 50 minutes). Each group had about seven members, with group membership having been pre-assigned by organisers to bring a mix of expertise and background to each discussion. Each group was asked to discuss and record important areas of rainforest restoration with insufficient information (knowledge gaps).

The following important knowledge gaps were identified in the plenary session, and are listed in descending order of votes.

	Topic	Votes
1	Cost-effectiveness of different restoration methods	22
2	Monitoring restoration activities and outcomes	19
3	Autogenic regrowth as a restoration tool	17
4	Institutional arrangements, storing knowledge, and information sharing	13
5	Landscape-scale resilience and prioritising where to act in the landscape	13
6	Effects of riparian restoration on water quality	10
7	How can the funding pool be increased; including methods of recovering costs and demonstrating benefits? (*linked to 1*)	8
8	Can we better combine different goals of restoration?	7
9	What incentives do landholders need to become involved? (*linked to 4*)	5
10	Lowering costs via "industrialising" restoration techniques (*linked to 1)*	*3*

It was agreed that all ten knowledge gaps would require collaboration between researchers, practitioners and managers. The best way to address a specific gap would often involve a particular sector (researchers, practitioners or managers) driving the process, with other sectors playing an informative or contributory role.

The top six knowledge gaps from Workshop 1 were used as the basis for group discussion in Workshop 2. Participants distributed themselves into groups according to their interests, with one group formed to discuss each knowledge gap (about 40 minutes).

Each group was then asked to consider how to fill their knowledge gap and to record important discussion points, in terms of: what needs to be done; who and how (including the role of possible researcher/ practitioner collaboration); timeframe; resources required; short term actions that could lead to progress. In the available time, groups made variable progress through this list.

The workshop organisers are hoping to coordinate the write-up of a more structured article for publication about the workshop theme, drawing upon information from both the presentations and the workshops. Advancing this will depend on the fate of a current funding application.

Predicting Weed Spread in the Wet Tropics

Using Computer Simulations

Cameron Fletcher (CSIRO Atherton)

Weeds and pest animals damage natural values, affect agricultural productivity and incur ongoing management costs throughout the world. The problem is getting worse with increased globalization and climate change, and the cost of managing the problem is increasing. Australian farmers spent over $1 billion in the 2005 - 2006 financial year on weed prevention and management alone. The scope of the problem suggests that simply scaling up current approaches to weed management will be costly and ineffective; what we need are new techniques that let us work smarter, not harder, to control the spread of weeds.

In protected areas, aggressively invasive species, like the small South American tree *Miconia calvescens*, can have similarly detrimental effects on natural reserves and biodiversity values, as has already occurred in Hawaii where it is known as the 'purple plague', and French Polynesia where it's called the 'green cancer'. In these archipelagos *M. calvescens* has replaced large areas of native rainforest with extensive monospecific stands, and it is considered by scientists and land managers to be the most damaging rainforest weed of the Pacific islands. In Tahiti, a single Miconia plant introduced into the Papeari Botanical Garden in 1937 has led to an infestation covering 65% of the island, and in Hawaii the introduction of a handful of plants in the 1960s has caused loss of biodiversity and increased runoff and sedimentation worth billions of dollars.

M. calvescens is naturalised at several locations in or near Australia's Wet Tropics World Heritage Area (WTWHA) rainforest. These infestations are generally the result of escape from commercial nurseries or cultivation by private landowners near protected natural forest in the early 1980s. Since being listed as a Class 1 weed in 2002 all known *M. calvescens* infestations are now managed under active eradication programs by Biosecurity Queensland and Queensland Parks and Wildlife. CSIRO became involved in the study of effective management strategies for *M. calvescens* in 2006 to provide advanced computational analysis based on ecological insights into the processes driving its spread in the WTWHA rainforest.

Species ecology

M. calvescens is a small, shade tolerant tree growing 4 to 15m. A plant can mature to reproduction within 4 - 7 years, producing small red fleshy fruits edible by nearly all rainforest frugivores. Each fruit contains nearly two hundred small seeds, and a single plant can produce up to 8 million seeds in one season. Current experiments suggest that seeds can remain viable in the soil for at least 14 years. Dispersal by rainforest frugivores drives the spread of plants like *M. calvescens* in Australia. Researchers at CSIRO in Atherton have studied dispersal in the WTWHA rainforest for about 10 years, including gut passage time experiments, focal tree watches, and over 10,000 observations of frugivore movements. By assigning *M. calvescens* to a fruit functional group based on the morphology, size and presentation of its fruit, we can estimate that in the WTWHA rainforest, frugivorous animals can spread the seeds almost 1500m from reproductive plants.

Computer modelling

This detailed ecological understanding of the life-history of an individual *M. calvescens* plant in Australian rainforest is useful but not sufficient for structuring management - we need an understanding of how millions of individual seeds move about the landscape and interact to create a population. This is not a simple matter, because at a population level the distribution of each new generation depends on the distribution, survival and reproductive success of the last. Simply put, it is neither sufficient nor efficient to say 'frugivores can disperse seeds 1500m, therefore we need to manage a region 1500m out from the core of the infestation'. The spatial scales for optimal and effective eradication depend on the number of generations that have passed since an invasion began, both the maximum and the average distances that seeds are spread, and the distribution of suitable habitat across the landscape.

Computer modelling is a powerful way of combining our ecological knowledge of individual *M. calvescens* plants in the WTWHA rainforest to predict the spread of the entire population and enhance management. We have constructed an individual-based computer model of *M. calvescens* which follows the life-history of millions of individual plants as they germinate, become reproductive, and produce seeds which are in turn dispersed across the landscape by rainforest frugivores. We also incorporate the actions of on-ground managers into the plant population model because humans remove plants from an infestation in a structured manner, and over several plant generations, these effects change the spatial distribution of the managed population.

One benefit of a computer model like the one described is that it represents a 'virtual world' where we can quickly assess the effectiveness of not just one or a hundred different management strategies, but millions of different strategies. With sufficient time and resources, we can tease apart what it is about different strategies that make them effective and answer general questions about the management of all frugivore dispersed weeds, not just *M. calvescens*. This knowledge can, in time, improve management responses to new infestations in the future.

***M. calvescens* in the field. The tree can grow 4 - 15 metres tall, and its distinctive leaves can be a metre long, with deep green velvet upper surface and vivid purple undersides**

Results and recommendations for management

Preliminary results from the analysis of management strategies of *M. calvescens* in the WTWHA rainforest produce a clear message: management must be structured at biologically appropriate spatial scales to have any significant chance of eradication success. Moreover, management programs must be resourced sufficiently to manage invasions at these scales effectively, or plants will escape the management region and the infestation will not be eradicated. In the case of core-focussed management strategies that manage a region out from the origin of the infestation to some maximum radius, our model can provide the "critical radius" for eradication success. It can also provide an indication of the amount of management resources required to control the infestation at this scale. However, the real insight and gains will come with the next phase of the analysis, where we will investigate the effectiveness of novel non-core-focussed management strategies, including managing for containment, the distribution of suitable habitat in the landscape, and the interaction of frugivores with broad landscape patterns in determining invasion spread.

Email Notices

Would those members who normally get notices by email but did not get an email reminder for the field day in June, please email Doug at dcburchill@bigpond.com so that their lost email addresses can be reinstated on the list. Any member wishing to be added to the email notices list should also email Doug.

Fruit Collection Diary April-June 2010

Species	Common Name	Collection Location/ Regional Ecosystem
Acronychia acidula	Lemon Aspen	7.8.2, 7.8.3, 7.8.4
Acrotriche aggregata	Ground Berry	Herberton Range
Alphitonia whiteii	Red Ash	7.8.4
Alpinia arctiflora	Pleated Ginger	7.8.2
Brachychiton acerifolius	Flame Tree	7.8.2
Clerodendrum tracyanum	Witches Tongues	7.3.10
Cryptocarya mackinnoniana	Rusty Laurel	7.8.2
Davidsonia pruriens	Davidson Plum	7.8.4
Endiandra sankeyana	Sankey's walnut	7.3.10, 7.8.1
Firmiana papuana	Lacewood	7.8.3
Galbulimima baccata	Pidgeonberry Ash	7.8.4
Gossia myrsinocarpa	Malanda Ironwood	7.3.10
Helicia nortoniana	Norton's Silky Oak	7.8.1, 7.8.2
Melicope elleryana	Evodia	7.8.2
Melicope rubra	Little Evodia	7.8.3
Melicope vitiflora	Northern Evodia	7.8.2
Pandanus monticola	Scrub Breadfruit	7.3.10
Pitaviaster haplophyllus	Yellow Aspen	7.8.2
Pittosporum revolutum	Lemon-fruit Pittosporum	7.8.3
Rhodamnia spongiosa	Northern Malletwood	7.8.3
Xanthophyllum octandrum	MacIntyre's Boxwood	7.3.10
Xylopia maccreae	Orange Jacket	7.8.3

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