STOP THE TOAD
KEEP WA CANE TOAD FREE

Stop the Toad Foundation (STTF)
Report on Outcomes of the
2007 Great Toad Muster

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Stop The Toad Foundation (Inc)
Report: Muster Operations
Dry Season 2007

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THANKS AND ACKOWLEDGEMENTS

The Stop The Toad Foundation would like to thank the following groups and individuals for their support during the Great Toad Muster and/or throughout the year:

PRINCIPAL SUPPORTERS

- Western Australian Government
- ABN Foundation
- Lotterywest
- Skywest

OTHER SUPPORTERS

- Slingair/Heliwork
- Timber Creek Community Government Council
- Department of Environment and Conservation (DEC)
- Northern Territory Parks and Wildlife Service
- Toll West
- Sally Malay Mining
- Barwick Estates
- Matso's Broome Brewery
- Kununurra Hotel
- Slackwater Safaris
- Air Liquide
- Mulayee Aboriginal Women Rangers
- Northern Land Council - Caring For Country Unit
- FrogWatch NT
- Errol Kruger and the DEC cane toad team, Allan Thomson and Save Endangered East Kimberley Species (SEEKS)
- John Sinclair Safari's
- Gunamu Tourist Park Timber Creek
- University Club of Western Australia
- Northern Habitat
- LightForce
- WA Museum
- Conservation Council WA
- Soroptimist International
- Rotary
- Scitech
- Kimberley Towns and Communities (Broome, Derby, Fitzroy Crossing, Halls Creek, Kununurra and Wyndham)

PHOTOGRAPHY

The Foundation would like to thank the following people for allowing their photographs to be used in this publication: Graeme Sawyer, Russell Gueho, Fiona Rafferty, Karen Ainsworth.

Base camp at Cedars Lagoon

1 EXECUTIVE SUMMARY

The 2007 cane toad Muster allowed STTF to progress the development of our cane toad control strategy using an adaptive management technique to test the practicalities of ideas and attempt to quantify the effectiveness of different aspects of the strategy.

We were able to recheck the areas of last year's Muster (2006) and also conduct field trials into new methods of more effectively removing cane toads from a given location with very significant and positive results that will have major implications for ongoing toad eradication and management.

We were also able to gather some additional data about the impact of the deflection fence trial on Gregory's Tree road that has been underway since early 2007.

The numbers of cane toads removed from the area was much lower than the previous year and the distribution of cane toads was also very different due to water availability being below average because of the much drier season.

Indications are that the 2006 Muster had a very significant impact on cane toads in the area both in terms of overall reduction of numbers and in the population profile.

There was a massive reduction in the numbers of sub adult cane toads between the two musters most likely due to the fact that when cane toads lay the bulk of their eggs, at the beginning of the wet season, there were very few cane toads in that area and so breeding was low and recruitment into the toad population even lower.

There were still significant numbers of cane toads and reports of the presence of cane toads from Bullo and the West Baines (west of the Primary buffer zone) indicate more needs to be done if the objective of preventing cane toads from reaching WA is to be achieved.

The trial of new techniques involving excluding cane toads from water with fencing were very successful and have the potential to be the single most significant development to date in the manual control of cane toads.

There are also some issues relating to total numbers of cane toads taken from the area during 2007 as Kimberley Toadbusters (KTB) and Department of Environment and Conservation (DEC) have been removing toads from the area. Their supplied data indicates they have collectively removed less than 7000 toads from the Primary Buffer Zone (PBZ) in 2007.

2 INTRODUCTION

The second Great Toad Muster (GTM) was held on Auvergne Station during the period September 20 – October 12 2007. The muster was focused on the STTF nominated Primary Buffer Zone and much the same physical area as the previous year with some additional work to the west, where cane toads had moved since October 2006.

The Muster was restricted in size and scope due to the issues with securing funding in time to organise an event similar to 2006 but was able to achieve very significant results.

As with 2006 the major effort was supported by unpaid volunteers, many of whom travelled to the area at their own expense. STTF was able to supply some support to volunteers to attend the muster following a major component of support from a private contributor.

3 MUSTER OBJECTIVES

Priorities for the Muster were to -

- Verify long-term impacts from last year's Muster and to attempt to verify the underlying core elements of the cane toad control model upon which it is based,
- To field trial the practicality of some new techniques to increase the effectiveness of the overall toad control model in removing cane toads from the primary buffer zone.
- To remove as many toads as possible from the region

The STTF is developing an integrated control strategy for cane toads using an adaptive management research[1] model to build and refine the model. This year's Muster was critically important in revealing results from the 2006 Muster. Our adaptive management strategy incorporates active trialling of ideas to provide useful insights into the practical potential of such a strategy as a part of a management model for controlling cane toads that will actually work to stop cane toad movement rather than just reduce their numbers.

The verification of a model of cane toad control that will actually stop cane toads moving west is the major priority. In doing so we will develop the most effective toad removal model feasible for the techniques and resources available.

We will also work to quantify the results where feasible to give us better planning capability.

4 MUSTER OPERATIONS

Base camp for the 2007 Muster was at Cedars Lagoon on Auvergne Station. It was chosen because it was a point central to our field of operations and was also a place that provided a swimming hole without having to compete with saltwater crocodiles for space!

[1] This model is derived from Action research models and some further details are at http://fosonline.org/resources/Publications/AdapManHTML/Adman_1.html#intro

Despite temperatures in the shaded areas climbing above 46 degrees Celsius during the day, everyone had a wonderful experience and were able to be well fed and looked after care of the 'Cedars Hilton' pictured below.

Muster camp at Cedars Lagoon

Again the success of the camp was testament to the qualities of the people who volunteer their time to participate in such adventures.

Special thanks to the manager of Auvergne Station Alan Andrews and his wife Ros for their support and to John Sinclair of Sinclair Safaris for the use of his camping trailer and equipment.

Also special thanks to Michael Lohf (Lofty) and Jim Bailey for their extraordinary efforts in making the logistics work. Power for freezers and fridges and running water were major advances in comfort for the camp.

5 RESULTS

As expected more cane toads had moved into the PBZ region during the 2007 Wet season. The exact number and location of toads removed from the plains complex over the 2007 year are difficult to quantify at this time as the datasets supplied to STTF by other groups working in the area are not able to be interpreted successfully to give us exact capture details by the locations we have identified. Data supplied does indicate about 7 000 toads were removed from the Muster area during the earlier parts of the year.

12,004 cane toads were removed from the region during the 3 weeks of the 2007 Muster. An unknown number (many thousands) of metamorphs were killed with bleach-based sprays as well. Overall approximately 20,000 cane toads were removed from the area by the combined efforts of STTF and other groups working on

cane toad control. This is significantly less than half the numbers of cane toads taken during the GTM 2006 indicating that ***a significant reduction in numbers has been achieved***.

Furthermore, the almost complete lack of the sub-adult age class within the population is a significant indicator of the lasting impact of the 2006 muster and the model STTF have adopted.

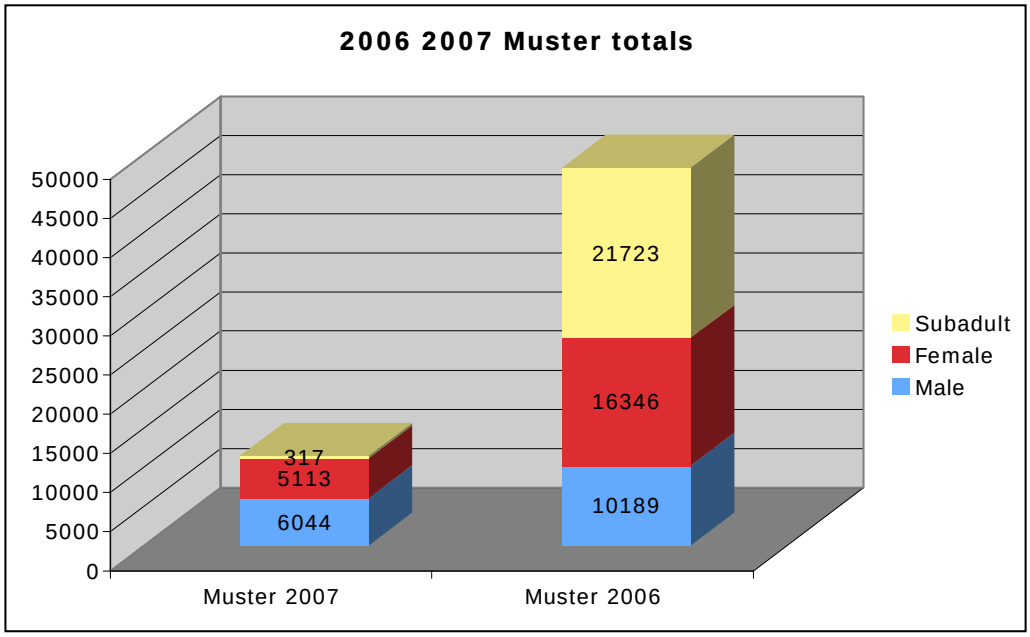

Chart1: Muster comparative totals – 2006 / 2007.

The fact there was a massive decline in the sub adult (toads less than 89mm) age class, as a proportion of the population, was most likely due to the fact that the main cane toad breeding time coincides with the early rains and at that point in November/ December 2006, very few toads were left in the area as a result of the comprehensive removal of toads from these waterholes by STTF during the 2006 Muster.

By repeatedly preventing cane toads from breeding in an area the build up of cane toad numbers can be managed. If barriers such as fences can be used to close off migration pathways it should be feasible to create buffer zones around identified places to protect them from cane toads or at least minimise the numbers of cane toads. It will be interesting to see what has occurred as this process is repeated during the Great Toad Muster 2008.

The toads that have moved into the area after the early rains had not bred significantly in the area until the un-seasonal rains experienced in July 07. There were still toads at the metamorph stage during the muster and they were sprayed, but not collected and counted.

No toads breeding in areas also means the native frog species in the area have a breeding season without competition from cane toads.

Natural systems appear to cope with low numbers of cane toad tadpoles and in such places recruitment through to the adult population is not all that successful, as many toad tadpoles get eaten by tadpole predators.

This result increases our confidence that we can create areas where cane toads will not be able to build up in numbers and so over time we can establish effective buffer zones as indicated in our strategy.

The new exclusion-fencing element (*discussed at 6 below*) will extend the effectiveness of such strategies and enable us to achieve even greater outcomes from the same resource levels.

The 2006/07 wet season was poor in terms of duration and magnitude of rainfall, and as a result many waterholes were already dry by September 2007. The much drier year has meant that the 2007 Muster had the potential to have a massive impact on the toads across the region. It needs to be recognised that seasonal conditions such as those experienced in 2007 make cane toad control much more effective than in years like the 2006 season.

Toads in the area this year had much fewer refuge options, as several major natural systems were dry. These systems were collectively the source of some 23,000 toads during the 2006 Muster.

- Flying Fox yielded 7297 toads in 2006
- Green's Swamp yielded 10,566 toads
- Ring Lagoon South yielded 6,506

A <u>total</u> of 35 toads were captured from these locations during the 2007 Muster effort.

When "dry years" like 2007 are experienced there should be significantly increased efforts made to maximise the impact on cane toad populations as toads will be forced into much reduced areas of habitat.

This difference in toad distribution between 2006 and 2007 makes it meaningless to try to compare numbers from specific sites from last year's Muster. For example, the turkey nests were grouped together in the 2006 Muster because their combined numbers were so low. In 2007, due to a poor rain season, they had become the major refuges for toads.

A more meaningful way of looking at the toad distribution in the area is to zone it into sections based on the available water points and compare the zones to 2006.

For example, Green's Swamp and Nesmit Tank are approximately 2.6 kilometres apart and it is likely that when Green's Swamp dried to the point toads could not re-hydrate there, they would most likely have moved to the water at Nesmit.

The Victoria River does not seem to be a preferred refuge option for toads as very low numbers were observed near the river, perhaps due to the salinity levels during the Dry season in the tidal sections of the river. Jellyfish were observed in the river in the area and the water tasted quite salty.

A Google view of the Nesmit Region.

5.1 NESMIT RESULTS

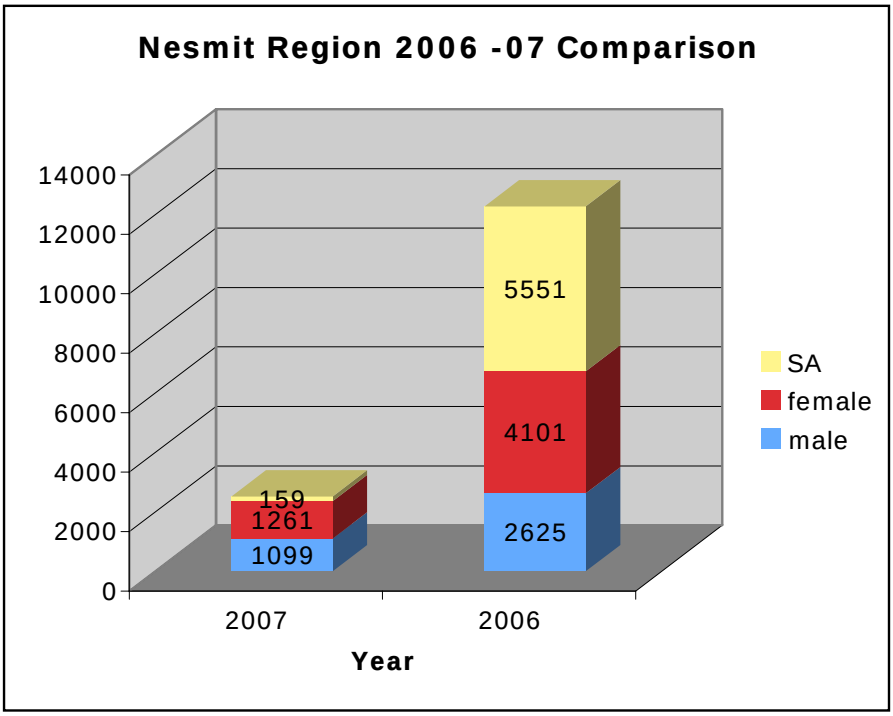

Chart 2: 2006 and 2007 comparison showing a large drop in cane toad numbers, especially in the sub adult (SA) class when compared to 2006. It will be important to see what results are found in the area during the 2008 Muster to see if this trend is continued.

This year it was apparent that cane toads had been forced to move to other water points such as the turkey nest dams. It has been reported by the station manager that in some years Auvergne Lagoon itself has dried up and if this were the case then toads in the area would have only turkey nest dams and possibly Ring Lagoon and the river corridors as refuge points. This climate/rainfall effect is a significant contributor to making complete eradication a real possibility.

Planning for toad control should include plans to significantly increase effort and resources in dry years.

5.2 HOLLYWOOD CAPTURES

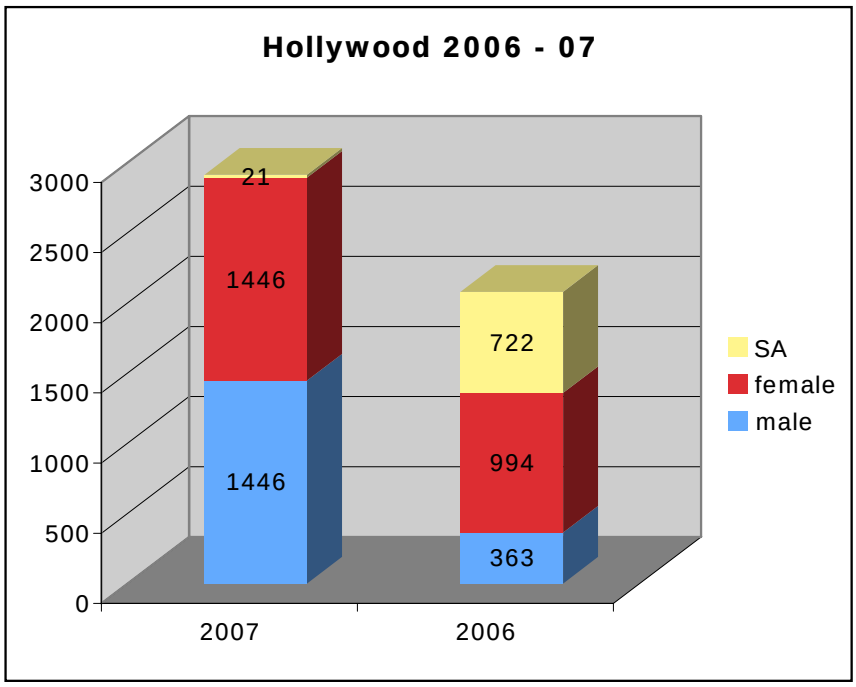

Chart 3: Shows the captures from the Hollywood Region and whilst there are more toads in total than in 2006 there was a very low number of sub adult toads indicating very low recruitment through breeding success.

5.3 GREGORY'S CAPTURES

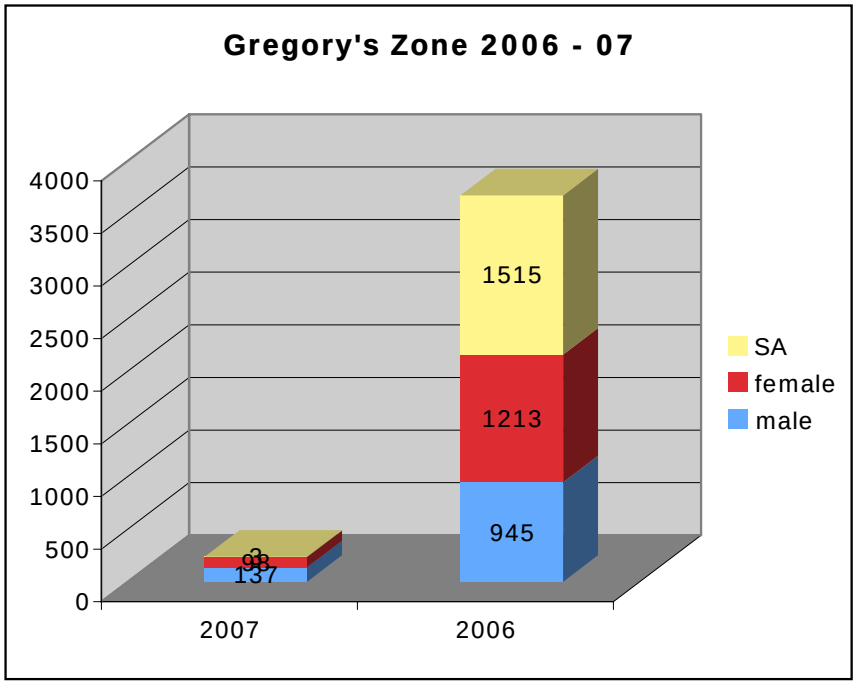

Chart 4: Gregory's Zone comparison. The small numbers of toads at this location may be due to the effect of the Gregory's Tree road deflection fence blocking the movement of cane toads into the region during 2007.The sub adult decline is significant – from 1515 in 2006 to just 3 in 2007.

5.4 LEICHARDT REGION

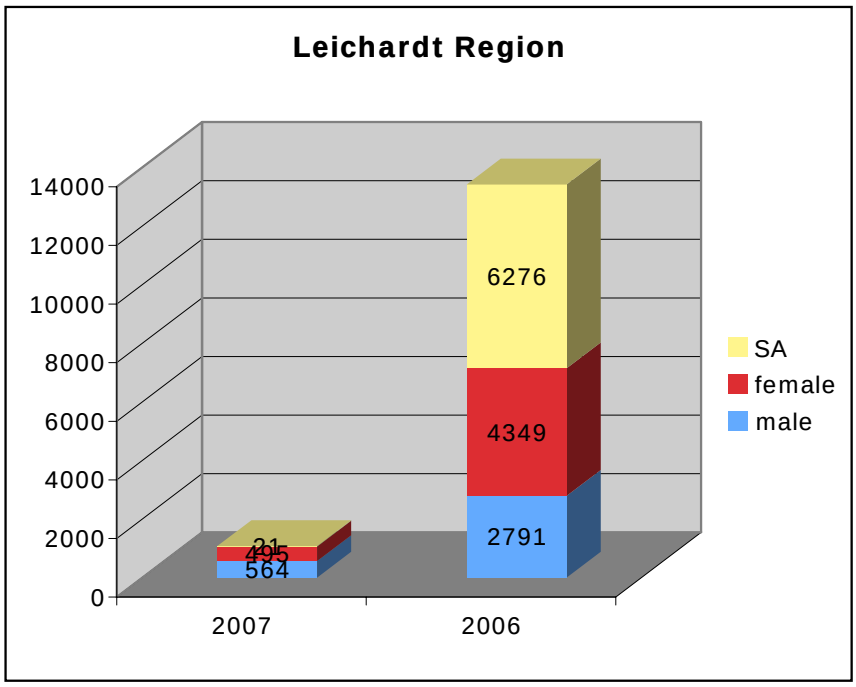

Chart 5: Leichardt region comparison between 2006 and 2007 efforts. Note sub adult figures crashed from 6276 in 2006 to just 21 in 2007.

5.5 OTHER RESULTS

One of the objectives for this year's Muster was to study the diet of cane toads, to begin to obtain a better understanding of the possible impacts on other animals in the region, through food competition. During the Muster we autopsied a number of cane toads and recorded their stomach contents. Large centipedes, spiders, scorpions, native frogs and a wide range of beetles and bugs were found.

Centipedes in cane toad stomach contents.

There are a wide range of organisms being consumed by toads. One large female toad from Auvergne Lagoon, with a snout vent measurement (SV) of 242 mm and weighing 298 grams (g), had 19 *Litoria inermis*, (a small native frog that remains active in the dry season), and 1 "adidas" cockroach in her stomach. The stomach weighed 56g, approximately 19% of her bodyweight.

Litoria inermis frogs removed from the stomach of a large female toad. Note large amounts of spawn in adult toads also.

A female, weighing 280 grams had 13 native frogs and 1 freshwater crab in its stomach. Another toad, with a SV length 91.6mm and weighing 84grams had 84 cockschaffer beetles in its stomach with a mass of 17g, which is 20% of the animals bodyweight.

Another female toad with a mass of 118g had 120 beetles in her stomach weighing 22grams. It is obvious that in areas where there are large numbers of cane toads that their predation effects on invertebrate fauna is a significant factor in relation to the available food supply and competition with other native wildlife that rely on invertebrates for food.

Given the way the limited availability of water impacts on both native wildlife and toads, and the requirement for toads to stay active during the dry season to feed and re-hydrate, there are large congregations of cane toads on remaining water. With their ravenous appetites and ability to eat virtually anything that is of the right size to fit in their mouth, their impact on the available food supply and competition with native species that may rely on this food source must be identified as events of major concern.

6 EXCLUSION FENCE TRIAL

STTF coordinator Graeme Sawyer developed the concept of the exclusion fence trials based on the success of other fencing trials, particularly the Gregory's Tree Road project conducted by STTF[2].

The exclusion fence concept is to erect temporary fencing to deny cane toads access to water and thereby increase their vulnerability to capture by traps and hand collection.

6.1 EXCLUSION FENCE RATIONALE.

Cane toads are vulnerable to dehydration and need to access water every 3 to 4 days to prevent death (Seebacher & Alford 2002). This 'weakness' is the cornerstone of the STTF strategy for dry season control of toads as the conditions in the top end of the Northern Territory, where there can be distinct wet and dry seasons, force cane toads to move to remaining water bodies in order to survive during the dry season (May to October).

It was observed during the 2006 Muster that the toads in the area of the PBZ were refuging on remnant water bodies, and many of these water bodies remaining at the end of the dry season are man made stock watering points with regular shape and have stock exclusion fences around their perimeter. Stock access water from well maintained troughs away from the dam.

An estimate that toads would have to find water at least every 6 nights has been suggested based on research that indicated the need for toads to rehydrate on a regular basis (Cohen & Alford 1996; Seebacher and Alford 2002). Alford indicated that toads denied access to suitable rehydration opportunities died within 4 days. In research work conducted in more favourable conditions in Queensland cane toads were found to be rehydrating every 3 to 4 days. Some toads went 6 days before emerging from their refuge, but the average was about 3 days.

[2] See STTF Report Gregory's Tree Deflection Fence trial (www.stopthetoad.org)

Whilst cane toads can rehydrate from a number of moisture sources, including cowpats and slightly moist soil, there is no evidence they can successfully do this on a regular basis. We have seen no evidence they can successfully use these moisture sources in the Whirlwind Plains region (PBZ) and so they must move to water to survive the dry season.

In the area of operations for the Great Toad Muster, Auvergne Station west of Timber Creek, conditions are particularly harsh for cane toads in the late dry season. Mean Average 3pm temperatures of 37.5 C and humidity of 29% and mean average 9 am temperatures of 29.8 C and humidity of 56% mean it is difficult for cane toads to maintain moisture levels.

Manual collection of cane toads from around water bodies can be very effective as demonstrated by Frogwatch NT as a part of its campaign to stop cane toads over running Darwin. This technique led to large numbers of cane toads being successfully captured during the Great Toad Muster 2006 where over 48,000 cane toads were removed from the Whirlwind Plains region. During that project Auvergne Lagoon was cleared of all cane toads[3].

There are however some issues with the model, especially in relation to the Western Australian objective of completely stopping the westward movement of cane toads. This requires every cane toad to be eradicated and whilst it has been demonstrated this can be done in specific locations, the resources required to do it across the entire region are enormous if only hand collection is used.

These issues with the model relate to the amount of time and effort required to get the "last toad" from an area and the numbers of people and the number of successive night visits needed to be made to an area in order to achieve the complete removal of cane toads. Not all cane toads need to re-hydrate every night and some do not emerge from their refuge on a particular night. This, coupled with the different times they move to water, makes it more difficult to completely remove toads using manual hand collection only.

The exclusion trial was specifically designed to develop a control model that requires less people effort to clear toads from an area and also bring a degree of certainty to the process in relation to the complete removal of cane toads as opposed to a reduction in their numbers. *The fence changes the fundamental driver of the control effort from the need to search areas and find the toads, to using a lack of water to "force" toads into a given area. Most importantly toads denied access to water will need to keep trying to find moisture and if not successful on one night will be back the next, or the next.*

During the 2006 Muster up to 14 nights were spent at some locations collecting toads and after all that effort we could still not be certain of having removed all the adult toads.

The Cedars Lagoon area provides an insight into this issue during 2007. The Kimberley Toad Busters and DEC cane toad team had been working in that location during the 2007 dry season. The Kimberley Toad Busters have published a report on their activities at that location[4] indicating that they had removed "*over 4013 toads*"

[3] See 2006 Field Operations Report. The complete removal was verified by repetitive visits by DEC staff, including their sniffer dog.
[4] "ToadBusters take to a tinnie", Kimberley toadBusters media release 24th September 2007

(KTB 2007) from Cedars during 2007 over many visits including 16 adults and nine children over a weekend.

It is unclear just how many person hours have been spent toad busting at Cedars by the combined groups (DEC and KTB) in 2007 but it is obviously significant. After all this effort there were another 986 cane toads removed from the site by STTF during the Muster.

6.2 CEDARS LAGOON EXCLUSION BARRIER TRIAL

A trial fence was erected at Cedars Lagoon, the location of our base camp, and the impact on native animals and cane toads was monitored. The site was chosen because we were camped there and therefore able to monitor it at all times.

The fence was placed at the top of the bank of the dam system and ran around the entire reservoir and the overflow area (west). Note in the aerial image below the overflow is dry and is located to the left of the reservoir in the image. The Cedars system is different to the other turkey nest dams in the area in that it has significant vegetation and toad refuge around the inside of the reservoir walls.

Cedars Lagoon; aerial image from Google. Note significant vegetation within the dam walls.

6.2.1 CEDARS FENCE CONSTRUCTION

This fence consisted of a single wire, 70 cm from the ground, supported by star pickets in the corners and a Waratah™ fence dropper, driven into the ground, every 5 - 6 metres.

Fence corner assembly and wire showing dropper placement.

Volunteers attaching shade cloth to the Cedars Lagoon fence.

Shade cloth was clipped to the wire and anchored to the ground using weed mat anchor pegs.
This enabled the fence to be constructed quite quickly. Approximately 54 person-hours of construction time and 29 person-hours to fit the native frog gates.

The completed fenced area was 210 metres (long) by 130 metres (wide). The fence was approximately 70 centimetres (cm) high with a 30cm. flap laid on the ground and then pegged with weed-mat anchors to prevent animals penetrating under the fence.

Cedars Lagoon fence showing the run down the northern bank to the overflow area (west). Note how the shade cloth is fitted to the contours of the ground.

On the first day all of the posts were installed and 1 roll of shade cloth was attached to the fence. It was noticed on the first night that some *Litoria inermis* frogs were not able to find a way past the 50-metre section of shade cloth on the fence and so the decision to install the native frog gates was made. These consisted of short sections (1.5 m long by 20 cm high) of 25mm square mesh installed in the fence at ground level to allow small frogs and reptiles to pass through the fence, but still prevent sub-adult and adult cane toads accessing water. This significantly increased the construction time.

6.2.2 CEDARS LAGOON RATIONALE

Cedars Lagoon was chosen primarily because of it being the location of our base camp and the trial was designed to show any issues with the fence in relation to:

- unwanted impacts on non-target species,
- the effectiveness of traps used in conjunction with the fence
- The field logistics and operational issues associated with using the exclusion barrier concept.

A total of 12 toad traps were placed at intervals around the outside of the fence. Cane toads were not collected at night from the outside of the fence to determine if the traps alone would capture them. Traps were deployed with water only (5) and 7 with water and lights to observe if toads would source water placed outside the fence.

Cedars has significant vegetation and toad refuge in the form of logs and deep soil cracks inside the main reservoir banks and this provided refuge for toads inside the fence. Traditional hand collection was used inside the fence to remove toads trapped in by the fence.

6.2.3 CEDARS LAGOON RESULTS

A total of 986, consisting of 440 male toads, 498 female toads and 48 sub adult toads were captured and a large number of metamorph toads were sprayed in the area.

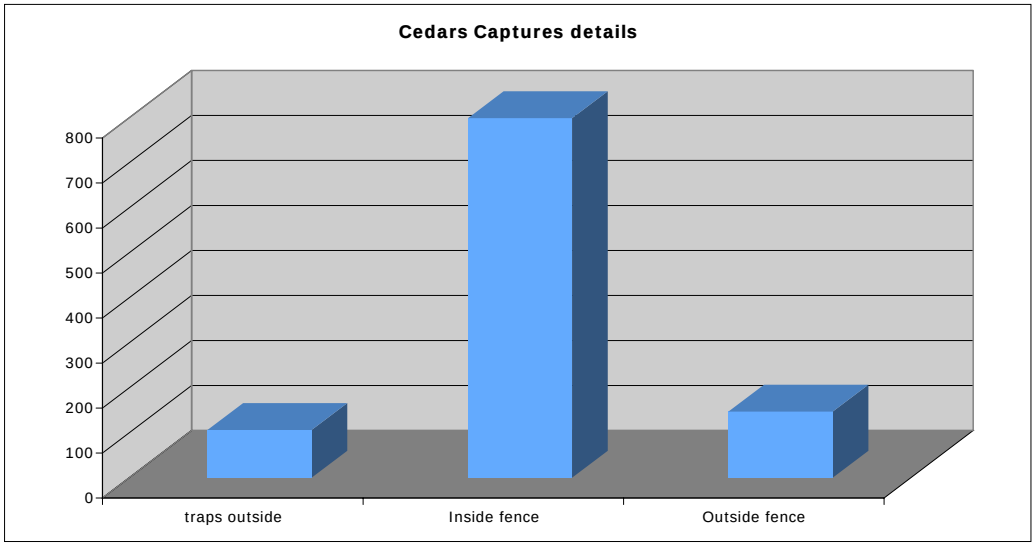

Chart 6: Toad capture by location at Cedars Lagoon.

A large number of the toads were collected inside the fence where many had been trapped in during construction due to the vegetation and other refugia lining the banks of the reservoir.

The fence demonstrated a number of operational issues relating to the height of the fence and the way the fence was anchored to the ground.

Agile Wallabies (*Macropus agilis)* endeavoured to push under the fence rather than jump over it and this resulted in some of the anchor pegs pulling from the ground in some places possibly allowing toads to find a way under the fence in those locations. Whilst these issues were not unexpected during research and development cycles they have allowed us to refine the strategy.

Some *Litoria inermis* frogs, which were in very large numbers at the site, had difficulty getting past the fence and there were some deaths due to desiccation. Continual monitoring of the exclusion fence allowed this issue to be dealt with as soon as it was observed.

Frog and wildlife gates were added to the fence and this prevented the problem from becoming a major issue (*see image below*). Some *L. inermis* were able to climb the fence and some were able to jump it, but some where unable to successfully negotiate the barrier until the fence gates were installed.

Native frog gate, made from 25mm square mesh installed in the fence. Note also the see through nature of the shade cloth, which may contribute to wallabies trying to push through the barrier.

6.2.4 TRAPS

Of the 106 toads captured in the traps located at Cedars Lagoon, 46 were captured on the first night.

The 7 traps with lights and water captured 88 toads and the 5 traps with water alone captured only 18 toads. Although difficult to analyse statistically, this tends to suggest that traps, with lights and water, are more effective in capturing toads, and that surprisingly, there does not appear to be a strong attraction to water alone for toads that are denied access to their primary water source.

6.2.5 CEDARS LAGOON DISCUSSION

A significant number of the cane toads at Cedars were refuging in the vegetation and soil cracks in the immediate vicinity of the reservoir and were “locked in” by the fence. Toads on the outside of the fence were not collected on the first few nights and a significant proportion of the toads on the outside of the fence were trapped. It is not clear how many toads get under the fence in spots where the wallabies had pulled the anchor pegs from the ground, so numbers taken inside the fence versus outside are indicative only.

The integrity of the fence was compromised by wallabies pulling out the bottom anchor pegs as they pushed under the barrier, and so it is likely that some toads were able to get under the fence in some locations. This makes the reliability of this data questionable.

However where possible exclusion fences should be close to the water and between any vegetation refuge areas and the water, to maximise the number of toads on the outside of the barrier.

The traps at the location did catch a number of toads and it will be worth further investigation to see if exclusion fences can be deployed with traps doing the toad capture work.

Gateways installed in the fences seem to be effective in allowing some native species to pass whilst blocking cane toads in particular size classes.

Volunteer Lucy buries toads. Dead cane toads are buried to reduce threats to native wildlife

6.3 LEICHARDT EXCLUSION FENCE TRIAL

A second exclusion barrier was constructed at Leichardt tank. This consisted of two separate fences, a fence around the smaller turkey nest, which was approximately 40metres square and a fence around the larger reservoir tank, which was approximately 100metres square.

Leichardt does not have any significant vegetation close to the water line and so no significant refuge locations were inside the fence. There were a few soil cracks and other holes where toads could refuge, but these were easily cleared.

The fence was placed closer to the water line and inside the top of the banks on the reservoir and along the edge of the top bank on the Turkey Nest.

Leichardt tank showing turkey nest dam and larger reservoir tank to the east.

6.3.1 LEICHARDT CONSTRUCTION

The fences were constructed with star pickets in the corners and Waratah droppers driven into the ground at 5 metre intervals. Two wires were used on this fence, one at 50cm above the ground and another at about 6cm above the ground. This enabled the shade cloth to be more securely attached to the wire and prevented animals such as wallabies from being able to push under the fence.

Volunteer Fiona erecting the fence at Leichardt - Note top and bottom wires, the overall height of just 50cm, and lack of vegetation inside the fence.

The fence was constructed in less than one day and took a total of 30 person hrs to erect. Erection of the fence is expected to take less time in future because the shade cloth was rolled up for storage still attached to the wire and this will significantly reduce the time required to erect a new fence. This saving could be as high as 50% of construction time.

Three cane toad traps were placed on the turkey nest dam fence to test their value in catching toads on the fence. Initially two of the traps only had water in them, the third trap had water and a light.

6.3.2 LEICHARDT RESULTS

Right from the first night it was evident the exclusion barrier was going to have a massive impact on toads. When we arrived at the fence location at about 8.00 pm there were already a significant number of toads lined up along the fence.

We collected the toads from the larger reservoir section and the toads from the traps on the turkey nest. The other toads on the turkey nest dam were left to see what the impact of the traps would be. We collected 207 toads from around the outside of the reservoir fence and 37 toads from the inside of the fence.

81 toads were collected from the traps around the turkey nest dam fence and 9 from inside the turkey nest fence. When we left the site at 10.30 pm there were 137 toads along the turkey nest fence and no toads on the reservoir fence.

It was interesting to note that the toads were not actively moving or trying to get to other water sources. Only four toads were observed moving away from the turkey nest fence towards the reservoir fence. Toads on the fence were not moving more than about 20metres and many hardly moved from where they first encountered the fence.

Toads along the exclusion fence at Leichardt on the first night. Note that some already appear desiccated.

We returned to the site at about 7.50 am the next morning and found a large number of toads still along the turkey nest fence. Some of these were quite sluggish due to desiccation and would have no doubt been killed by the sun if they had been left there. We collected 177 toads from the turkey nest fence, 83 toads from the traps on the turkey nest fence and 51 toads from the reservoir fence.

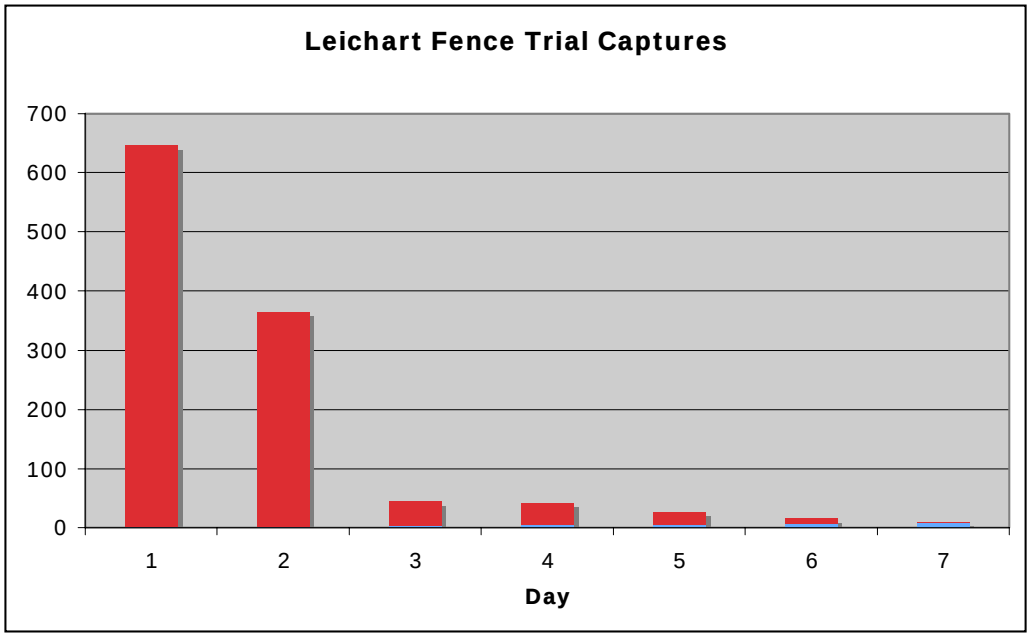

Chart 7: Continued trapping and collection at Leichardt showed a rapid decline in numbers. The graph above shows the capture data.

Toads collected from traps and along the fences early in the morning were counted with the toads collected the night before.

59% of total toad captures for the site was on the first night and 33% on the second night giving a massive 92% of the population in the area removed in just 2 nights.

6.4 EXCLUSION FENCE FINDINGS

The results of the project at Leichardt are very significant as shown in the graph above. The exclusion fence dramatically increased our ability to remove cane toads from the location and also meant we could do it significantly more quickly and with less person hours required.

Most significantly it gives us the ability to get every toad because the strategy alters the fundamental driver of the control effort and forces the toads to a place where they can be easily found and removed. We do not have to search all around the location for toads but can wait for them to come to the fence, which they will all have to do at some stage to attempt rehydration.

As a contrast the Hollywood turkey nest dam system was also a target for the Muster and we collected toads at this location using traditional hand collection methods.

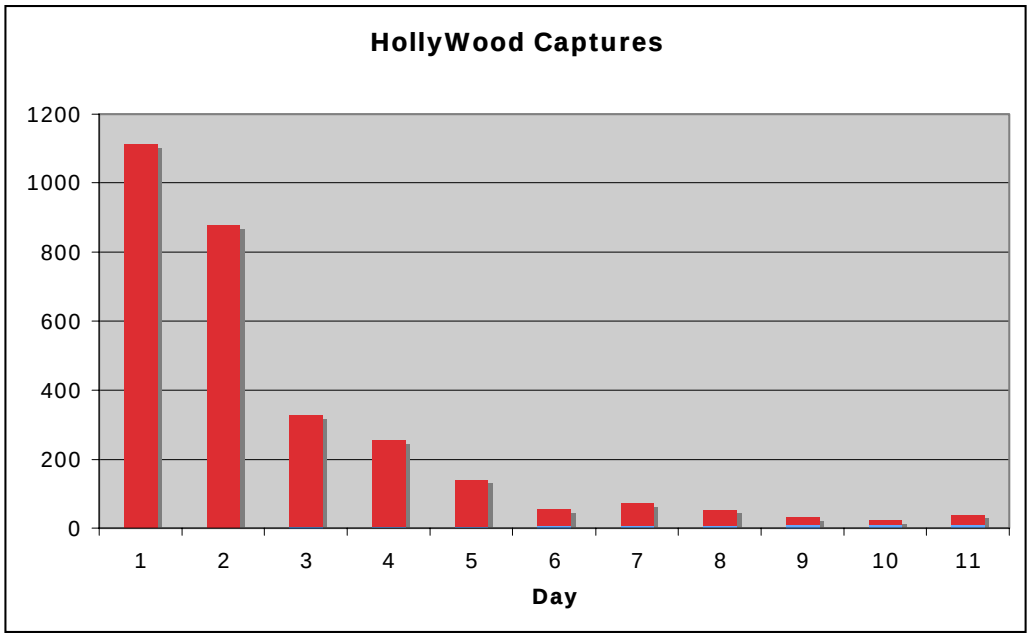

Chart 8: The graph above shows the capture details from Hollywood and shows that even after 11 nights of busting we were still getting toads from the location and cannot be sure that we removed all the toads from the site.

The Hollywood site also required many more person hours and involved people searching the location for toads. At Hollywood we spent 97 person hours collecting toads over the course of the Muster. At Leichardt we spent about 13.5 person hours collecting toads.

This very significant difference shows the potential for exclusion fences to totally transform the effort to stop toads moving towards WA and is a major development. If we can reduce the effort required to eradicate toads from a location it means the volunteer effort can spread over a much greater number of sites in a given time.

If fence construction time, 30 person hours, and removal time 11 person hours are included, the Leichardt project took about 50% of the Hollywood effort in terms of person-hours and at least 40% less nights to achieve the zero target.

The exclusion fence project has shown that we can remove cane toads from an area in a reasonable timeframe and with a low number of people. This gives us great confidence that we can significantly increase the effectiveness of events like the Muster in clearing cane toads from the Primary Buffer Zone.

Such a massive increase in the efficiency of toad control efforts could swing the balance of control work to stop cane toads moving to WA in our favour.

The fact that the toads were still along the fence in daylight also has significant implications for control work as it means some of this work can be done during the daytime.

For groups such as the DEC team, which operates under legislative awards and consequently has time and operational restrictions to work within, it would be feasible to erect fence complexes during daylight hours and to just check them in the morning and not worry about night time checks apart from some monitoring of wildlife effects.

These findings appear to allow for a much more strategic approach to cane toad control and when comparisons between the 2006/2007 Great Toad Musters and the efforts of KTB and DEC in 2007 it would appear feasible (using this model) to quickly eradicate areas of cane toads with only a fraction of the effort currently being put into control work.

6.4.1 IMPACT ON NATIVE WILDLIFE

Concerns have been raised over impacts of the fences on native fauna. In the first instance, any effects will be short-term, as the fences are deployed only for the duration of the Muster, and then removed. Similarly, it is likely that other groups (DEC and/or KTB) would only deploy fences for short periods at any single waterhole.

From observations made during the 2007 Muster, wallabies tended to go over the Leichardt fence as a first choice, probably because they could see over the fence at just 50cm in height. The wallabies did not try to go under the fence as they did at the Cedars project and did not damage the Leichardt fence in a way that allowed toads to go under it.
(See also Appendix 1)

Wallabies drinking inside the fence at night.

The fence on the turkey nest dam also trapped some small feral pigs indicating that the fence was strong enough to withstand feral animal impacts. The large adult pigs in the group did slightly damage the fence but not to the degree that cane toads could get over or under it.

6.4.2 NATIVE FROGS

There were very few native frogs, especially *Litoria inermis*, at the Leichardt site compared to the Cedars site and they seemed to be able to get over the 50cm barrier much more effectively.
Litoria rothii, Roth's Tree Frog and *Litoria caerulea*, Green Tree Frog and *Litoria rubella*, Red Tree Frog were observed to climb or jump the fence without difficulty.

6.4.3 OTHER NATIVE ANIMALS

Mammals such as wallabies were able to pass the barrier without difficulty and no other mammals were observed along the fence. Evidence from the Gregory's Tree Fence trial show that small mammals such as Western Chestnut Mice and Delicate Mice are also able to climb the fence.

Several species of geckos were also observed climbing the fence, as were some snake species, *Liasis Childreni*, Children's pythons and *Tropidonophis maini*, Keelbacks.

The exclusion fence presented no access or egress problems to mammals such as wallabies

6.5 Traps Along Exclusion Fences

The use of traps on the turkey nest section at Leichardt showed that there is potential to use exclusion fences and traps as exclusion barriers and thus not require people to visit the site every day.

On the first night 164 toads were trapped. Interestingly (as with the Cedars observations) the trap with lights and water caught more toads than the other two (water only) combined 104 to 60. On the second night a light was added to a second trap and its captures increased significantly to the same levels as the other light and water trap.

As with the Cedars trial the results clearly supported the notion that traps used along such barriers should have lights and water to maximise their effectiveness.

The traps did not catch all the toads around the fence and more trials will be needed to see if it is feasible to use them without checking the fence each night. At the 2008 Muster we will trial an exclusion barrier with traps to see if this is feasible.

7 CONCLUSIONS

What is apparent is that the two methodologies employed as physical management techniques are particularly effective against populations of cane toads that are concentrating onto remnant and man made water points late in the dry season in northern Australia. It is also apparent that toads have made effective use of man made water points as significant refuge areas in their movement across northern Australia. Exclusion fencing of man made water points dramatically increases our ability to remove cane toads from these locations and this may even hold potential as a wetland and infrastructure protection methodology in the future should toads enter Western Australia in large numbers.
However, the very significant difference between the Hollywood and Leichardt sites shows the potential for exclusion fences to totally transform the effort to stop toads moving towards WA and is a major development. If we can reduce the effort required to eradicate toads from a location it means the volunteer effort can spread over a much greater number of sites in a given time.

The exclusion fence project has shown that we can remove cane toads from an area in a reasonable timeframe and with a low number of people. This gives us great confidence that we can significantly increase the effectiveness of events like the Great Toad Muster in clearing cane toads from the Primary Buffer Zone and indeed other areas. Such a massive increase in the efficiency of toad control efforts could swing the balance of control work to stop cane toads moving to WA in our favour. The fact that the toads were still along the fence in daylight also has significant implications for control work as it means some of this work can be done during the daytime.

These findings appear to allow for a much more strategic approach to cane toad control and when comparisons between the 2006/2007 Great Toad Musters and the efforts of KTB and DEC in 2007 it would appear feasible (using this model) to quickly eradicate areas of cane toads with only a fraction of the effort currently being put into control work.

8 RECOMMENDATIONS

- It is recommended that the exclusion fencing model be incorporated into all volunteer and DEC operations following appropriate briefing sessions that explain the rationale; demonstrate the technique (taking into account wildlife gates, landscape restraints, feral animal activity and toad behaviour) and identify the strategic importance of site selection.
- For groups such as the DEC team, which operates under legislative awards and consequently has time and operational constrictions, it is recommended that they adopt this methodology as it is more resource efficient to erect fence complexes during daylight hours and to just check

them in the morning and not worry about night time checks (apart from some monitoring of wildlife effects).

- It is recommended that further investigations into these control strategies be supported by Federal and State Governments and undertaken based on the adaptive and innovative control models developed by STTF that have proven so effective against cane toad populations
- It is further recommended that when “dry years” like 2007 are experienced there should be significantly increased efforts made by all volunteer and government groups to maximise the impact on cane toad populations as toads will be forced into much reduced areas of habitat and subsequently be much more susceptible to the mustering and exclusion barrier control methodologies.

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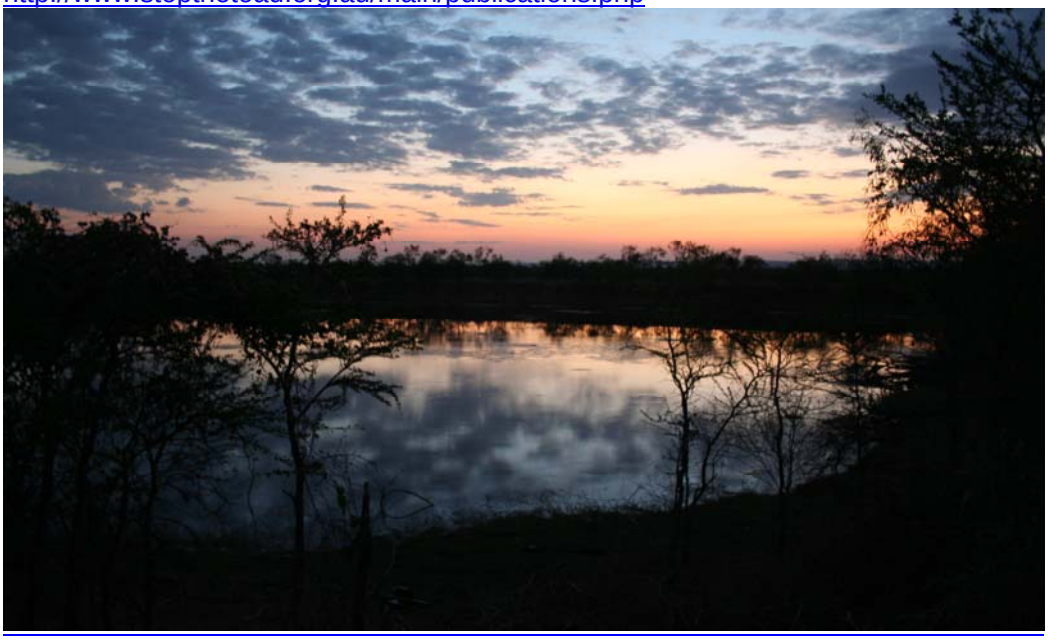


Sunset at Cedars Lagoon

APPENDIX 1 - WILDLIFE IMPACTS

Two mature King Brown snakes (*Pseudechis australis*) were found during the Muster. One had been dead for over a week the other was was still supple and

decomposition was not advanced. An autopsy revealed an adult male cane toad in the throat of this snake.

Cane toads also devastate reptile populations. This freshly killed large King Brown snake (Pseudechis australis) was autopsied with a male cane toad in its throat. Another dead King Brown was observed less than a metre from this animal.

Goanna carcasses were common across the area but no live goanna was seen during the period of the toad bust. There were also a significant number of shells of long necked turtles in the water as well as some on land. Local indigenous people commented there appeared to be many more than usual.

Cane toads were in very high concentrations in some areas and the impact on native species utilising the same food supply were potentially significant. Whilst we do not have good information on this the numbers of species like *litoria inermis*, native frogs which congregate on water late in the Dry Season, their numbers seemed to be much higher at many areas visited during the Muster. We also found *litoria inermis* in the stomach contents of a number of the cane toads we autopsied. In one case 19 *L.inermis* from one female toad.

Cane toads have a significant impact on the invertebrate fauna of northern Australia. Little is known about the downstream impacts on native wildlife which are competing for this resource or indeed what impacts are actually occurring to invertebrate fauna populations. Significant reductions of invertebrates and their predators may have unwanted economic and environmental impacts.

APPENDIX 2: OTHER MUSTER IMAGES

As water recedes during the late dry season remnant water lends itself to strategic fencing

Fences combined with traps can be effective at quickly reducing toad populations

A typical turkey nest dam with an overflow area in the foreground. These dams are fenced to exclude cattle and other stock and are consequently easily defended from cane toads when innovative exclusion fencing and trapping techniques are applied.

APPENDIX 3: A VOLUNTEER'S VIEW – MARG FRECKLETON

"As some of us head home it seems it's time to say adieu
And Judy thought this better done in verse
Now the weather up here's hot, more for drinking than clear thinking
But here we go for better or worse."

Some of the Volunteer Brigade of 2007

The Great Toad Muster 2007

It's the end of the dry and the waterholes are shrinking
And this puts those thirsty cane toads into a fluster
We're quite happy this is so 'cos we know where they will go
And it's prime time for the Great Toad Muster!

To stop the toads advancing, destroying native wildlife in their path
Takes a lot of effort from people without a doubt
Scientists, conservationists and volunteers all working side-by-side
Is what the STOP THE TOAD FOUNDATION's all about.

We need to capture cane toads and learn more about their habits
We need to cull their numbers that's for sure
So a dedicated team forms in September every year
And the results of their hard work we can't ignore.

So what about the motley crew assembled for this year?
Have they done the job to the best of their ability?
Let's take a look as best we can with another verse or two
And if I offend anyone let's put it down to early onset senility!

By car or plane and trooper, we vollies made our weary way
To the base camp known by some as the “Cedars Hilton”
Yes Lofty and his mates in Jim, Lucy and Fiona
Had set up all mod cons to stop our spirits from wiltin’.

So with tents and and beds and a shower and two portaloos thrown in
We were well on the way to being happy campers.
Add to this a a great camp kitchen and loads of equipment ready to go
We could almost have been accused of being pampered

The set-up team aforementioned was joined by toad guru Graeme
And, as fate would have it, Tina and Jim
This little famly did it all, the establishing, the planning, the executing
An amazing effort since their numbers were so thin

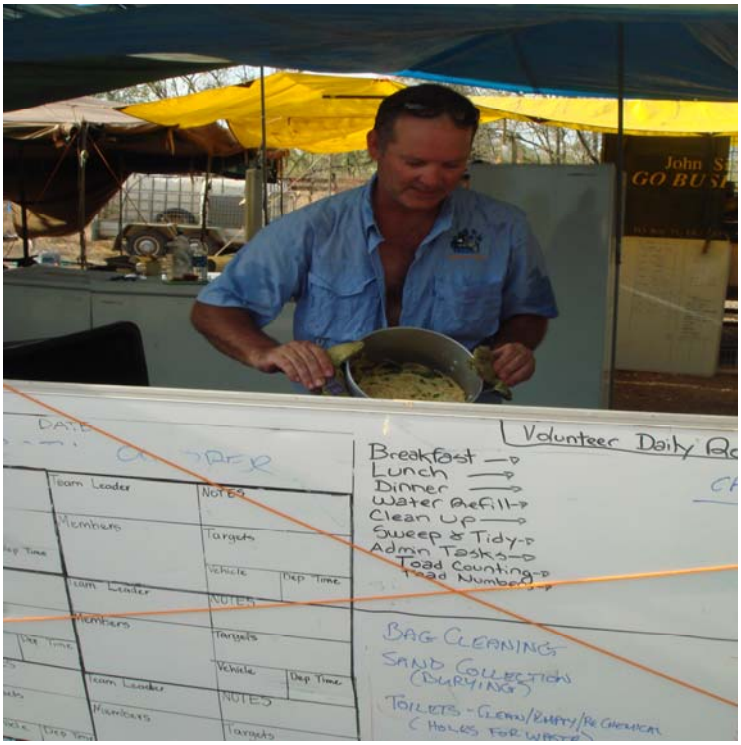
When Lesley and Judy joined the team
These extra hands were sure welcome
With the myriad of jobs the muster creates
It’s good to have people to share ‘em.

Apart from the bursting, the gassing and the count
The dissecting, data recording and the burials
There’s the reconnaisance, the traps and the fences to build
And all the equipment to keep highly functional.


Intrepid volunteers up for the early morning count!

At the camp there are jobs which are also important
The supply of cold water among them
There are the bags to be washed and the loos to be emptied

and even dinner can take some co-ordinatin' ……..



So it's pasta tonight a la Russell!

By the time of the arrival of Rod, Marg and Anne
The camp was running quite slickly
With some on-the-job training over a day or two
They picked up the skills fairly quickly

Twelve became seventeen a few days later
When Fiona arrived with her gang
Karen and Jane had to brave the heat
While second-timers Geoff and Wendy had the hang

The last to arrive to this point in time
Were Russell and a rookie named Steve
They slotted into it right away
Busting toads out at Nesmit that first evenin'.

The team's quite a sight getting ready to bust
I guess we do look pretty daggy
Kitted out with headlights, nets, spotlights and water bottles a must
With the bumbags and the gaiters, the pants look kinda baggy

Jim, Geoff, Wendy, Karen, Fiona, Jane, Steve and Lesley…ready for another night of busting

But we do not care as we rattle along
We have a common purpose in mind
We are out to collect as many cane toads as we can
And ideally leave none behind.

Night busting

Graeme's planning seems amazing and his strategies effective
His background knowledge and forward vision just spot on
His immediate support team – you know that mob that set up camp
They too know how to get this big job done.

Graeme entering data and planning more busting strategies!

The problem is too big, no hassle all-consuming
They just keep going 18 hours a day
Okay, they have a bit of trouble remembering peoples' names
But hey, isn't that a small price to pay?


The morning toad burial ceremony.

So thank you one and all for the part that you have played
In this Great Toad Muster of 2007
Your commitment, camerarderie and tolerance.

You have made this venture actually happen.

A well-earned siesta for Graeme.

Congrats and good luck to you all.

Marg Freckleton