STOP THE TOAD
KEEP WA CANE TOAD FREE

Seasonal Cane Toad Control Strategy
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Contact: Graeme Sawyer
Regional Coordinator
Stop The Toad Foundation Inc
0411 881 378
graeme@stopthetoad.org .au


stopthetoad.com

1 INTRODUCTION

The purpose of this plan is to detail the next stage of cane toad control by the Stop the Toad Foundation (STTF). The aim is to apply what we have learnt from our observations and experience to date to determine the best control methodologies and the strategies for 2008, especially the Great Toad Muster (GTM) 2008.

In essence this is about putting a practical Kimberley/ Victoria River District (NT) perspective on the scientific and other knowledge in relation to cane toads and reviewing the progress that has been made to date.

The overall aim is still the eradication of cane toads from the control zone, the area between the western side of the Victoria River and the WA border, in an attempt to stop cane toads penetrating into WA.

2 SUMMARY

Combinations of trapping, fencing and hand capture have been used to remove cane toads from areas within our designated control zones. To do this, considerable on-ground activity is required through the coordinated delivery of significant personnel and financial resources.

Cane toads are particularly vulnerable to dry conditions and they are not well adapted to the dry season (May – November) conditions in the region. There is a scientific basis to this (Alford, personal communication & Christian, personal communication). STTF research indicates this impact is even more pronounced in the control area.

Cane toads have a number of behaviours that they use (refuging within 100 metres of water, concentrating around remnant water, crepuscular and night active) to cope with dry conditions and these behaviours can be exploited as the key element of control efforts.

During the 2006 Great Toad Muster, Auvergne Lagoon was cleared of cane toads (Graeme Sawyer, personal communication) using volunteers who undertook a range of removal actions including hand collection and sniping, showing that it is possible, with the right level of resources, to remove cane toads from areas.

During the 2007 Great Toad Muster, toad specific exclusion fencing trials were conducted on Auvergne station and a trial at Leichhardt tank showed spectacular results with 93% of toads caught in 2 nights and the entire toad population from the trial area was removed in 7 nights. This is a very significant shift in our control capability and it not only changes the fundamental driver of the control effort but also makes the task much easier as it achieves the desired outcome in much less time, at much less cost and with significantly more certainty than other physical methods.

The 2007 Muster was able to cover a similar overall area as the 2006 Muster with less people and less time because the 2007 dry season was much drier and many water bodies, particularly the large more difficult to work natural systems, like Flying Fox waterhole, were dry and did not hold cane toads.

The actual 2008 action strategy details will need to be determined once on-ground conditions are clear. This especially relates to available water and whether major natural water systems in the area dry up during the 2008 Dry season. At the time of writing it is expected that 2008 will be a particularly dry year and that physical cane toad control activities will be highly successful especially if applied in a complimentary fashion.

The 2007-08 wet season rainfall has been well below average in the Timber Creek/Victoria River region with a reported driest January on record, a moderate February rainfall, followed by the second worst March rainfall on record. These conditions coupled with an early onset of the dry season (already underway in May 2008) should mean most natural water bodies in the Auvergne station area will dry up even earlier than in the 2007 season. Whilst this may change if unseasonal rainfall occurs (as it did in June 2007) STTF is planning to exploit this opportunity to maximise the impact on cane toad populations and indeed calls on other groups to take this opportunity as well in a coordinated fashion.

The STTF Primary and Secondary buffer zones (identified in 2006) should be moved west to take account for recent reported cane toad movement. The original primary buffer zone will now become the location of the secondary Buffer zone and the new Primary Buffer Zone will extend from the Pinkerton range to the WA border.

3 TOAD ECOLOGY AND BEHAVIOURAL KNOWLEDGE

Cane toads are a species that is very water dependent and consequently are biologically ill equipped to deal with extended dry periods. This means they have developed behaviours which allow them to cope with dry conditions and STTF has successfully exploited these behavioural characteristics to remove significant numbers of cane toads from areas of the control zone.

Behavioural data from FrogWatchNT and from previous research in Queensland and the Northern Territory, as well as the results of survey and control work undertaken by Department of Environment and Conservation (DEC), Kimberley Toad Busters (KTB) and STTF have allowed us to build a suite of strategies that are being incorporated into the battle against the toad invasion.

The major knowledge sets that have been developed include:

- The degree to which toads are reliant upon surface water at this time of year, the late dry season (in the current control zone).
- The impressive effectiveness of exclusion barriers to keep toads from water whilst having minimal to nil impact on wildlife (STTF, 2007).

- The importance of significant early surveillance to identify refuge areas and wetlands that create landscape links for toad populations.
- The various levels of effectiveness of volunteers hand collecting cane toads.
- The requirement for multiple night hand collection only busts (>6 consecutive and as much as 15) at individual locations to ensure that the majority of toads at a location are removed – (based on knowledge that toads will not leave their refuge every night).
- The effectiveness of simple barrier fencing to direct/deflect toads into traps.
- The effectiveness of simple barrier fencing to be erected in a toad specific fashion.
- The effectiveness of 'black light' technology to attract toads to traps.
- The effectiveness and efficiency gains that are obtained by adopting an adaptive and whole of suite approach to toad control and management.
- The Gregory Tree Road fence trial is demonstrating an apparent effectiveness as a cane toad management tool (STTF believes it is also time to identify wetlands at risk both in the NT and Kimberley).
- STTF believes it is time to commence negotiations with pastoral land holders, NT Government and Aboriginal communities about likely locations for an extended fencing program. This should primarily include all man-made water bodies - to take them out of the equation as their effectiveness as toad refuge areas during the extended dry season has been demonstrated (STTF 2006, 2007).
- Initial observations support a combination of major targeted toad control activities towards the late dry season. This approach could be supported by encouraging localised employment to monitor /maintain traps and fences and undertake reconnaissance as directed e.g. Muyalee Womens Rangers (STTF believes this is a cost effective strategy and has a number of positive social and economic outcomes for small communities).

4 ISSUES AND RESEARCH OPPORTUNITIES

There are many effects STTF need to build a better understanding of and there is a need to keep an open mind about these as their relative importance from a control perspective is identified.

Included are:

- How effective are the tidal mudflats as barriers to toad movement during the early 'wet season'; 'dry season'; during flood events?
- That it appears reasonably certain that the Bradshaw Base is a feeder area for toads to cross the Victoria River into the control zone and further north. STTF believes that more can be done in this area to reduce populations or provide protection to the buffer zone.
- What landscape parameters should be identified to determine effectiveness of management and control activities? – in some

situations landscape may need to be sacrificed due to terrain, safety or operational issues.

- What are realistic assessments of the efficacy of parasites as a long term eradication method?
- How far do toads actually move during the wet season and what is this movement based on? Do toads just simply 'up and run' as far as they can in response to rainfall or have they been in an area for longer than expected? (there is some basis for this observation given the size and age class distribution found on Auvergne Station by STTF in 2006).
- What short, mid and long term effects on toad movement and age class disposition are the various control and management activities having?

Existing control methods that have been developed by FrogwatchNT in the Northern Territory such as the light traps and 'super traps' catch cane toads during the wet season and will probably be very successful at localised control of toads, particularly during the extended dry season experienced in the NT and the Kimberley region (Seebacher and Alford 2002).

The traps can be effective in a number of circumstances including localised control (around dwellings in towns) and on deflection fencing (where toads are deflected along the fence line into the trap) and their use could be extrapolated to cover broader scale areas such as the invasion front (particularly around waterholes/wetlands in conjunction with strategic fencing).

Hand collection (particularly associated with events like GTM 2006 and 2007), exclusion barriers, and traps used in conjunction with barrier fencing will slow the invasion front of toads and may in fact be able to stop it if environmental conditions allow.

These actions may have the impact of slowing the toad advance and so 'buy' much needed time to allow the development of appropriate specific biological controls. Comparisons between the 2006 and 2007 muster results are encouraging but more work is required to increase the impact and verify we can clear the buffer zone and create the delay in toad movement.

Research Opportunities (Honours/Masters projects) during coming 2008 Muster events include:

1. Collection and preservation of captured toads for future examination of gut contents for an analysis of prey items.
2. Data collection by muster participants for comparison of trap success in paired trials (i.e. using paired sets of traps in equivalent positions) of traps with/without black lights and with/without deflection fencing. This should scientifically demonstrate the effectiveness or otherwise of those methods.
3. Efficiency of muster activities in eradication of toads from at least three discreet areas via verification of reported toad eradication through the use of sniffer dog or professional (DEC) monitoring for set time period post muster – to determine the time "bought" by the

efforts of the muster to delay the final permanent arrival of toads to each area.

4. Collection of Toad body condition data by Muster volunteers through recording snout-urostyle length vs. weight of toads collected and compare early with late dry season statistics to determine whether toads are indeed going through a decline of condition during the dry season.
5. Collect data on temperature and relative humidity at each location where muster work is carried out to compare capture rates with environmental conditions.

5 HAND COLLECTION

5.1 TOAD ACTIVITY

The percentage of toads active in an area on any given night varies considerably. This has significant implications for activities such as toad control utilising hand collection. Given that not all toads are active on a given night (5-80 % (Schwarzkopf and Alford 1996)), that the active toads move to water at different times during the night and that toads remaining in refuge sites are unlikely to be found, it should be acknowledged that hand collection as a lone activity will not remove all the toads from an area in one night.

As groups are hand collecting only a percentage of the toads in the area that are out of their refuge sites on any given night (depending upon environmental drivers and conditions), this gives rise to the question as to how often 'we' need to 'bust' an area in a repetitive fashion to eradicate toads.

An estimate of 6 nights has been suggested based on research that indicated the need for toads to rehydrate on a regular basis (Seebacher and Alford 2002, Cohen and Alford 1996). Alford also indicated that toads denied access to suitable rehydration opportunities (water) died within 4 days.

In their natural habitat (Venezuela) toads emerge only every 2-3 nights whereas in some NT conditions they may emerge more often. Observations during the GTM 2006 demonstrated that repetitive night hand collection was necessary to increase confidence that the majority of toads had been removed from collection sites.

This is thought to be related to food availability and so it has been anticipated that as the insect numbers decline, as the Dry season sets in, the toads will become hungrier and come out of their refuges more often. This represents typical food, water, shelter requirements.

(*The effects of ambient temperature and humidity also needs to be considered as does the effect on toad emergence of cool/cold winds that can be experienced over the northern Australian tropics during the mid dry season*).

FrogWatchNT research (Sawyer 2006) indicates toads do lose physical condition as the dry season progresses, but the degree to which this is a problem for the toads is unclear. Toads are also not all present at one time in the night. FrogWatchNT have cleaned a billabong edge of cane toads only to come back 4 hrs later and found even more toads.

Research (Schwarzkopf and Alford 1996) indicates toads may stay in their refuge for 3 days and potentially even up to 6 days, *but not more than 6*, without emerging. This has implications for toad busting strategies in particular:

- If toad refuge time is increased by cold weather in the mid dry season this will have significant implications for strategy at that point in time. Observations by STTF staff and communication with others involved in the control effort indicate a very significant impact and decline in visible toad numbers during periods of cold night time temperatures.

- The soil and atmospheric moisture (RH) influence on toad activity also appears very strong.

- In some areas of the control zone this impact (reduced soil and atmospheric moisture) is likely to be so strong it will force all toads to leave that area or die from moisture loss.

- Toads denied access to man made water bodies at the Leichhardt and Cedars exclusion fence trials were observed to remain on the fence for many hours (in some cases overnight) before attempting to retreat to refuge – this extended environmental exposure appeared to increase the rate of dehydration and the subsequent abilities of toads to deal with the extreme environmental conditions experienced in the buffer zone. Toads on the fence at Leichhardt were so dehydrated next morning they were unable to hop and would have undoubtedly died in the sun if we had not removed them.

The verification of these factors should be a focus of reconnaissance as such locations may provide significant defensive lines which can be reinforced by STTF and cooperative activities leading to effective eradication and significant impact upon the westward movement of cane toads.

5.2 TEMPERATURE THRESHOLDS

Toads respond to cold temperatures by remaining in refuge areas and so the temperature as well as the moisture levels will impact on the number of toads that are going to be active on a given night.

- *STTF/DEC need to gather information using appropriate technology to quantify this impact and find out what the cane toad's response is going to be to cool nights in the dry season*.

Personal observations (Graeme Sawyer) indicate that in some periods of cold weather toads at Ringwood Station emerged from their refuge burrows and

logs but did not move to the edge of nearby water bodies, instead tending to remain close to the refuge area.

- *One trap trial with a field trap caught 50 toads in a night when placed right next to a major refuge site*.

Preliminary observations in the area in April/May 2006 indicate cold night time temperatures stop significant numbers of toads being active in an area. Observations from the DEC, KTB and STTF field staff as well as personal communication with Larry Ford (AgWA) support this, as do observations in August 2006 when toads became active at Auvergne Lagoon during a visit by STTF and KTB to determine toad presence. (It appeared that the trigger was an increase in RH and 'dew' occurring.)

STTF and DEC need to confirm the levels of this effect and the actual temperature thresholds.

- Some observations indicate increased toad activity in the late afternoon and early mornings which could indicate a change in 'normal' toad behaviour due to them being unable to feed during the cold nights. (Similar observations have been made on freshwater crocodiles, *Crocodylus johnstonii*, and the effect of 'cold' weather on feeding activity. Observations on Lake Kununurra between 1988 and 1997 also indicate that some freshwater crocodiles are unable to digest food when conditions remain 'cold' for several nights and this can result in raised mortality of crocodiles at these periods; due to undigested food apparently 'rotting' in the animals stomach)(Russell Gueho, personal communications).

The observations from the region over 2006 and 2007 indicate the high temperatures and high evaporation rates mean cane toads are more active during the late dry season and movement and breeding responses are linked to and are humidity and rainfall dependant.

5.3 Refuges and Toad Mortality

Dry conditions and poor day time refuges leads to significant mortality of cane toads (Zug and Zug 1979).

This may be the case in areas of the control zone on the cracking soil (black soil) plains where refuge sites would appear to be limited (see Buffer Zone Discussion below). Adult toads are frequently too large to successfully access the deep cracks in the soils, burrows and hollow logs (apart from those associated with wetlands such as Freshwater Mangroves, *Barringtonia actangulata*) would appear to be scarce and restricted in this habitat.

Significant mortality in such areas may be a determinant in establishing a buffer zone; an area the toads will not be able to penetrate.

During the 'wet season' these cracking clay soils can absorb a significant volume of water which effectively cause the soil to 'swell' until it can absorb no more, then 'run off' begins.

Toads at this time of year possibly use dense stands of vegetation growth, exposed tree root systems, rocks and fallen trees as refuges. There appears to be an aversion to moving through dense vegetation and toads have been observed to actively seek open spaces to seek prey.

Understanding these behavioural components will be critical in deciding the boundaries and locations of control zones.

It is important to continue to encourage people in the area to report observations of toad activity and to clarify subtle aspects of their behaviour.

5.4 RECONNAISSANCE

It is vital to identify locations toads have colonised during the previous wet season. Significant effort needs to be put into this work in the early part of the 'dry season' and DEC and KTB should be a key part of this work.

Reports from the DEC, Kimberley Toad Busters, Muyalee Rangers and other parties such as Parks and Wildlife Rangers, Aboriginal communities and pastoral station workers and fishermen should also to be encouraged. (STTF (in conjunction with DEC) will develop a report card/ observation form for use by in field observers).

Reconnaissance methods will include:

- Aerial surveillance and ground truthing of wetlands and man made systems where necessary
- Tadpole/ metamorph surveys
- Sentinel traps
- Refuge traps
- Spotlighting
- Sniffer dogs (helicopter/sniffer dog combo)
- Indirect: Water audit, refuge audit, map based (and ground truthed by sampling) refuge estimates.

5.5 TRACKS

Cane toads leave quite distinctive tracks in sand and mud and these can be used during daytime surveys to identify areas where toads are active. Not all soil types provide tracks but most places in the control zone have fine sand and soft mud, especially around the edges of water and on well used tracks around waterholes.

Traditional owners and indigenous people may have skills to bring to bear in this area.

Scats of cane toads are quite distinctive and can be used as an indicator of the presence of toads in an area.

5.6 LANDSCAPE AND MOISTURE

Topography and vegetation can be a key guide to the location of moisture and hence likely toad populations.

It is essential to get the best understanding of this using the available resources such as maps and weather data; but just as relevant are the experiences and knowledge available from people 'on the ground who know the country' and have observed at the micro level. Aboriginal traditional owners and stockmen and pastoralists are all holders of aspects of this knowledge.

STTF and FrogWatchNT have developed good working relationships with The Northern Land Council (NLC) Caring for Country Unit in Timber Creek. The NLC is developing maps of water points based on communication with traditional owners and this data will be able to be integrated with data from DEC, Kimberley Toad Busters, STTF and FrogWatchNT.

It is imperative that in 2008 there is a commitment from DEC and NT Parks and Wildlife to undertake interpretation of satellite imagery for the buffer zones and surrounding areas to help identify water points, topographical features that are potential barriers and soil and vegetation types.

5.7 LIFE STAGES AND BEHAVIOUR DIFFERENCES

In order to eradicate cane toads from areas of the control zone we need to continue the development of a data base of observations of the different life stages of toads and bring control strategies together that will assist in determining the best methodologies for targeting toads at all growth stages.

(There are also potential safety concerns with entering water bodies (particularly during the warmer months) with the likely presence of saltwater crocodiles, feral pigs and wild cattle. It should be recognised that these animals have attained mythical stature as to the threats they present. However with soundly managed safety strategies field workers can operate safely.)

5.7.1 EGGS

Cane toads may breed throughout the year as has been the case in the NT.

Eggs can be removed from water within 24-36 hrs of deposit but the terrain and visibility in the water mean it is unlikely that the majority of eggs will be discovered.

Egg removal should be used where viable but it is unlikely to be a major part of control efforts.

5.7.2 TADPOLES

Cane toad tadpoles may be evident in water bodies throughout the year. Tadpoles can be removed from the water by using nets but the effectiveness of control is uncertain. Research by Alford et al suggests that removing some of the tadpoles only results in bigger stronger metamorphs which are more likely to survive the juvenile stage and become adults.

Tadpole control should only be a priority in areas where there is going to be a greater than 90% eradication result. This is possibly the case in the dry season as remnant water can become quite shallow allowing access to concentrated tadpole populations. During the Great Toad Muster 2008 tadpoles will be removed as a matter of course from the primary buffer zone from water bodies that allow safe and effective access.

5.7.3 METAMORPH (<30MM SNOUT-VENT LENGTH (SVL))

At this stage of the life cycle cane toads are at their most vulnerable and this is where the bulk of natural mortality occurs.

Metamorph toads are very small and quite susceptible to water loss. They are also diurnal (daylight active) and can congregate in huge numbers.

As tadpoles develop their fourth leg and get ready to emerge from the water they congregate in areas where the water is most shallow and there is a gently sloping bank.

This effect can be quite strong and even though tadpoles may be spread around the edge of a waterhole the metamorphs may only emerge at one or two points.

This has obvious implications for control, both in terms of collecting tadpoles and in terms of destroying newly emerged metamorphs.

Metamorph cane toads move away from the edge of the water at a very slow rate, only a few centimetres a week and need to have moisture to survive. These toads use shallow cracks in the soils around wetlands, vegetation debris, leaf litter, fallen branches, grass clumps and root systems and animal tracks including cattle prints in mud as refuge areas.

- In dry periods such as experienced in the Kimberley and NT, it appears that they are unable to move away from water for any length of time and they remain concentrated near water as a result.

- Control methods should be continually investigated but placement of artificial refugia, especially ones with added water, has been demonstrated to have a medium level of success. Type and placement are critical to encourage the metamorphs to congregate. The use of chemical spays would appear to be another option, however, residue

and side effect issues need to be evaluated. Chlorine bleach works well and is thought to be reasonably safe in small amounts.

- Toads of this size can be collected during hand capture activities and some devices such as nets and motorized garden leaf blowers can increase the effectiveness.

- Toads of this size can be killed in seconds by spraying with substances such as Chlorine Bleach.

- The STTF will also trial metamorph specific fences during 2008 as these animals can be targeted during daylight hours.

5.7.4 JUVENILE (30-59MM SVL)

At this stage cane toads become much more mobile and can spread further away from water bodies although they are still very water dependent.

Large numbers of toads in this size range have been caught in cane toad traps even though they can pass through the wire. It would appear that they are refuging in the traps because of the moisture and cover.

It may be possible to cover the larger mesh holes in the traps with a finer mesh (shade cloth or similar) to actually capture these sizes of toads in the traps.

The by - catch of native species is less than 1 in 100 trap nights (Graeme Sawyer, personal observation) with the current traps and an evaluation will need to be made to determine if the smaller mesh would significantly increase the risk to native species, although it is anticipated that suitably sized egress points would be included as a matter of course.

Toads at this size can also be captured by hand.

During this stage the toads become more nocturnal in their habits.

5.7.5 SUB-ADULT (60-89MM SVL)

At this point the toads are behaving like smaller versions of the adult toads and are basically crepuscular and nocturnal.

They are susceptible to specific exclusion fencing, trapping and hand capture.

5.7.6 ADULT (>90MM SVL)

Specific exclusion fencing, trapping and hand capture, especially once dry season congregations have occurred, are currently the most effective ways of controlling mature cane toads.

There are a number of biological and behavioural traits which can be exploited to achieve high levels of control.

STTF and FrogWatchNT have refined the processes to achieve local eradication on a broad scale across the control zone (Report on Great Toad Muster (GTM) 2006).

6 BUFFER ZONES

The STTF Primary and Secondary Buffer Zones, as shown in the 2006 Strategy, need to be re-evaluated. The existing Primary Buffer Zone (PBZ) should become the Secondary Buffer Zone (SBZ) and the new Primary Buffer Zone should be declared from the Pinkerton ranges to the WA Border.

The ongoing identification of specific areas within the control zone that feature especially difficult conditions for cane toads (including tidal flats, black soil plains with minimal permanent water, buttress type rock barriers and hyper saline areas) is a priority as they will provide the Foundation with the ability to focus activity in areas where the most success in stopping the westward movement of toads can be achieved.

Such "natural barriers" may be crucial to making the overall task achievable as they will significantly reduce the areas where control work needs to be carried out.

Toads have major physiological weaknesses in their response to water loss and have no physiological mechanism to prevent dehydration. As quoted in Lever (2001, p.16 – 17) '*desiccation plays an important role in the mortality of cane toads in seasonal tropical regions*'.

Lever (2001) also states '*since cane toads do not dig their own refugia, the existence of shelter is essential for their survival*'.

These factors may combine with specific habitat types to make some areas very difficult for toads to survive the extended dry season.

Some of the soil types and habitats in the region are much less suited to cane toads than others in that they do not retain much soil moisture and provide few refuge areas such as rocks, burrows and hollow logs.

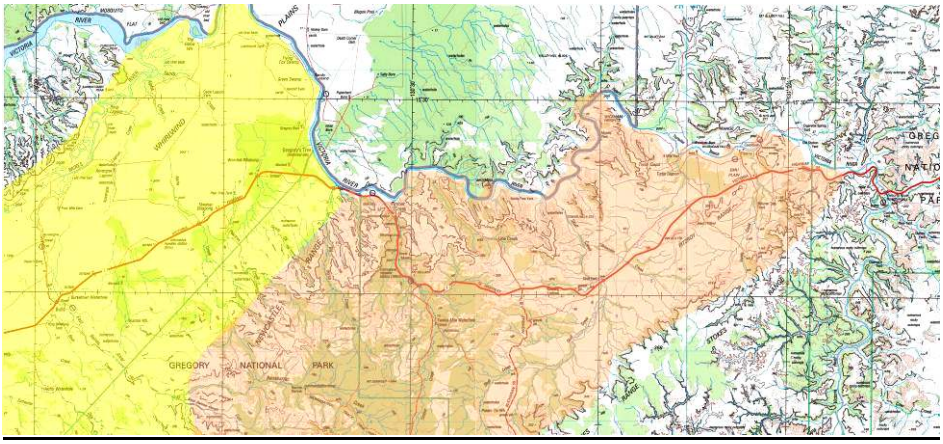
Areas of black soil that are non self-mulching and characterised by *Melaleuca minutifolia*, *Excoecaria parvifolia* (*Gutta- percha)*, and *Bauhinia cunninghamii* need to be studied closely as preliminary indications are that toads will not survive in those areas without moisture.

There are significant such areas along the Baines River floodplains and the area around the town of Timber Creek.

These have been mapped in detail as areas to set up a buffer zone and significant establishment and ongoing work has been undertaken to establish

the feasibility of creating such a buffer zone where the toads can be removed each year.

Current buffer zone locations are shown below;



The yellow region is the primary buffer zone and the pink region the secondary buffer zone.

The primary buffer zone is an area between the Pinkerton Range to the west and the Newcastle Range to the east.

First priority in the 2006 Dry season was to clear the primary buffer zone. The second priority was to clear the secondary zone as time and resources allowed.

With demonstrated effectiveness of the exclusion and barrier fences and 'black light traps' there is now a significant suite of management tools that can be brought to bear on the toad invasion.

7 CONTROL MODEL

Toads appear to stop moving across country as the available surface moisture disappears as the Dry season sets in (May – November). They will continue to move along corridors of creeks and rivers but this movement will be restricted when compared to wet season movement. The significance of man made water points is yet to be fully understood but it would appear that cane toads have most likely used these systems as a road way across northern Australia since their introduction – retreating to them during the dry season and 'leapfrogging' from them as the rains come to northern Australia.

There should be little westward movement during this Dry season period as the creeks mainly run south to north and the tidal influenced Victoria River has a significant saline density north from Timber Creek in the dry season.

Once this cessation of movement has occurred toad populations become much more vulnerable to manual control work.

The indicators that support toad rehydration and movement such as climatic effects and ambient moisture RH should be documented for the area but these would appear to significantly change only a few weeks after the rains cease.

The impact of dew on lengthy movement is unclear but it does provide toads with enough moisture for rehydration early in the dry season.

Finally, toads refuge near permanent water and significant congregations will occur around water bodies (including man made dams) allowing localised eradication to be achieved by control methods described above.

In these cases it is important to recognise the types and density of refuge areas adjacent to these water bodies as this can provide an indication of potential toad numbers likely to be using the site.

- This refuging effect occurred in the PBZ from approximately August 2006 through to mid December 2006 when significant rainfall occurred across the Victoria River District (VRD). This confers with data from the Ringwood research site where it appears to be July- August (Sawyer 2006).

It could actually occur much earlier in the Timber Creek region (as 2008 was a 'below average' wet season). Exploiting this congregation behaviour is again a key component of the Foundations Muster 2008 strategy.

7.1 OVERVIEW 2008 MUSTER PLAN

The main plan for the 2008 Muster is to repeat the work conducted on the site of the 2006 and 2007 Musters to further extend the data set and deliver more knowledge of the impact of our control work. This is vital information that allows the foundation to plan further cane toad control work, and if cane toads do manage to penetrate into WA, it provides solid supporting information to allow us to eradicate them or at the very least demonstrate alternatives and control methodologies that may minimise the damage they may cause.

The Foundation will undertake activities to attempt to eradicate the toads closest to crossing the WA border as they are the greatest threat and thus will be a major focus for control efforts. DEC and KTB are working on this area also and the Foundation will coordinate activities with them where feasible.

The Foundations approach to control activities for 2008 will be to start toad control on the western side of the PBZ (WA border) and SBZ and work back towards the eastern side with an attempt to be made to impact on the feeder area of Bradshaw Military base near Timber Creek. The Campaign Manager will also be directed to establish community links across the NT and into Queensland to undertake a 'National Cane Toad Eradication' week using the exclusion fencing as a model.

The 2008 Muster is likely to have several main bases from which control work will be conducted. This will be supported with mobile squads equipped to eradicate toads from given locations, especially by using portable exclusion barriers.

Water points will need to be identified and classified in terms of characteristics and control options to see if they are suitable for exclusion fencing, and or trapping or if they will require hand collection.

Once this is completed equipment will be moved onto the next site and the process completed.

8 TOOLS

- Hand capture
- Traps
- Fencing
- Sniping

8.1 HAND CAPTURE

Large numbers of volunteers (>120) contributed to the GTM 2006 with over 48,000 cane toads hand collected from strategic waterholes within the control zone.

This community engagement is a key aspect of the seasonal strategy. Groups like STTF, FrogWatchNT and KTB have refined this model for the Wet/Dry tropics and have shown it can remove significant numbers of cane toads (KTB report collecting over 200,000 toads using this method at sites they have visited).

There are a number of issues relating to the technique's effectiveness with respect to the number and timing of such activities required in an area to achieve eradication. Consideration should also be given to the abilities of volunteers to locate toads and recognise behavioural activities that can be used to locate toads – and a range of other factors also come into play including fitness, eyesight and suitability of equipment.

8.2 TRAPS

Cane toad traps developed by FrogWatchNT which use a one way 'fingered' door design and use various light sources to attract insects and thus toads have proved effective in certain circumstances. In remote operations trap efficacies are subject to a number of influences including;

- Location
- Impacts from fire
- Impacts from theft and vandalism
- Impacts from stock and wildlife
- Impacts from poor maintenance and subsequent equipment failure
- Impacts from weather conditions

Trapping can be a very effective tool when used in conjunction with exclusion fencing and hand collection activities. It also plays a significant role minimising colonising toads and can be effective around refuge sites that hold large numbers of toads and as a sentinel role to determine toad movement through specific areas.

Traps will be used in conjunction with exclusion fencing and as a mop up tool at cleared areas during the 2008 Muster and will continue to be used as part of the Gregory's Tree Road fencing trial.

9 FENCES

Exclusion fencing has been successful as an exclusion mechanism for cane toads and this will be used on a larger scale during the 2008 Muster. Results from the 2007 Muster indicate that at isolated sites like Turkey nest Dams, cane toad populations can be completely eradicated in 7 days.

STTF has advanced plans to put in place a number of trial fences and to also trial the way they can be used to supplement existing cane toad control activities such as trapping and toad busting.

Fencing will increase the effectiveness of trapping and hand capture. Traps placed along the fence-lines should capture a significant number of toads that are deflected along the fence-lines.

The fence-lines will also provide field operatives with strategic lines to work against and will hold toads in an area making them more vulnerable to control activities.

Fences or multiple fence lines augmented with traps and periodic toad collection activities may be the only way to control or prevent toads entering terrain that is very difficult to access for either trapping or 'toad busting'.

9.1 EXCLUSION FENCES

The fences will be built along the lines of the Leichhardt Dam fence used during the 2007 GTM, incorporating 2 wires and a barrier height of 600 mm.

Mesh and posts from 2007 are stored in Timber creek. The Foundation requires resources for at least 15 fences to be erected at any one time.

We also need to perfect the mechanism for allowing small native frogs, especially *Litoria inermis*, to navigate the barrier. The temporary method of providing an access gate during the 2007 Muster should be streamlined to allow easy implementation and placement of this type of wildlife friendly gate.

10 MISCELLANEOUS TECHNIQUES

- **Fire** - Grass fires at Mareeba Wetlands (NT) have been observed to have high mortality on toads, especially without suitable refuge nearby. Native frogs appear well adapted to escape these fires. (Use of fire or exploitation of existing fire to control toads are techniques that require ongoing monitoring. The Foundation is not in a position to trial this method of control and considers it a control method (along with several others) of 'last resort')

- **Chemical** – delivery of toad poisons via a variety of vectors; spraying, introduction to waterways, baits etc. Some leads, such as Lavender beetles toxins (based on ascorbic acids) and native fish poisons, are yet to be fully explored.

- **Sniffer dogs** - may be very useful for quickly determining the presence or absence of toads from a given system and therefore making intensive toad control methods more efficient. They may also have a role in targeting individual toads in difficult terrain, e.g. scree slopes and thickets and in a 'mop up' role to determine success of control methods.

- **Sniping** – the use of low calibre (.17 or .22 cal) air rifles was trialled during the GTM 2006 with excellent results. There is a number of legal, access and safety issues associated with using firearms in this context, however the STTF have fully investigated these requirements and established safe operational procedures. Essentially sniping is used as a 'mop up' tool for difficult to access toad refuge areas – particularly those areas associated with Freshwater Mangrove thickets.

11 ON-GROUND OPERATIONS AND COORDINATION

Planning and control work must be coordinated amongst all of the groups involved in toad control to achieve best results. This includes the identification and prioritisation of control targets as well as determining resourcing decisions.

It is the STTF's firm opinion that a coordinating group needs to be established and maintained as a matter of urgency if the efforts and good will of all groups working to fight the cane toad in Northern Australia are to be maximised.

Through its association with them the STTF could bring the input of the Timber Creek Women's Rangers, the Northern Land Council Caring for Country Unit (NLCCCU), and the Ngaliwurru-wuli Aboriginal Association to compliment the management strategies that are required to impact on toads.

12 MAJOR TOAD MUSTER LATE DRY SEASON 2008

The concept of establishing base camps across the region in the late Dry season (September to October) and using these as bases from which large numbers of volunteers can work to remove any remaining toad populations has been implemented successfully during the GTM 2006 and GTM 2007.

This type of activity requires major resourcing and logistical effort (and needs to be delivered at the end of the normal tourist season).

STTF have demonstrated that it is possible to train team leaders and enlist and manage substantial volunteer effort to have a major impact on toad populations while these populations are effectively stationary and concentrated onto rapidly depleting water resources.

FrogWatch NT and other experienced locals also provide support to supervise the volunteers who sometimes have little experience in the region and limited understanding of the environment and its dangers.

We have resources in the form of people that have been to the 2006 and 2007 Musters and they should be encouraged to be a major part of the 2008 Muster as they have significant experience and skill sets that are valuable to these types of operations.

12.1 MAJOR BASE CAMP / CAMPS

Operationally the Foundation will require a major base camp and may need two such locations. Auvergne Lagoon and Cedars have been used to date. A decision on where to base the camps in 2008 will need to be made once the target areas and priorities for 2008 have been set. It is likely that some significant activity could be based from the town site of Kununurra. We have the resources to set up basically one base camp and one or two mobile camps at the moment.

12.2 MOBILE TEAMS

Mobile teams will be equipped to move around the control areas and set up exclusion barriers and manually bust specific small targets. They will require two vehicles and 6 to 8 people.

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