

SESSIONAL COMMITTEE ON THE ENVIRONMENT

WRITTEN SUBMISSIONS - MIMOSA PIGRA

February 1997

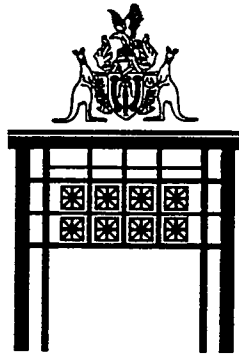
NUMBER	AUTHOR	AGENCY/COMPANY
1	Mr John Pitt, Regional Weeds Officer	Department of Primary Industry and Fisheries, Alice Springs
2	Mr Harold Wilson, President	Peppimenarti Community Council Inc
3	Mr Mark Ford	White Eagle Aboriginal Corporation
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5	Mr Tony Metcalf (CEO), Mr John Fielke, Mr Yuri Obst, Ms Corrine Turner, Mr Barry Wright	APLEX Pty Ltd
6	Mr Graham Schultz	Personal
7	Mr Ned McCord	Tipperary Group of Stations (northern Division)
8	Mr Garry Cook & Ms Wendy Forno	CSIRO
9	Ms S Whitfield, NT Manager	Australian Trust for Conservation Volunteers
10	Mr Joe Wilson, Manager	Murwangi Station, Ramingining NT
11	Dr Colin Wilson, Senior Weed Management Officer	Parks and Wildlife Commission of the Northern Territory
12	Mr Gilbert Pollock, Administrator	Ramingining Homelands Resource Centre Aboriginal Corporation
13	Dr Wayne Mollah, Director, Land Resource Management	Department of Primary Industry and Fisheries.
14	Mrs Claire O'Brien, President, Lower Mary River Land Care Group	Lower Mary River Land Care Group
15	Mr Robert Wesley -Smith	Private citizen
16	Mr Ian Baker	Northern Territory Buffalo Industry Council Incorporated
17	Mr Neil Ross, Operations Manager, Opium Creek Station	Carabao Exports Pty. Ltd.
18	Mr Tony Searle, Manager, Melaleuca Station and Mr Don Milford, Properties Manager, Paspaley	Melaleuca Station <b>IN CAMERA SUBMISSION</b>

**SESSIONAL COMMITTEE ON THE ENVIRONMENT**

**WRITTEN SUBMISSIONS - MIMOSA PIGRA**

**February 1997**

<b>NUMBER</b>	<b>AUTHOR</b>	<b>AGENCY/COMPANY</b>
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TO: MR. IAN MUIR..... FACS NO: 89992049.

FROM: LIZ McFARLANE.....

NUMBER OF PAGES (including cover sheet) .....

DATE: 26/3/97.....

URGENT

MESSAGE:

NAOMI'S TAPER WORK FOLLOWS  
FOR YOUR INFORMATION

PLEASE DISCUSS WITH GRAHAM  
RE CHANGES TO TRANSCRIPT  
BEFORE INCLUDING ANYTHING  
IN REPORT

Cheers  
LMF



Submission No. 21  
MIMOSA PIGRA

Dr Naomi Rea  
PO Box 567  
Palmerston  
0830 NT  
8944 8418 (wk)

24 March 1997

Dr Richard Lim  
Chairman Sessional Committee on the Environment  
Senate Inquiry into the Future Management of Mimosa  
Parliament House  
Darwin, 0800, NT

Dear Dr Lim,

Re: Senate Inquiry into the Future Management of Mimosa

Thank you for the opportunity to make an oral contribution to the Sessional Committee on the Environment. Please find enclosed a hard copy and a soft copy of the transcript of this contribution. I suspect that the speech was so difficult to follow because the contribution was not formally prepared as a written submission. The edits have tightened up the transcript so that it is more coherent and concise, with each intended point made clear. I hope that you are happy with a more logical and succinct contribution, especially as it is lieu of a formal written submission. I wish you every success with parliamentary solutions to the management of the mimosa problem. Please do not hesitate to contact me if you require any further information

Yours sincerely

Naomi Rea.

Naomi Rea



*complete rewrite by Dr Rae  
test as submission only.*

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SESSIONAL COMMITTEE ON THE ENVIRONMENT - 5 February 1997

7ENVWEEDS.PT2

Dr LIM: The committee welcomes Dr Naomi Rea. As you have been present for some time, you probably heard my comment that the evidence given by witnesses must be truthful. Do you wish any part of your submission to be in camera or confidential?

Dr REA: No.

Dr LIM: For the record, please state your full name and the capacity in which you appear today.

Dr REA: My name is Naomi Rea. I appear today as a citizen who as a plant ecologist has studied vegetation change in wetlands for over 10 years.

To my knowledge, the Sessional Committee has not received a contribution about the biology of mimosa and the ecology of the environment it invades. This contribution is intended to provide insight into the mimosa problem from a botanical perspective. I hope that my background can help your undertakings to improve the future management of mimosa in the Top End.

Mimosa appears to be managed from an agricultural viewpoint, with herbicide use prevailing. This is possibly because there are few models for environmental weeds which need ecologically sensitive management. Control may be a lot more effective if solutions to this ecological problem were based on ecological information. Mimosa is not only an agricultural and pastoral weed, but a threat to flora and fauna, traditional landuse and culture, tourism and potentially, the sustainable wildlife harvest industry and fisheries.

My major observation is that so far the whole management and control of mimosa has lacked a framework. A lot of time and energy goes into attempts to kill the weed or treat the symptom, rather than understanding the cause of mimosa's invasiveness and why it is so weedy here compared with its minor presence and small stature in South America. Weed control has usually been left to government practitioners and people on the land to figure out how to do things best. Management by trial and error has been a strong feature of mimosa control. Although this can result in effective control in some areas, the hardest part is how to maintain control, particularly where control methods are palliative. The discipline of invasion ecology is receiving more attention, and increasingly points toward the need to understand the plant; where it comes from, its impact and what is causing environments to be invaded. This information provides an ecological framework to manage the problem and leads to better control programs. It is likely that the nature of invasions and weed control will be substantially different in the tropics compared with case studies in temperate regions. Understanding how wetlands function in this region should help to improve management of invasive species.

Dr LIM: Is this information available on mimosa?

Dr REA: Not really and this is what I wanted to highlight today. Although there is a basic understanding, there are many assumptions about what causes spread, the rates of spread, and the ecological and economic impacts of mimosa. Government programs are dominated by chemical control undertaken as the application of a recipe, rather than as programs which operate in a framework of planning, recording and adaptive management. It has been difficult to locate well documented records and references to mimosa control for a paper I am presently co-authoring about the underlying non-ecological reasons for the degradation of NT wetlands from weed invasions.

The current momentum to start using integrated control is encouraging. In particular, there is a need for chemical control to operate less separately from biological control, which is a major prospect for mimosa control, as well as mechanical control, fire and preventative measures. By prevention, I mean not only the treatment of satellites by 'search and destroy', but the use of washdown facilities, management of dispersal vectors such as feral animals. Given the circumstantial evidence that ad hoc control and fiddling with different approaches to control can actually lead to vigorous regrowth, there may be occasional consideration of quarantining an area. Over time, mimosa infested country which is left unmanaged, may return to some semblance of ecosystem balance, a pattern not uncommon for some weeds. Where a landowner has removed stock from mimosa infested country and left mimosa unmanaged, there appears to be, along with the mimosa, a greater diversity of flora, fauna and ecosystem integrity. So when mimosa control does start, there needs to be a concerted and long-term commitment for any effort to be worthwhile.

Dr LIM: The people using the mechanical and biological control methods would say that they dovetail into each other. The mechanical methods will clear the land, allowing new shoots to occur which are quite rapidly colonised now by the biological controls. The biological controls can affect the younger shoots a lot more effectively than they could affect the more mature plants. Isn't that a coordinated way of looking at it?

Dr REA: Yes, that is a future strategy which people will investigate. There is the potential to use different options, including integrating different methods, but these are very early days, because there is insufficient information to go and do it now, apart from practical adaptive programs, which would seem a sensible and necessary approach at any time. There is very little documented information on mechanical control, and although there is slightly more known about fire, there is still much to learn. A better understanding about maintaining control, prevention, and revegetation, together with a realistic framework for managing an ecological problem, may have been hindered by the small NT population and the channeling of funds into 1 or 2 control programs. Managing without this information, may be just nibbling at the edges.

Although new infestations are strongly correlated with disturbance, mimosa has been known to invade near-pristine areas, in which case the disturbance may have been a natural factor or the absence of predators, which allows plants to behave as weeds. A quote from the National Weed Strategy (1996) is a useful starting point for managing weeds.

*'Weeds are a symptom of the degraded state of the land or water resource rather than the cause of that degradation. This lack of understanding often leads to unsuccessful attempts at weed control rather than rehabilitation of the degraded resource.'*



The following overheads demonstrate the sorts of frequently asked questions, and understanding of which would be useful for the future management of mimosa.

- How much mimosa is there ? It is generally agreed that the infested area has not been measured since 1985. It is unknown whether mimosa has spread or retreated, or whether it is more or less of a problem than thought ? A mapping exercise would be useful in identifying habitats susceptible or resilient to invasion. It is also useful benchmark information to monitor the impact and effectiveness of future control programs.
- How is mimosa dispersed ? Is it from causes which there is no control over, such as the natural background environment of the NT. If the extremes of flooding, drought, temperature and wind are responsible, then control methods that treat the symptom will be important. If factors under human control are dispersing seeds and creating disturbance for seedling establishment, then these issues need addressing eg; vehicle washdown facilities around serious infestations to help reduce spread. Preventative control programs can only be developed when modes of dispersal are known. Identifying the cause can avoid costly ineffective control.
- Understanding mimosa's biology and characteristics is useful baseline information for helping to predict how it might respond to various treatments.
- Knowing mimosa's ecological and economic impact would help determine the degree of severity of the problem. Impact can be used as a benchmark for measuring the success of control programs. There are very few detailed studies on the impact of mimosa, particularly on rare species, and physico-chemical and hydrological changes.
- What limits mimosa's distribution? How does water regime, soil type, light and other species, interact and influence where mimosa grows. It appears to tolerate a wide range of climates and conditions (typical of a plant when it acts as a weed), and is therefore a potentially very great problem, requiring control programs that vary management prescriptions accordingly.
- Integrated control, where one method predisposes the plant to better control by another method(s), needs a lot of study. As no single method is likely to solve the mimosa problem, integrated control and a strategy of horses for courses with different combinations of methods used in different situations, is likely to achieve the best results.
- Examining the ecological impacts of control treatments should be mandatory in order to minimise risk of adverse effects. For example, the disturbance caused by mechanical control and fire may create habitats suitable for reinvasion, while herbicides can have toxicity effects and varying residual efficacy. Some of the herbicides used are banned in other parts of the world and in aquatic situations. The precautionary principle is recommended when using herbicides in wetland environments. In comparison to the scrutiny applied to wetland and herbicide projects I was involved with in southern Australia, and where permission was required from a range of state and local government and public groups, there appears to be very little legislation and guidelines in the NT. To my knowledge, a lot of herbicide use is not subject to environmental impact assessment.
- There may be a need to compare control programs with quarantining an area. Although it is generally considered irresponsible to do nothing, realistic issues of costs and

benefits can leave little alternative. Governments need to decide the level of support they can afford. While efforts concentrate on stopping spread from satellite patches and edges, it is not yet determined how best to deal with extensive monospecific stands.

- There is a need for greater discussion about why control mimosa in the first place. A major reason must be the desire to see other plants in its place, although mimosa will always be part of the landscape, and can never be eradicated. Little effort has gone into the revegetation component of control programs. Is vegetation expected to come back naturally or is there a need for active replanting? Which plants can maintain control by resisting the establishment of mimosa seedlings? There needs to be open discussion about how to maintain control, post-control management and the composition and requirements of replacement vegetation. Where the seed bank is still intact, intervention can be avoided. Otherwise, the establishment requirements of replacement plants must be understood, as well as collection and distribution methods. This sort of information needs to be freely available for people to draw on for their own rehabilitation work. Accessible extension services are needed for all components of mimosa control.

The Oenpelli mimosa project provides information for future revegetation programs. My first impression was that plants had returned very slowly, with large bare areas evident several years since treatment. Plants present consisted of hardy, stress-tolerant species such as *Phyla nodiflora* and some Cyperaceae spp. Few of the native grasses or *Eleocharis* species had returned, species which were likely to have been dominant prior to mimosa invading. The pattern of the establishing vegetation was typical of early primary colonisation, with small circular patches of sedges and bare sediments. Patches should eventually coalesce through vegetative growth to form the typical extensive sedgelands and grasslands and with more species moving in all the time. The patches suggest that the plants have established from seeds or propagules that have come in from elsewhere, indicating that the seed bank was affected by control treatments. Just as revegetation was perceivably good in some bays but not others, mimosa was also controlled better in some areas, while in other bays, large areas of scattered individuals and regrowth were evident. To assess the revegetation success at Oenpelli, there needs to be formal documentation of the abundance, associations and distribution patterns of species and vegetation types.

Dr LIM: Would you like them to specially plant native vegetation in the cleared areas?

Dr REA: This may be a good thing in some cases. At a location such as Oenpelli, it is probably not necessary because the area is remote from other weed sources, and you can get away with slow recolonisation without fear of new weeds reinvading. If the same program were undertaken on the Arnhem Highway, there probably would need to be active revegetation. Reinvansion of mimosa seedlings can be checked by ground control methods or possibly by planting competitive species.

Dr LIM: As a medical practitioner, I can empathise with what you have said, but can you also see the point that, with 80 000 ha of mimosa, with its potential to spread, the priority to control the infestation at this very moment is pretty high? That priority supersedes everything else, including research that has to be done. Let us get rid of cancer before we start looking for the reasons why the cancer was there in the first place. Once we get rid of most of the cancer, maybe we will then have time to do some research into why it is there.



Dr REA: I understand what you say. In order to capitalise on the investments made by control efforts, information needs to be coming in alongside those programs. Examples of successful long-term, low key control do exist, but in large dense extensive mimosa stands, such control is likely to be prohibitively expensive, and alternative options may need to be considered while investigative studies take place that allow control and management to improve.

Incentives for control need to match the relative importance of control methods. Until last year, the NT subsidy scheme, which gives landholders a 50% rebate, was available as an unlimited amount for aerial control, whereas ground control received a maximum rebate of \$1000. Although ground control can now receive \$3000, claims for the aerial subsidy are still significantly greater. This imbalance makes it difficult to warrant aerial programs. Funding for control on the ground is essential if aerial spraying is to be of any use at all.

The final point I wish to make relates to the overall management of mimosa across the Top End. Different agencies with different commitments and financial capabilities use different control methods and are responsible for a range of different land tenures. Mimosa transgresses these sectoral boundaries. While management is not unified across these differences, it will be difficult to manage any weed successfully. Some agencies, control methods and land types have been left out of the picture in the past. An inclusive strategy with all control methods available to everyone is a prerequisite for good results.

Mr MITCHELL: You said that there have been no surveys since 1985 and therefore you are not sure of the level of infestation. Do you mean that nothing has been happening in the last 12 years in terms of surveys on this?

Dr REA: To my knowledge, there has been no formal re-estimate of that area since then. Plotting new infestations can indicate general trends, but the total area may or may not be increasing. In lots of ways, it is a formidable task, which may not receive a high priority.

Dr LIM: Are you aware of this map?

Dr REA: Yes.

Mr LIM: This is dated August 1995. Are you suggesting that this is not a good indication of the extent of mimosa in the Top End?

Dr REA: I think it is a general but satisfactory map. Mimosa is also tucked away along tributaries, in swamps and beneath the canopy of monsoon and melaleuca forests. I do not really know whether it is an effective use of resources to try and accurately calculate the area it covers. What I was trying to allude to is the extent of the problem. Is this area increasingly significantly or has the rate of spread slowed or stabilised ?

Dr LIM: On one of the field trips that we made, we were assured by some people that mimosa is contained and is not spreading outside of the extremities of its current area of occupation. I am not sure if that is a correct statement. We were told that there were 80 000 ha 10 years ago and there are 80 000 ha now.

Mr MITCHELL: Have you been talking to any of the departmental people? What do you base that on?



Dr REA: It is probably too early to say that mimosa is definitely contained. Estimates enable the total area to be considered 'large' rather than 'small'. The strategy to contain mimosa at the extremities is to stop it spreading east to QLD and west to WA. The difficulty is managing the problem with anecdotal information. Every now and then, it would be useful to have some hard data to say where it is, and at what rate it is changing. Recent anecdotal observations that native vegetation can be resilient to mimosa invasion, suggests that the return of vegetation to the floodplains after the removal of buffalo might prevent the sort of mass invasions that took place in the past: eg Adelaide River floodplain. The need to be cautious about overstating and understating the problem would lessen if these kinds of questions were answered with new and better information.

Mr MITCHELL: You mentioned herbicides that are banned. Which herbicides were you talking about specifically?

Dr REA: I did not say they were banned here in the NT.

Mr MITCHELL: In other countries or interstate.

Dr REA: I think Starane is a chemical that is not recommended for use in aquatic situations.

Mr MITCHELL: Not recommended by ...

Dr REA: I did not intend to speak about, or previously mention, specific chemicals. Herbicide use always needs thorough investigation. Exemptions are often provided, but only after rigorous review through the correct channels. Where the impacts are unknown, the precautionary principle should be adopted. *The point is not that herbicides should be avoided, but that where there has been special dispensation to use a chemical, its use should be carefully recorded and its effects rigorously monitored.*

Dr LIM: You did not provide us with a written submission. Would it be possible for us to have a copy of your overheads?

Dr REA: Yes. *(NB: apologies, but insufficient time to prepare properly)*

Dr LIM: Is this part of the paper that you are writing?

Dr REA: Yes.

Dr LIM: When do you anticipate that the paper will be available?

Dr REA: It probably will not be published until later this year.

Dr LIM: Could we have a copy? It would be treated in confidence.

Dr REA: Yes, when it is published.

Dr LIM: Thank you for your time and your comments.

[Witness withdrew.]

\*  
please  
include in  
the disc  
version.  
thankyou.



MIMOSA-PIGRA  
Submission No.2

by  
White Eagle  
Aboriginal Corporation

To

The Chairman,  
Sessional Committee  
of the Environment, Mimosa-Pigra  
G.P.O. Box 3721  
Darwin N.T. 0801

February 1997

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WHITE EAGLE ABORIGINAL CORPORATION  
C/- P.O. BATCHELOR  
N.T. 0845

## **INTRODUCTION**

White Eagle Aboriginal Corporation had several members attend the open Committee Hearings at Parliament House. There were a variety of views put to the Committee for consideration. As a result of some of the Oral submissions we have requested another opportunity to present a short response to the Sessional Committee on the Environment. It is hoped that our contributions will be usefull during your deliberations.

## **STEERING COMMITTEE**

The Mimosa Steering Committee was formed to allocate Federal money to Aboriginal Land.

Is the Committee aware how much of this money is spent on Biological Control on Aboriginal Land and how much is spent on Chemical Control of Mimosa?

Of the money allocated to Biological Control a considerable amount is used in research, this benefits Non-Aboriginal Land as well. Who else contributes to the cost of research?

What Guide lines does the Steering Committee use to make the allocation of funds, eg: Sacred Sites, Waterholes, Commercial Benefits etc., have Aboriginal people got any say in the allocation of expenditure?

## **GUARANTEED ACCESS**

Government Departments need written authorisation of access for Mimosa-Pigra control, unlimited and guaranteed, to all Aboriginal Land capable of being affected, this would be a guarantee of the continuance of control programs and money would not be wasted beginning projects that may be jeopardised by local political differences.

## **CIRCLE CONTROL**

We would also point out that if large clumps of Mimosa-pigra are treated by Circle Control methods to stop spread, many satellite infestations will still occur.

Circle Control will result in an area being a "seed factory" and any form of motion like pigs, birds, people and vehicles have the ability to carry the seed to new locations. Some Submissions put forward suggested "Circle Control" to be a viable proposition. In some cases there may be no choice, where Mimosa-Pigra is mixed with Paper Bark etc. But Mimosa stands on open Wetland Plain must not be treated this way as they pose a threat to that whole Plain and anything less than total treatment is going to result in loss of non-affected areas.

## **SIGNS**

There is a need for the introduction of Mimosa control signs, these need to be of a different colour to BTEC signs showing Control Areas and Fire control signs for Biological Control areas. An Education program of the public through the media should also be undertaken so the seriousness of the Mimosa-Pigra threat can be understood and respected.

Signs and fencing of uncontrollable areas, especially those under Melaleuca to allow a competitive grass build up along the boundary to slow down spread through competition and act as a filter to trap floating seed may be necessary in public access areas.



### **BIOLOGICAL CONTROL**

Biological Control must be seen as the tool or backup strategic plan. Knowledge that it is there and progressing slowly all the time, is the eventual relief to the financial burden of Chemical Control. After accessible areas have been cleared with Chemicals to a point where ground control is cost effective the Biological aids will be invaluable in arresting the spread of Mimosa - Pigra.

### **OENPELLI**

The Oenpelli experience can never be condemned, this has been a reminder of the expense in controlling large infested areas, but also of success, as an area returned to control. Oenpelli has not failed, the rampant spread of Mimosa has been stopped, the ongoing ground control is a small cost against the cost of controlling a huge area in Arnhem Land.

To backup the Oenpelli expense a control regime must be set up to monitor Eastern Top End catchments.

Education of the population in the region would be invaluable, they could act as a reporting mechanism reporting back on the outbreak of new infestations, the growth of existing and the success of control methods. If the Traditional Owners were actively involved there may be cost savings in mapping and research resulting in more money for actual control.

### **REGULATION**

Regulations for chemical use need to be revised with emphasis on a constant search for new cost effective products. Some products may need to be registered for aerial application as they may be more cost effective than existing products for application to Mimosa- Pigra, eg; Glyphosate.

### **CONCLUSION**

In closing White Eagle Aboriginal Corporation wish to thank the Sessional Committee on the Environment Mimosa-Pigra for this opportunity to present a further submission on behalf of our members. We would also appreciate a copy of any Publications prepared by the Committee for public distribution.

## Wetlands Task Force - Mary River

Chairman: Dr Goff Letts  
Members: Mrs Clair O'Brien  
Mr Darrell Tutty  
Mr Trevor Simmonds  
Mr Graeme Fagan

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DARWIN NT 0801

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Dr Richard Lim MLA  
Chairman  
Sessional Committee on the Environment  
Parliament House  
DARWIN NT 0800

Dear Dr Lim

Re: Mimosa pigra

As a result of your Sessional Committee's inquiry into matters relating to the Mary River Wetlands, the Northern Territory Government appointed a Wetlands Task Force in October 1995 to oversee the development of an Integrated Catchment Management Plan (ICMP) for the Mary River. This Committee, comprising representatives from the pastoral, tourism and fishing industries and the Lower Mary River Landcare Group, has been charged with raising any other matters with the Minister which concern Territory wetlands.

In developing the ICMP, the Task Force has identified Mimosa as one of the main issues to be given priority. The Task Force, and its technical working group, have examined closely the problem of mimosa in the Mary River catchment and have developed a strategic approach to dealing with it which involves all arms of Government and of course the landholders in the catchment. The Task Force welcomes this latest inquiry by your Sessional Committee and believes the work the Task Force is undertaking will be of relevance and of interest to your Committee in undertaking its investigations.

In the course of deliberations, Task Force members had concerns regarding the lack of information and knowledge of the effects of herbicides for mimosa and weed control. It was also identified that the impact of these chemicals on both aquatic and terrestrial environments was not widely known or recognised. The Task Force believes that greater effort should be placed on informing landholders on the effects of these herbicides and, if there is a lack of information in any of the areas of concern, then government needs to conduct the appropriate research to find this information.

It was obvious to the Task Force that in dealing with mimosa it is useful, in fact critical, to have good spatial information on the location and extent of mimosa infestation in any catchment. This information is currently not available, at least for the Mary River, from the lead Department responsible for mimosa control and the Task Force has requested that the Department of Primary Industry and Fisheries provides a map of infestations with some urgency. The Sessional Committee therefore needs to be aware that good mapping of mimosa infestation throughout the Territory is lacking and the Task Force encourages the Sessional Committee to raise it as a priority for further action.

The Task Force recognise that there are short falls in the current subsidy arrangements in relation to mimosa control and have noted that the Department of Primary Industry and Fisheries intends to review the mimosa subsidy scheme. The Task Force are concerned that the 50% subsidy should be available for the full costs of dealing with a mimosa infestation in the most efficient manner practical. It was noted that aerial application of herbicides for mimosa control is not always the most efficient and effective control of outbreaks and that the subsidy arrangements should be extended to landholders who choose to use other means of control. Included within the subsidy should be the cost incurred by the landholder in rehabilitating degraded land which has been successfully treated for mimosa.

Given the nature of mimosa's pattern of spread, support should be available to all landholders irrespective of the size of property and/or the size of the infestation. If landholders are not encouraged to deal with the problem when it is small then it is likely the problem will become large and very costly to control at a later date.

Whilst the Task Force can not, at this stage, forward you the draft ICMP, we would like to outline the approach proposed in dealing with mimosa in the Mary catchment. It is anticipated that there will be a two-level planning response to weed infestation. Firstly the development and implementation of a Mary River Weed Management Plan by all stakeholders; and secondly individual property weed management plans developed and implemented in conjunction with the Mary River Weed Management Plan. We believe such an approach has merit in other catchments and commend this to your Committee for consideration.

Please advise should you wish to discuss further or clarify any matter.

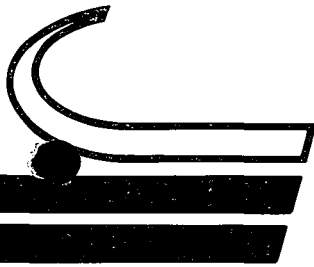
Yours sincerely



Dr Goff Letts  
Chairman, MRWTF

6 February 1997





**CARABAO EXPORTS PTY. LTD.** 17

(A Subsidiary of Glencoe Pty. Ltd.)  
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**The Legislative Assembly of the NT**

**Sessional Committee on the Environment**

**Future Management of Mimosa Pigra**

**4 & 5th February 1997**

**Parliament House, Darwin**

**Chairman Dr R.S.H. Lim MLA**

As the owners of Opium Creek Station we are very concerned at what we see as a down grading of the workforce involved in the location and eradication of Mimosa in the Mary River area.

It appears to us that while considerable resources are spent on the control and eradication of large infestations of Mimosa, once a property is only infested with scattered plants interest from the Government Departments declines rapidly. This may be the result of an acute lack of manpower.

The control of the large infestations is very important but if every plant upstream of these infestations is not controlled fresh seed will be delivered to the floodplains every year.

Mimosa has spread to the upland areas surrounding the floodplains and is very difficult to locate, landowners can only allocate a small portion of their yearly budget to weed control and appreciate the assistance that has been given by the Government in the past. We are very concerned that just when we were at the stage where 4 - 5 years of hard work would have reduced the Mimosa to a manageable level in our area the men on the ground are being reduced and the Bureaucrats, Consultants and "Talk Fests" are increasing.



It has been proven that Mimosa can be controlled, we know what poisons work, what biological methods will work, what machinery is required and what pastures to plant to restrict re-growth. What is needed now is enough manpower to start a program of mapping and eradicating the isolated plants on the upland country starting at the top of The McKinlay and Mary River Systems and working toward the large infestations in the Shady Camp area.

Once a property has been inspected and mapped it should receive a rating based on the amount of Mimosa found and an eradication program formulated for that particular property.

A weeds officer should then inspect the property on a tri-annual basis to rate the progress of the program.

Chemical needs for each property should be evaluated and supplied free of charge as the cost of labour and machinery that the landowner supplies is very high when eradicating isolated plants.

If a landowner refuses to fulfil his program obligation the work should be done by a Government contractor and charged to the landowner at commercial rates.

Government owned land should be a role model for weed eradication.

There are three Government reserves inside the Opium Creek lease. Could you please advise me who owns them and when was the last time an inspection for Mimosa was carried out. The areas are the Jimmy's Creek, Opium Creek and Boggy Springs Rainforests.

The old Point Stuart Abattoir lease has infestations of Mimosa on a water course that runs into Jimmy's Creek rainforest this would not be allowed if a B.T.E.C type program was introduced and policed.

The over zealous construction of fresh water retention banks (salt water intrusion) is of extreme concern to us, in one area where a bank 40 metres long would have sufficed more than a kilometre of bank was constructed. This creates a perfect habitat for growing Mimosa with the seed being carried in the first flush of the Wet Season floods being retained adjacent to the wall instead of being flushed out to sea.

There are people in the Department of Lands Planning and Environment who appear to be on a personal crusade to create a wetland in an area that was well drained when the first explorers mapped the area.

Before they are allowed to waste valuable taxpayers dollars and even more valuable time on this project, their superiors (ie Ministers) should be advised that if they construct the wetland before they remove all traces of Mimosa in the area they will create another Oenpelli.

Mimosa on the floodplains is relatively easy to locate and poison, it is the isolated plants and small infestations in the upland areas that are very difficult to find and treat and will probably only ever be controlled by biological methods once their numbers are significantly reduced.

Sensible clearing and improved pasture development on the upland country surrounding the floodplains is probably the most effective method a pastoralist has of controlling Mimosa.

During the clearing, ploughing and seeding process any plants discovered are poisoned and the area flagged for later inspections. As mustering is carried out on horses or motor bikes rather than helicopters new infestations are easily seen and treated.

The strips of native timber that are left along the water courses and sloping ground are narrow enough to be easily inspected and the chance of large amounts of seed being washed onto the floodplains each wet season is greatly reduced.

The vast tracts of unoccupied or underdeveloped land that surround Mimosa infestations will be a major problem until the landowners, whether they be individuals, companies, Government or Aboriginal Associations are made responsible and accountable. If the landowners refuse to meet their obligations the Government must resume enough land in the immediate area to allow a responsible landowner to maintain a viable operation.

Work commitments do not permit me to be present on the 4th and 5th of February, but I would be available to discuss this submission with members of the committee at a later date.

Yours Sincerely,

A handwritten signature in blue ink, appearing to read 'Neil Ross', written in a cursive style.

**Neil Ross**  
**Operations Manager**



# NORTHERN TERRITORY BUFFALO INDUSTRY COUNCIL INCORPORATED



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Winnellie NT 0821 Australia  
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Unit 15A, Coolalinga Village  
Stuart Highway NT Virginia 0835

## MIMOSA CONTROL SUBMISSION

### KEY POINTS

- ◆ The area under mimosa has not decreased in the last ten years.
- ◆ We need a much increased effort.
- ◆ This problem is not just a pastoralist problem. **It is the most serious environmental issue facing the Northern Territory.** This priority is not reflected in allocation of government resources.
- ◆ The Department of Primary Industry & Fisheries have two control teams. Parks and Wildlife have one person for the Mary River system. Our understanding of current government expenditure is (approximate figures):

Control subsidies	450 000
Control teams	670 000
Biocontrol research	\$1.2 million
CSIRO	
Biocontrol research	\$1.0 million

The balance is skewed 2:1 to biological research. **Expenditure on control reflects a lack of commitment to control**

- ◆ The current subsidy is effectively 15% as it applies only to chemicals and helicopter hire. At Melaleuca Station in 1996, the total expenditure for mimosa control was \$180 000. Only \$60 000 of this attracted a 50% subsidy, ie, \$30 000 out of \$180 000 is 17%.
- ◆ Chemicals, mechanical and fire are the ways to knock down the bulk of the problem using pasture establishment and biological control to contain regrowth. **A massive ten to fifteen year program is required to knock down existing stands.**

- ◆ This program demands a large government input into what is essentially government's role, ie, a large community problem affecting the environment across a very large area.
- ◆ Pastoralists are one small part of the solution. They are only leaseholders; the Crown owns the land. Currently, pastoralists are forced to shoulder most of the burden - up to 85%.
- ◆ The commitment in resources should at least match BTEC, which cost the Northern Territory Government at least \$70 million and the Commonwealth \$70 million, to control a disease that affected on average 3% of the cattle/buffalo population.
- ◆ The Oenpelli experience is clear evidence of a successful sustained operation that should be applied in all areas.

### **Proposal**

A joint Northern Territory, Commonwealth, leaseholder program funded at over \$100 million for next ten to fifteen years based on using chemicals, mechanical and fire to knock down existing stands. Followed by pasture establishment, biological agents and spot chemical use to control re-establishment.

The funding formula should be 60% Northern Territory, 20% Commonwealth and 20% leaseholders on all costs.

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Graham Codd re MIMOSA - for Ctee

Document from Nov 1969 - Has lessons re management.

eg. Role of people in remote areas.  
Right + encouragement to speak out  
Decisions by non-scientific staff  
Role of major flooding, of 1/97!!  
My treatment subsequently, yet  
potential ability to contribute.

I might be able to appear, I could  
correspond if necessary Cate.

+ 1 main  
+ 2 extra pp

Rob Wedley 12.45 4/2/97

Sente to Sessional C'ke  
re MIMOSA 4/2/97

Extract from ASAP NT symposium minutes of 12/11/69 on the topic  
"Weed control - plan now" Minutes by Rob Wesley-Smith (sec)

The spread of seed by river system was illustrated by reference to **MIMOSA PIGRA**. The question was raised about requiring properties and the Crown to eradicate weeds so that seeds were not spread to farmers further downstream, thus negating their efforts at eradication.

There might also be a requirement to force properties in watershed areas to sow only certified seed.

**Mimosa** is spreading rapidly, and may have been transported to the Finnis River area by cartage of sand. In 1956 it was only around Adelaide River, but is now between there and beyond Marrakai crossing. The PIB (Primary Industry Branch) weed control team has prevented Mimosa seeding along the 12 miles downstream from Adelaide River, but as there is a lot of dormant seed, some of which is uncovered whenever river sands are shifted, the area is not yet clean. It takes only 4-5 months from germination to seed setting.

Mimosa causes decreased production due to direct effects on pasture, loss of access (often to the best country - levee), and decreases the recreational value of the levee. There is a view that Mimosa may prevent soil erosion of river banks by decreasing access to stock, and that therefore no steps need be taken to eradicate it.

**This is a dangerous and irresponsible view in my opinion.** Mimosa pigra is a recently introduced weed, with a very limited distribution at present, so that given a lack of procrastination, and a lot of facilities, it should be possible to eradicate it now. We do not know its range of adaptability, but it is proving versatile in establishing on levee and floodplain. We do not know if it has much soil conservation value per se, and it could be, for example, that by preventing close ground cover, it could allow erosion to accelerate. We do know that it causes a loss of production, that cattle don't eat it at all or very much, and that those pastoralists on whose properties it exists are worried by it. **We also know that as it is a very prolific seeder, if eradication is delayed much longer, eradication may become virtually impossible.**

Rob Wesley-Smith  
Ph Ex 89832113

Well, was I right? Did government take any notice? Have I been promoted since 1969? Is science under threat in the NT and in Australia today? Is it possible to produce the "clever" country without adequately supporting science, as well as education, development of ideas etc etc?  
Answers: Yes, No, No, Yes, No.



# Playing politics with our weeds



**B**OTH Territory and Federal Government authorities are calling for a united front on mimosa control.

Each is accusing the other of playing politics rather than priorities.

The noxious woody weed threatening the Top End has again assumed hit the public spotlight since Prime Minister Paul Keating's Environment Statement last week.

Territory MHR Warren Snowdon branded the NT Government's response to the \$5 million mimosa pigra control strategy in Kakadu National Park as "pointless and rather churlish attempts... to confuse and mislead the public".

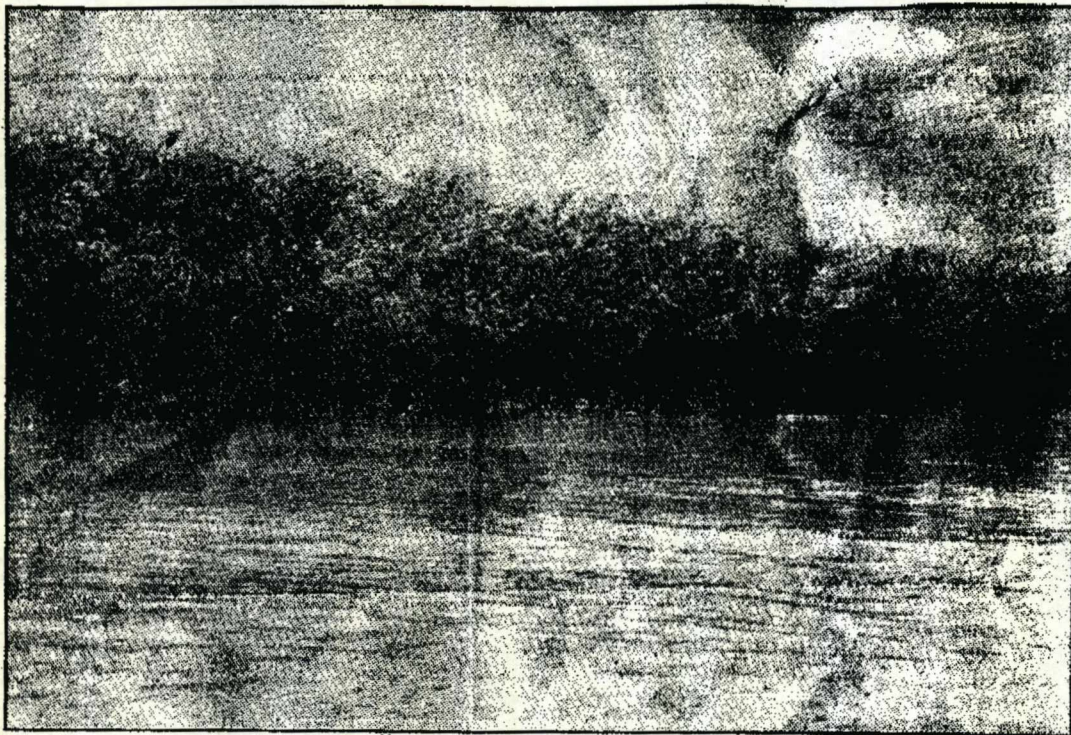
He said attacking the strategy funded in the Environment Statement was "an unfortunate distraction from what should be our first priority - control of this aggressive weed".

A statement released by an NT Primary Industry and Fisheries (DPIF) officer said "many either do not realise, or conveniently forget, the NT Government is regarded as a world leader in mimosa control and has been heavily committed to control it since day one in self-government".

DPIF Minister Mike Reed last week welcomed the injection of funds.

However he said the timing and lack of consultation about how funds would be used meant a co-ordinated approach would be difficult to achieve.

Mr Snowdon said the Prime Minister's Environment Statement had not been perceived by Australians as a political effort to buy off sectarian interest.

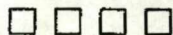


Mimosa pigra on the Adelaide River bank.

"In fact it was criticised by the greens for not addressing political issues enough," he said.

"The NT Government can't have it both ways.

"Mimosa control needs to be co-ordinated and indeed it is - the Oenpelli program is managed by a task force of DPIF, NT Conservation Commission, Australian National Parks and Wildlife Service, CSIRO, the Northern Land Council and the NT Health and Community Services."



**H**E said the Environment Statement targeted an extra \$3 million for mechanical and chemical control of mimosa on the East Alligator floodplain outside Kakadu.

This would prevent the infestation destroying Kakadu National Park.

"Workers in the Oenpelli program will also be able to search out and destroy other infestations of the weed in Arnhem Land," he said.

"The new federal funding for biological control will be of wider benefit in the Top End.

"Critics and commentators overlook the fact that the extra \$2 million guaranteed by the Federal Government

for research into a biological control agent should produce results within two to three years at the most.

"And a biological control agent is the only hope we have of long-term control across the whole NT."

He said much of the biological work to date had been on the Finnis and Adelaide Rivers.

Six insects which fed on mimosa had been screened and released (and) next wet season the CSIRO and and DPIF would release a virulent fungus which attacked only mimosa pigra.

DPIF principal weeds officer Ian Miller said that apart from work in Kakadu, the federal contribution in recent years had been for research into biological control and to fund chemical and mechanical controls on an 8000 ha infestation near Oenpelli in Arnhem Land.

He said the Oenpelli infestation was reported in 1983 and chemical control started in 1986.

"It is the largest single infestation to which chemicals are applied, but there has been a start-stop-start approach by the Commonwealth to funding - an approach

which is useless for effective weed control," Mr Miller said.

"In historical terms the mimosa story is a sorry saga of Commonwealth neglect.

"Requests for assistance to the Commonwealth by the local administration go back to the 1960s.

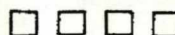
"At that time it could have been eradicated."

Mr Miller said the Territory inherited a reduced control program at self-government in 1978 and expanded it through increased staff, capital, operational funds and subsidies.

Mr Miller said the Oenpelli infestation was only one of many that were controlled across the Top End by a small team of NT Government workers, in association with a sparse population of pastoralists and Aborigines.

About 80 000 hectares were infested from the Fitzmaurice River in the west to Arnhem Land.

"In recent years the NT Government has been spending up to \$1 million on mimosa control through the DPIF and the Conservation Commission," Mr Miller said.





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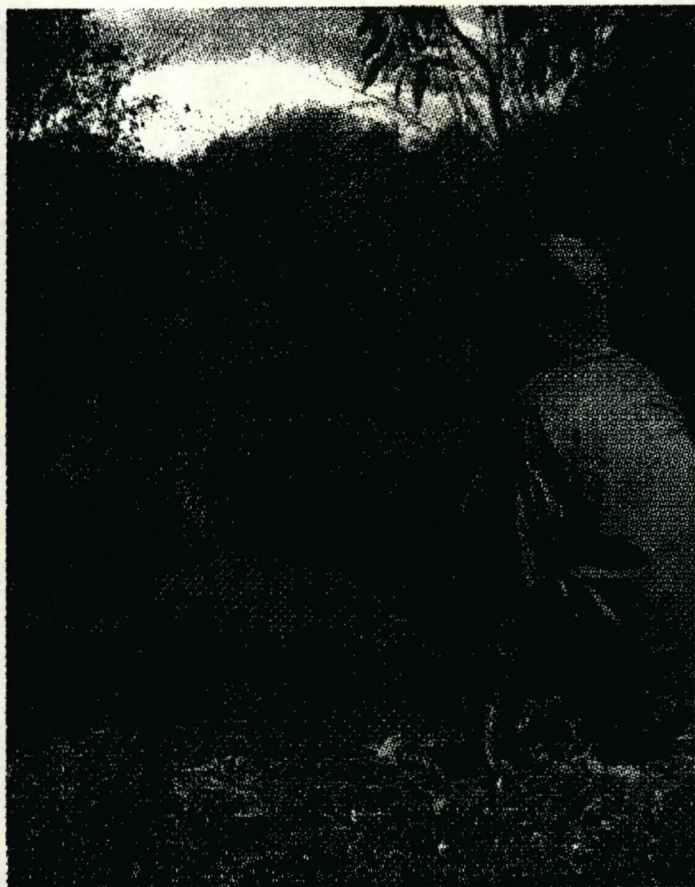
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Vol 13 No 3

Thursday, January 23, 1997

Phone (08) 8988 1604

# Weeds choking water courses



Former Primary Industry agricultural scientist Rob Wesley-Smith is concerned that introduced pastures are threatening swamps and lagoons near the Howard River at Howard Springs.

Mr Wesley-Smith, whose block in Dichondra Road backs on to one of the swamps, recently called a meeting of other block owners in area to discuss the problem.

While there was an encouraging response, there were no immediate answers what to do about the introduced grasses, particularly humidicola, which now is blocking parts of the waterway.

"Humidicola has a running

By JACK ELLIS

capacity as well as a seeding capacity," Mr Wesley-Smith explained, indicating a thick mat of seeding grass along a large drain flowing from the swamp.

"I was shocked when I came down here.

"I knew it was down in this valley because I helped plant the stuff."

Mr Wesley-Smith was involved in a trial planting of various pastures, including humidicola, on a Howard Springs property some years ago and believes the grass spread after being neglected.

"You could spray glysophate (Roundup)," he said.

"Yes, it could kill other things as well but (humidicola) is taking over as a monoculture anyway.

"The whole subdivision right through to Hillier Road influences the swamp.

"I've been thinking for some time about the need for swamp blockies to collaborate on the need to look after the best interests of the swamp.

*Continued page 2.*



Rob Wesley-Smith stands near one of the swamps under threat.





95/1125

31 January 1997

The Chairman  
Sessional Committee on the Environment  
GPO Box 3721  
DARWIN NT 0801

Dear Sir

In relation to the Sessional Committee on the Environment's inquiry into *Mimosa pigra*, I enclose the submission from the Department of Primary Industry and Fisheries and the Interim Mimosa Planning Group.

Yours sincerely

DR WAYNE MOLLAH  
Director Land Resource Management

DEPARTMENT OF  
PRIMARY INDUSTRY  
AND FISHERIES





# **FUTURE MANAGEMENT OF *MIMOSA PIGRA***

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**A SUBMISSION TO THE SESSIONAL COMMITTEE ON THE  
ENVIRONMENT BY THE DEPARTMENT OF PRIMARY  
INDUSTRY AND FISHERIES AND THE INTERIM MIMOSA  
PLANNING GROUP**

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**30 JANUARY 1997**

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## Introduction

Mimosa (*Mimosa pigra*) is a woody invasive shrub. Originally from tropical America and introduced into the Northern Territory via the Darwin Botanic Gardens before 1890, it is now known to infest approximately 80, 000 ha of coastal floodplain in the Territory where it impedes or halts all types of land use. It is presently restricted to the NT but threatens wetlands in Queensland and Western Australia.

Mimosa is recognised as one of three weeds of national importance in the action plan under the National Weeds Strategy which is now going through the final phases of approval.

In August 1996 a new Northern Territory Weeds Management Strategy, 1996 - 2005, was released. Its goal is to protect the Northern Territory economy, community, industries and environment from the adverse impacts of weeds. Six complementary objectives support this goal:

1. preventing introduction and spread;
2. ensuring weeds management is an integral part of land management;
3. learning more about weeds in the Territory as an essential basis for land management;
4. increasing public awareness and education;
5. providing appropriate legislation for weed management;
6. reviewing progress in weed management (mid way through the strategy's 10 year period).

Objectives 1-5 are particularly relevant to the management of the mimosa problem. Progress in the drafting of a new Weeds Management Bill (objective 5) pertains to the preparation of this submission to the Sessional Committee on the Environment and its inquiry into *Mimosa pigra*. The draft bill supports the integration of weed management into all land management by proposing the development of weed management plans. These are to be drafted by Weed Management Committees appointed by the Minister on regional or catchment bases or for specific weed problems. A committee for mimosa is an option given the significance of this weed. As a possible precursor to such a committee the Minister appointed an Interim Mimosa Planning Group (IMPG) with the Head of the Department of Primary Industry and Fisheries (Mr Roger Smith), Dr Joe Baker, Chair of the National Landcare Advisory Committee and Mr Jim Forwood, Northern Territory land management consultant, as members. Its terms of reference are attached (Appendix 1).

The IMPG has met four times with out-of-session support from members and departmental staff. It proposes to report on its terms of reference to the Minister later in 1997. The progress made in developing this report constitutes this submission to the Sessional Committee. Further progress by the IMPG could be submitted to the Sessional Committee later, should this be acceptable.

## Biology of mimosa

Mimosa is a leguminous, thorny shrub up to 6m tall. Isozyme analysis of the seeds has shown that mimosa populations in the Northern Territory are genetically uniform, suggesting that they may have originated from a single infestation or possibly a single plant. Under ideal conditions plants can begin flowering 6-8 months after germination. Flower heads are about 1 cm in diameter, each head containing about 100 flowers. A typical stand comprises 1 plant m<sup>-2</sup> and produces 9 000 seeds m<sup>-2</sup> of canopy. Seed pods are covered with bristles that facilitate floating and spread by water. However, isolated plants have larger areas and can produce up to 220 000 seeds per year.

Mimosa is hard seeded and most viable seeds are lost from the seed bank relatively rapidly on clay soils, but rate of loss varies with soil depth. In sandy soils it has been observed that seeds can survive at least 23 years.

### IMPG Term of Reference 1 (i):

#### Assess the current distribution, rate of spread and impacts of *Mimosa pigra*

##### (a) Current distribution

In the Northern Territory mimosa occurs from near the Fitzmaurice River in the west to Arafura swamp in the east. Its favoured habitat is the river systems and their associated wetlands. However, it does have the ability to grow in upland habitats. This is evidenced by its growth on road sides and in quarries in the Territory, and by its growth in upland habitats overseas. The size of infestations varies between river systems, but the largest infestations are on the Adelaide River, Mary River, Finnis River and in the Daly River/Port Keats Land Trust.

*A Directory of Important Wetlands in Australia* (The Australian Nature Conservation Agency, 1992) lists 21 important wetlands covering 1,444,051 ha in the Northern Territory. Mimosa occurs on 10 of these wetlands where it is estimated to infest about 80,000 ha (Table 1).

Outside of Australia, mimosa is relatively widespread throughout the tropics. As well as occurring in its native tropical America, it has been recorded through Africa, Egypt, India, Indonesia, Papua New Guinea, Singapore, Thailand, Vietnam, Myanmar, Laos and in the Philippines and Florida.



**Table 1. Wetlands of the Top End of Australia infested with *Mimosa pigra***

<b>Wetland System</b>	<b>Total Area (ha)</b>	<b>Estimate of area infested with mimosa (ha)*</b>
Adelaide Floodplain System	134,800	30,000
Arafura Swamp	71,400	5
Blyth-Cadell Floodplain & Boucaut Bay System	35,500	>1
Daly-Reynolds Floodplain Estuary System	159,300	17,000
Daly Middle Reaches	1650	>10
Port Darwin	48,800	500
Finniss Floodplain and Fog Bay System	81,300	17,484
Mary Floodplain System	127,600	10,000
Moyle Floodplain and Hyland Bay System	48,100	1,000
Murgenella-Cooper East Alligator Floodplain System	81,500	4000
<b>Total Area</b>	<b>789950</b>	<b>80,000</b>

\* *Mimosa* may occur as scattered plants over much larger areas.

*(b) Potential distribution in Australia*

In its native range, *mimosa* extends from approximately the Tropic of Cancer to the Tropic of Capricorn, in areas with an annual rainfall down to 800 mm. If it grows in a similar climatic zone in Australia, large areas of river systems and associated floodplains from Derby to approximately Rockhampton have the potential to be colonised with *mimosa*. CLIMEX predictions (a computer program for climatic data) confirm this. It may even grow in northern New South Wales. This threat is recognised in the draft Action Plan for the National Weeds Strategy where it is proposed to contain *mimosa* within the Northern Territory, and to remove *mimosa* from key areas in the Northern Territory.

CLIMEX predictions also show that there is still potential for considerable expansion of *mimosa* in Asia.

*(c) Rate of spread*

The main method of spread is by seed production. The seed pods are covered with bristles that facilitate floating and thus allowing the rapid spread of the weed along river systems, particularly when maximum seed fall coincides with flooding. Large numbers of seeds then germinate as they are deposited on bare soil left by the receding floodwaters in the early dry season.

Two factors are important in accelerating the spread of mimosa within a catchment. Overgrazing by buffalo prior to the late 1970s and fires removing vegetation from the floodplains, combined with rapid spread of seed by water led to the formation of dense, practically monospecific stands of mimosa. In some cases, the sizes of infestations have been recorded to double in a period of about one year.

Spread from one catchment to another is by man and animals. Sand removed from the Adelaide River for use in concrete for railway and bridge culverts spread mimosa to the Batchelor - Rum Jungle area and buffalo catching vehicles moved seed to clean areas further afield. Mimosa is spread by buffalo, cattle, horses and wallabies, and it has also been speculated that spread occurs by birds.

Publicity about the dangers of spread by man and the cessation of issuing permits for sand removal in infested areas has reduced the spread of mimosa by man to new areas. However, small new infestations continue to occur each year either due to seed being moved to new areas or dormant seed being allowed to germinate. eg a single plant at Nguu on Bathurst Island was found and treated in 1995.

Many mimosa infestations are being reduced but due to the long dormancy of seed it is not possible at this time to declare that all plants are eradicated.

#### *(d) Impacts of mimosa*

##### Adverse effects

Dense mimosa thickets compete with pastures, hinder mustering and prevent access to watering points. Mimosa impacts on the recreational fishing industry by preventing access to rivers and billabongs. In conservation areas it reduces floral and fauna biodiversity and reduces the wilderness value of these areas. Hence mimosa has an impact on the tourist industry.

Further detrimental effects of mimosa for Australia, which have not yet been realised, are well illustrated in Thailand where it is more widespread than in Australia. In Thailand it is a serious weed in irrigation systems including water reservoirs, the adventitious roots causing sediment accumulation in such areas. It is a safety hazard along roads, and it interferes with access to electric power poles. Infestations grow in fallow rice paddies, making reclamation of the land for cropping more expensive. It has been estimated that 75% of the cost of preparation of land infested with mimosa is for the control of mimosa. Disruption to agricultural activity has also been reported in Malaysia.

##### Benefits

Despite its detrimental effects, mimosa does have some uses. It was introduced to Thailand as a green manure and cover crop. It is also used as a source of firewood and bean poles. Experiments have been done to use it as a substitute for *Leucaena leucocephala* in animal feed

due to its high protein content. Samples of fibre board have been made from the wood, but they were found to absorb an unacceptable amount of moisture for commercial use and the additional chemical treatment to prevent this was too expensive. It has also been used as a novelty and medicinal plant. Preliminary studies are under way by a South Australian group to assess its suitability as a source of tannins.

In areas where mimosa grows profusely it increases the soil fertility and redistributes nutrients from the lower soil profile to the surface.

It should be noted, however, that many weeds have some use and if commercialisation is contemplated it does not necessarily solve the problem. The plant will still be a weed outside of its cropped area, hence uses of a weed in the wild or by cultivation must be carried out under controlled conditions.

### **IMPG Term of Reference 1 (ii)**

#### **The effectiveness of past and current control methods used against *Mimosa pigra***

##### *General overview*

The earliest record of control action was in the Darwin Botanic Gardens in 1913 when its control, along with that of other noxious weeds, was "being taken in hand; and I hope in my next report to be able to state that they are clean of these pests, but the work will take some months to accomplish" (Allen 1914<sup>1</sup>). The methods used are unknown but obviously Allen's plan was not fulfilled.

Its spread to the upper Adelaide River in the 1950s and an eradication program commenced in 1965. The plan was to eradicate it from its uppermost point in the catchment for 35 km downstream using physical and chemical means. A full-time eradication attempt by two persons, sometimes three, continued for six years. The team successfully stopped plants seeding within the eradication area, but plants continually reappeared from previously deposited seed and the infestation spread downstream from seeding plants below the control area.

In 1966 the technician in charge of the program made a request for an extra labourer, but he was told that he was "glorifying the job". The full time eradication attempt ceased in 1971 as the team was fighting a losing battle. In 1974, a further proposal was put to the Commonwealth for a full-scale eradication program costing \$647,500 over 12 years, but it was not approved and mimosa continued to spread.

However, from 1972 to the present day, limited control measures have been carried out to slow down the spread of mimosa. This was based on the policy of eradicating new isolated infestations to slow down the spread of mimosa to new areas, roadside control for the same

<sup>1</sup> Allen, C.E.F. (1914). Report of the Curator, Botanic Gardens, Darwin. In: *Northern Territory of Australia. Report of the Administrator for the Year 1913*, p. 28. Commonwealth of Australia.

purpose, and controlling large infestations where required for production or conservation purposes.

In this period there was no known example of mimosa being controlled anywhere else in the world and it was not until the late 1970s and early 80s that contact was made with authorities in the Americas and Thailand. Nevertheless, while the Thais had a problem, they also did not have a solution and were looking for assistance.

After self government in the Northern Territory in 1978, a greater interest was shown in political circles about doing something about the escalating problem. It was realised that complete eradication of mimosa from the Northern Territory was not feasible, but that a lot could be done to control and contain the weed. It was from that time onwards that the plan of using biological control agents was born and in 1979 a cooperative project between DPIF and CSIRO commenced. In the Australian Centre for International Research (ACIAR) funded a project on the management of mimosa involving DPIF, CSIRO Division of Entomology, The Thai National Biological Control Research Centre and the Thai Royal Irrigation Department. This project supported research into biological, herbicidal and other forms of control, and the development of integrated control strategies. It terminated in 1991.

The plan, as determined in the late 1970s, was to integrate chemical control with burning, chaining, cultivation, planting of pastures, and the use of biological control as agents became available.

The chemical, physical and biological control methods that have been used in the Northern Territory are listed in Tables 2, 3 and 4. Statements on ecological control methods follow the tables.

**Table 2. Physical control techniques for mimosa**

Control Method	Dates used	Effectiveness (subjective)	Known specificity of action
Hand pulling	1965 - 1997	High for small isolated plants if roots removed	Specific. Must remove carefully and hand pick seed
Dig out with a hand tool	1965 - 1997	High for small isolated infestations if roots removed.	Specific. Hand pick seed. Now not often used.
Cut stump with herbicide	1980s	High for isolated plants	Selective for broadleaf plants. Herbicide must be applied immediately after cutting stump
Bulldozer - scrub roller	Late 1980s	High, in combination with herbicide	For medium sized areas and laneway preparation for herbicide application
Bulldozer - chaining	1990s	High, in combination with herbicide	For large dense stands



**Table 3. Effectiveness of herbicides commonly used for mimosa control**

Herbicide	Dates used	Effectiveness as measured in trials using the recommended rate and method of application (Range of % kills)	Known specificity of action
<b>(a) Previously used</b>			
2,4,5-T	1965 - 83	75 (in water) - 100 (in diesel)	Selective for broadleaf plants
2,4,5-T + Picloram	1960s - 80s	High - as a basal bark spray (data not analysed)	Selective for broadleaf weeds
Dicamba + MCPA	1983 - 85	30-93	Selective for broadleaf plants
<b>(b) Currently used</b>			
Dicamba	1983 - 97	60-100	Selective for broad-leaf plants. Used near potable water
Ethidimuron	1983 - 97	95-100	Non-selective. Soil application.
Fluroxypyr	Late 1980s - 1997	53-95	Selective for broadleaf plants.
Glyphosate	1980 - 1997	75-87	Non-selective.
Hexazinone	1982 - 97	50-95	Non-selective.
Metsulfuron methyl	1990 - 97	93-100	Selective for broad-leaf plants.
Picloram + triclopyr	1980s	High - as a basal bark spray and cut stump application. (Data not analysed)	Selective for broadleaf plants
Tebuthiuron	1988 - 97	95-100	Selective for broadleaf plants
Triclopyr	1980s	High - as a basal bark spray Data not analysed)	Selective for broadleaf plants

It should be noted that the season of application and the method of application can influence the effectiveness of herbicides. For example application of dicamba in the wet season gives a more rapid defoliation and better kill than does application in the dry season. The age of

plants is also important and, in the case of soil applied herbicides, soil features can influence the effectiveness.

#### *Ecological control of mimosa.*

Fire and competitive pastures have been used for control of mimosa, both of which are most successful when integrated with other methods.

The only experimental work reported for pasture competition is a pot trial carried out in 1987 to measure the competitive effects between the pasture Koronivea grass (*Brachiaria humidicola*) and mimosa seedlings. Koronivea grass was highly effective in controlling the seedlings without the use of any herbicide. Improved pastures have also been established in areas that have been treated with herbicides (eg para grass) and they have been effective in suppressing regrowth. Likewise, native herbaceous vegetation regenerates quickly after herbicide application (within 2 years) as observed on both the Adelaide River floodplain and at Oenpelli. The effect of these species on seedlings, has not been measured.

Fire has a role in control programs by enhancing the kill of plants that have not been completely killed by herbicides, to break seed dormancy, to kill seeds and to clean up sprayed areas. Plants weakened by mechanical control or biological control may also be more vulnerable to fire. Follow-up control after fire is imperative, otherwise rapid regeneration of burnt infestations will occur through coppicing and enhancement of germination.

#### *Overall effectiveness of control in the Northern Territory*

There are many interacting factors which can affect the rate of spread of mimosa and no studies into effectiveness have been carried out except on the Commonwealth funded control program at Oenpelli. It is difficult to quantify effectiveness, but if the work initiated in 1965 had not been carried out, mimosa would certainly cover a far greater range than it does today. It is still contained within a relatively small area of the Northern Territory (0.06%) and occurs nowhere else in Australia. From land management and conservation perspectives it is imperative that it spreads no further.

With weed control in a natural environment it is not what you can see, but what you cannot see that is evidence of a successful result and, in the case of mimosa, it is clear that large areas have not become infested either because the seed has not been transported there or because of the control program.

At Oenpelli, a Commonwealth funded program, carried out by DPIF and the Kunbarllanjana Community from 1991, successfully removed dense mimosa from about 7,000 hectares of wetlands through aerial application of herbicides, chaining and burning. Satellite outbreaks were controlled from the ground by Aboriginal teams.

This project represented the largest aerial application of herbicide ever undertaken in the Northern Territory, the largest single application of herbicide to mimosa in the world, the

Table 4. Biological Control for *Mimosa pigra*

Control Methods	Past Showing Dates used	Present showing dates commenced	Effectiveness i) Alone ii) In combination	Known specificity of action covering e.g. impacts on other species or animals or plants	Cost/ha	Type of control
<i>Acanthoscelides</i> spp.	1983 - present	Apr 1983 Adelaide River Jul 1983 Finnis River Jul 1983 Mary River Aug 1983 Oenpelli floodplain Mar 1985 Sadgroves Creek Apr 1983 Reynolds River	i) Low ii) Medium: methods which reduce the seed production will increase effectiveness.	Specific to <i>Mimosa pigra</i>		Larvae feed on hard seed. 1 larva /seed.
<i>Chlamisus mimosae</i>	1986- present	Nov 1985 Finnis River	i) Low ii) Low; • Epidermal damage may enhance the impact of pathogens. • Will have greater impact on seedlings and regrowth.	Specific to <i>Mimosa pigra</i>		Adults and larvae feed on leaves and epidermis
<i>Neurostrotia gunniella</i>	1989-present	Feb 1989 Adelaide River Nov 1989 Darwin Feb 1990 Elizabeth River Jul 1989 Finnis River May 1989 Oenpelli floodplain Currently established on all river systems in the Top End west of Oenpelli	i) Medium: shown to reduce seed production by up to 60% ii) High; • After other control measures have removed adult plants, will attack seedlings and regrowth, reducing plant vigour and increasing susceptibility to competition from native and introduced grasses. • May act as a vector for pathogens.	attacks all species of mimosa present in Australia as well a native <i>Neptunia</i>		Larvae bore into stem tips
<i>Carmenta mimosa</i>	1989-present	Jul 1989 Adelaide River Dec 1989 Finnis River Sept 1989 Oenpelli Aug 1995 Mary River	i) High ii) High; • Efficiency will be increased by control methods which remove adult plants allowing <i>Carmenta</i> to attack seedlings and regrowth, reducing plant vigour and increasing susceptibility to competition from native and introduced grasses. • May be a vector for pathogens	Specific to <i>Mimosa pigra</i>		Larvae bore into stems.

<i>Apion</i> spp.	1994-present	May 1994 Adelaide River. June 1994 Finnis River Oct 1995 Mary River Feb 1996 Wagait Aboriginal Reserve Jan 1996 Moyle River	i) Medium ii) High; • Ideal to introduce 2 - 3 years prior to other control methods to reduce seed production and seed bank. • Integration, once control measures that prevent large flower production have begun, requires provision of refuges.	Specific to <i>Mimosa pigra</i>		Adults and larvae feed on flower buds
<i>Phloeospora mimosae - pigrae</i>	1994 - present	Jan 1995 Adelaide river Apr 1995 Finnis River Jan 1996 Sadgroves Creek Dec 1996 Reynolds River.	i) Unknown ii) Unknown; • Diapause during the dry season so timing of chemical and mechanical control would be critical to its efficiency. • Fire would have a negative effect • Would benefit from availability of seedlings and regrowth, reducing their vigour and increasing susceptibility to competition from native and introduced grasses. • Both <i>Neurostrota</i> and <i>Carmenta</i> may act as vectors. As may native insects which use mimosa as a refuge rather than a host.	Specific to <i>Mimosa pigra</i>		defoliates plants and causes stem cankers. Active only during the wet season
<i>Diabole cubensis</i>	1996 - present	June 1996 Adelaide River June 1996 Finnis River	i) Unknown ii) Unknown; • Removal of adult plants providing a population of seedlings and regrowth. would increase its efficiency. • Both <i>Neurostrota</i> and <i>Carmenta</i> may act as vectors. As may native insects which use mimosa as a refuge rather than a host.	Specific to <i>Mimosa pigra</i>		Defoliates the plant. Active during the Dry season
<i>Chalcodermus serripes</i>	1996 - present	March 1996 Adelaide River March 1996 Finnis River	i) Unknown ii) Unknown; • Will add to reduced seed production filling a niche between <i>Apion</i> spp. and <i>Acanthoscelides</i> spp. Refuges may need to be provided in an integrated program as survival is dependent on seed availability.	Specific to <i>Mimosa pigra</i>		Adults and larvae attack mature green seeds



largest single Graslan herbicide application ever undertaken in Australia and probably the largest application of Graslan to a wetland environment in the world. As expected in a project of this size, difficulties were encountered in its implementation, both at the administrative and technical levels. However, these difficulties were overcome and the five-year project is considered to be highly successful.

It is important to note that the project was designed to use chemical and mechanical control as, at that time (1991), it was unlikely that biological control would be effective within 5 years.

In 1995 the Mimosa Steering Committee established to oversee the project reported that native flora and fauna are recovering well in the area. With the return of waterbirds, and the enhanced success, Aboriginal use of this area for the collection of traditional food has been restored. However, as with most weed control programs of this nature, sustained effort is required to ensure that the area is not reinfested.

The success has also been documented in reports by CSIRO, by a consultant to the Mimosa Steering Committee (Australian Research Associates) and in correspondence between ANCA and DPIF.

#### *Control in other countries*

Hand weeding and removal with heavy equipment have been used in Thailand along irrigation canals, roadsides and in agricultural land. In some cases burning is practised together with chemical control. The chemicals recommended are dicamba, fluroxypyr, glyphosate, hexazinone, metsulfuron methyl, picloram, tebuthiuron and triclopyr. In agricultural crops it is controlled along with other weeds by soil preparation prior to planting, either by ploughing using animal or mechanical traction, by cultivation using hand tools, or by hand weeding of crops after planting. Flooding will kill seedlings and mature plants and is sometimes used to control mimosa in Thailand. Despite its high human population density, overall control in Thailand is no more effective than in the Northern Territory.

In the United States of America the area infested is small (150 hectares in 1992) and at that time it was being contained with the herbicides, dicamba and glyphosate.

Thickets of mimosa in its native range are very small in comparison with those in the NT, and are all attacked by a much larger complex of insects. This suggests that natural enemies in the native range are an important factor in maintaining the population at low levels and that biological control may be effective in the introduced range.

Nevertheless, there are records of physical and chemical control of mimosa in its native range during the 1960s and 70s. In Mexico and Costa Rica good control was obtained with 2,4,5-T and 2,4,5 T and picloram.

Cutting and burning was also carried out in Mexico but eradication was not been achieved in paddocks where this method has been used for up to 30 years.

## IMPG Terms of Reference 1 (iii):

### Current research and development of control methods for *Mimosa pigra*

#### *Biological control* (See also Table 4)

It has been recognised since the 1970s that the best long-term solution for management of mimosa is biological control integrated with other methods. However, biological control research may take 10 years or more from initiation of a program to successful establishment of an agent. The biological control research program on mimosa was initiated by DPIF and CSIRO in 1979/80 and current research by DPIF follows.

#### Determination of the life cycle of seed feeding beetle *Chalcodermis serripes*.

This insect has not completed its life cycle in Australia. Field studies are under way at Berrimah Agriculture Research Centre to follow larval development in order to determine the conditions under which it completes pupation.

#### The Ecology and spread of the rust fungus, *Phloeospora mimosae pigrae*.

This focuses on the interaction between tip boring moth, *Neurostrota gunniella* and the rust fungus. It will also include laboratory and field impact studies.

#### Aerial application of *Phloeospora mimosae pigrae*.

If successful aerial application will enable *Phloeospora mimosae pigrae* to be applied over several hectares at a time. Currently it is applied from motorised back pack sprayers. Inoculum has been applied at 2 rates, each over 1 ha of mimosa. The plots will be assessed for symptoms of infection at 6 weekly intervals.

#### Impact of the stem borer *Carmenta mimosa* on mimosa seedlings and regrowth

A field site (500 m<sup>2</sup>) has been cleared at Finnis River mango patch to provide seedlings and regrowth. Some plants will be treated with the granular systemic insecticide Furodan to exclude insects. Insect populations, growth rates of mimosa, flower and seed production will be monitored.

This is a joint project with CSIRO Darwin

#### Developing mass culturing techniques for the dry season rust *Diabole cubensis*

This work is to test inoculation techniques to maximise spore production, wet vs dry inoculation techniques, to trial a variety of wetting agents, to determine temperature and humidity requirements for sporulation and the effect of light on spore production.

● Host specificity determination of the seed feeding beetles, *Sibinia fastigiata* and *S. seminicola*.

The life cycle and rearing methods of the insects are being determined. The insects are then tested against approx 100 species of plant that are either closely related or of economic importance.

This work is funded by DPIF and done under quarantine conditions in Brisbane by CSIRO Div of Entomology.

Life cycle determinations of new Biocontrol agents.

This work is funded by DPIF and done in Brisbane by CSIRO

*Other methods of control*

There is no current research. Research on chemical, ecological and mechanical control was carried out between 1981 and 1991 and is listed in the list of publications and unpublished reports in Appendix 2.

**IMPG Term of Reference 2:**

**Assess relevant current and potential roles of land owners, land managers, the Territory and Commonwealth Governments in the management of mimosa.**

Table 5 addresses this term of reference directly. Tables 6 and 7 provide supplementary information on expenditure on mimosa from 1991/92 to 1996/97, and on subsidies paid to landholders to control mimosa from 1988/89 to 1996/97.



**Table 5. Current and potential roles of landowners**

<b>Land tenure</b>	<b>Current</b>	<b>Potential</b>
Freehold/leasehold	<ol style="list-style-type: none"> <li>1. Accept (increasingly) mimosa as a serious problem on their land and on other lands.</li> <li>2. Integrated control (Mechanical/herbicidal/revegetation)</li> <li>3. Provide 'trial' release sites for biological control agents</li> <li>4. Prevent spread of <i>Mimosa pigra</i> - control of existing 'margins' of infestations - hygiene of vehicles, machinery, etc</li> <li>5. Rehabilitate land into productive use after mimosa</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase integration of weed management into all management of the land.</li> <li>2. Increase management of pasture species (native and introduced) to prevent further weed problems.</li> <li>3. Participate actively in group/catchment management processes.</li> <li>4. Adopt successful integrated control, including biological control agents.</li> <li>5. Prepare property weed management plans.</li> <li>6. Participate in relevant education and extension projects</li> </ol>
Aboriginal land trusts	As for freehold/leasehold	As for freehold/leasehold.
Territory Government Agencies	<ol style="list-style-type: none"> <li>1-5 as above</li> <li>6. Provide appropriate legislative base for weeds management plans.</li> <li>7. Review Mimosa Control Assistance scheme, MCAS.</li> <li>8. Oversee administration and management of Territory government funds and other funds made available for mimosa control.</li> <li>9. Develop further potential integrated control methods - including biological control.</li> <li>10. Develop further whole of government approach to integrate weed management into land management.</li> <li>11. Collaborate with Commonwealth Government agencies to harmonise delivery of weed management programs</li> </ol>	<ol style="list-style-type: none"> <li>1-6 as above</li> <li>7. Assist with preparation of weeds management plans on property/catchment bases</li> <li>8. Plan and implement an expanded strategic research program.</li> <li>9. Contribute actively to implementation of National Weeds Strategy through Natural Heritage Trust.</li> </ol>

Land tenure	Current	Potential
Agencies of Commonwealth government	<ol style="list-style-type: none"> <li>1. Oversee administration of Commonwealth funds and management of programs for mimosa control (on Aboriginal land, for biological control).</li> <li>2. Control mimosa on Commonwealth land - Parks, defence.</li> <li>3. Introduce new biological control agents for release.</li> <li>4. Introduce National Weeds Strategy through National Heritage Trust</li> <li>5. Collaborate with Territory Government agencies to harmonise delivery of weed management programs</li> </ol>	As for current
Aboriginal Groups ATSIC, NLC, Indigenous Land Corporation	<ol style="list-style-type: none"> <li>1. Support mimosa control by Aboriginal landowners (eg. NLC through Caring for Country).</li> <li>2. Provide further funds for mimosa control land rehabilitation development (ATSIC)</li> <li>3. Provide education and extension programs to Aboriginal landowners and managers</li> </ol>	As for current
Government Committees - Territory	Interim Mimosa Planning Group to produce 5 year plan	New single Committee to oversee Mimosa control on all land (See non government committees)
Government Committees - Commonwealth	Oversee administration of Commonwealth funds for mimosa control (on Aboriginal land, for biological control)	Oversee implementation of National Weeds Strategy (through Natural Heritage Trust)
Non Government Committees		Serve as 'Mimosa weed management committee' under proposed NT legislation and as required by the Minister

**Table 6. *Mimosa pigra* Expenditure/ budget - 1991/92 TO 1996/97**

PROGRAM	1991/92 \$000	1992/93 \$000	1993/94 \$000	1994/95 \$000	1995/96 \$000	1996/97 (EST.) \$000	TOTAL \$000
Northern Territory Government Mimosa Control Assistance Scheme	153	167	169	336	355	381	1561
CSIRO Biocontrol	214	225	218	232	200	168	1257
NT Land Corporation Beatrice Hill	-	4	22	1	-	-	27
Sampan Ck	-	-	70	127	190	105	492
Commonwealth -CSIRO Mass Rearing	93	83	68	103	106	158	611
Control of mimosa on Aboriginal land	1344	2000	899	836	379	385	5843
Establish pathology laboratory/screenhouse	-	-	-	-	30	50	80
<b>TOTAL</b>	<b>1804</b>	<b>2479</b>	<b>1446</b>	<b>1635</b>	<b>1260</b>	<b>1247</b>	<b>9871</b>

It is estimated that in addition to the above, readily identifiable expenditure on mimosa control, 75% of the remaining Northern Territory Weeds Branch Personnel, Operational and Capital Equipment expenditure can also be identified as being related to mimosa control, as follows:

75% Weeds Personal/Operational/ Capital	882	930	1075	1103	1175	1083	6248
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**Table 7. Distribution of Mimosa Control Subsidy 1988/89 - 1996/97 (\$)**

PROPERTY	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	
Annaburro (Bugg K)								667.00	3,525.00	-
Carmor Plains Stn (O'Brien M J)								431.00	770.00	+
Devereaux C (Ironstone Stn)							1,042.00	5,726.00	4,850.00	even
Old Mt Bundy (Coulter B)							1,008.00		1,100.00	+
Opium Creek (Little J)	5,072.00	21,649.00			4,956.00			364.00	9,675.00	+
Beatrice Plains (B Hanna)								3,352.00	1,050.00	- ve
Carabao Exports			19,949.75	23,057.75	10,293.00	12,181.00	6,732.00	6,835.00		- ve
Donald Lagoon (C On)	4,900.00	4,023.00	4,022.67	2,873.51	3,045.00				6,050.00	+ ve
Finniss River Station/Input Pty Ltd/L Venturin		4,769.00	5,359.25	5,054.88	7,234.00	10,050.00	11,149.00	14,550.00	15,600.00	+
Kerlin Pty Ltd			4,305.00							
Koolpinyah Station Pty Ltd								11,374.00	20,000.00	+
Labelle Station		2,128.40	1,342.50	4,792.25	3,811.00	8,229.00	29,980.00	9,781.00	14,550.00	+
Marrakai Pastoral Co/Woolner	11,611.00	15,901.00	17,406.75	15,824.17	19,143.00	24,164.00	27,801.00	33,940.00	35,511.00	+
Melaleuca Station	13,480.00	11,308.00	24,553.50		20,237.00	32,639.00	3,094.00	27,583.00	34,603.00	+
Mt Keppler Station								9,580.00	10,048.00	even
Mt Ringwood Station					2,044.00		3,189.00	1,159.00	1,500.00	+
Smoky Creek Station							777.00			
Tipperary Station	67,752.00	74,750.00	71,754.73	85,678.73	79,083.00	82,045.00	231,402.00	221,145.00	153,000.00	- ve
Twin Hill Station									4,700.00	+
Wandinya Farm (K Sheridan)									2,150.00	+
Wangi Homestead							19,446.00	26,350.00	49,540.00	+
Waymar Farms (W Adams)									250	+
Welltree Station	16,543.00	20,317.00	17,852.69	15,996.68	17,440.00			10,080.00	12,750.00	+ ve
Woodlane Dairy										
<b>TOTAL</b>	<b>119,358.00</b>	<b>154,845.40</b>	<b>166,546.84</b>	<b>153,277.97</b>	<b>167,286.00</b>	<b>169,308.00</b>	<b>335,620.00</b>	<b>382,917.00</b>	<b>381,222.00</b>	



### IMPG Term of Reference 3. Recommend, or where appropriate implement;

- i. **future/potential management options;**
- ii. **how land owners, land managers and governments can realise these options.**

#### 1. Mapping and management

It is recognised that mapping of the known and potential distributions of mimosa in the Territory needs to be more accurate and more comprehensive to allow better management decisions to be made. Remote sensing will detect large stands of mimosa but the reflectance signature cannot be detected with sufficient accuracy for small stands and individual plants.

The current proposal to deal with this situation seeks to build on data available within the Departments of Primary Industry and Fisheries and the Department of Lands Planning and Environment. Land unit mapping is available for most of the areas where mimosa occurs and most of this is available in digital form. A land unit is a unit of classification of a reasonably homogenous part of the land unit surface, distinct from surrounding terrain, with consistent properties of landform, soils or vegetation. These factors are generally linked and are of consequence to land use. That is, they are valuable for land management.

GIS capabilities in the departments can be used to integrate these data with the known distribution of mimosa:

- i) to identify potential areas of mimosa;
- ii) to plan further detailed surveys of these areas (eg. using GPS capabilities);
- iii) to formulate land management practices to prevent the spread of mimosa into these areas;
- iv) to develop further management plans where mimosa occurs now to prevent spread from these areas and to allow their rehabilitation as appropriate according to land type and land use.

The DPIF Weeds Branch is scheduled to have an officer start in mid March to develop and manage a new weeds data base for the Territory. This mimosa project would be part of that officer's responsibilities, in collaboration with other DPIF and DLPE staff and with land managers. In addition, another professional officer, with extensive experience in the Northern Territory on mimosa issues, has been identified to draft weed management plans with landholders.

#### 2. Economics and management

The economics of different land uses and of individual operations vary widely. Tourism differs from traditional Aboriginal use which differs from pastoralism. Similarly, the economics of the impacts of mimosa and of its treatment vary across types of land and land uses. Economic analyses need to be adjusted accordingly with

natural resource economics applied to matters like the value of conserving biodiversity. On the other hand more orthodox production economics applies to pastoralism.

On behalf of the IMPG, DPIF economists have prepared partial budgets for replacing *Mimosa pigra* with pasture grasses for intensive grazing. This work is at an early stage. However, it does raise questions about the economics of various methods of mimosa control. The results are very sensitive to factors like productivity per hectare and cattle prices. They show that a long-term commitment to control (more than 10-12 years) is required in order to achieve a net return. This in turn raises questions about options for government assistance to landholders (currently through the Mimosa Control Assistance Scheme).

The IMPG is aware that in its report on the Mary River System of April 1995 the Sessional Committee recommended that subsidy arrangements for landholders conducting mimosa control programs be structured to encourage greater commitment, action and successful outcomes by landholders.

The analyses so far indicate a need for further economic analyses and for further investigations of different individual and integrated methods of control. In this context recommendations can be made about assistance to pastoralists.

**IMPG Term of Reference 4. Based on Terms of Reference 1-3 draft a Plan of Action for the next 5 years to manage *Mimosa pigra* in the Territory**

This will be a major component of the report of the IMPG.

It will need to be consistent with the Northern Territory Weeds Management Strategy, 1996-2005, the National Weeds Strategy and the NT *Weeds Management Act*. All require a long-term perspective in terms of weed control and any five year plan will be set in this broader context. Funding cycles are for shorter time-frames and this practical aspect will also need to be recognised in the IMPG's recommendations.

**IMPG Term of Reference 5. Oversee the Plan of Action in the 1996/97 season and until the formation of a relevant management committee or committees as proposed under the Draft Northern Territory Weeds Management Bill.**

*[The IMPG will be reviewing the first six months of the 1996/97 Plan of Action at its next meeting on 24-25 March 1997]*

**IMPG Term of Reference 6. Throughout its operations the Working Group will consult and liaise with as many individuals and groups as are necessary for it to fulfil its goal.**

So far the IMPG has undertaken field trips to the Adelaide River (Window on the Wetlands) and the Mary River (Melaleuca Station), and to Finniss River (biological control release sites). It has also visited the DPIF biological control facilities at Berrimah and has been briefed by operational staff at each meeting.

At its meetings the IMPG has had discussions with the Chair of the Mimosa Steering Committee (Mr John Hicks, Assistant Secretary, Parks Australia North) and an officer from the Department of Lands Planning and Environment.

Departmental officers are in daily contact with landowners whose properties are affected by mimosa and relevant information is provided to the IMPG. The IMPG will meet with Aboriginal representatives during the first half of calendar year 1997.

The IMPG will consult further, as appropriate, up until the time its reports is presented to the Minister.

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APPENDIX 1**Terms of Reference of the Interim Mimosa Planning Group**

**Goal:** To identify and recommend a plan of action to protect the Northern Territory economy, community, industries and environment from the adverse impacts of *Mimosa pigra*.

**Terms of Reference:**

1. Assess
  - i. the current distribution, rate of spread and impacts of *Mimosa pigra* in the Northern Territory;
  - ii. the effectiveness of past and current control methods used against *Mimosa pigra*;
  - iii. current research and development of control methods for *Mimosa pigra*;
2. Recommend future/potential management options.
3. Assess relevant current and potential roles of land owners, land managers, the Territory and Commonwealth Governments in the management of mimosa.
4. Based on Terms of Reference 1-3 draft a Plan of Action for the next 5 years to manage *Mimosa pigra* in the Territory.
5. Manage the implementation of the Plan of Action until the formation of a relevant management committee or committees as proposed under the Draft Northern Territory Weeds Management Bill.
6. Throughout its operations the working group will consult and liaise with as many individuals and groups as are necessary for it to fulfil its goal.



## APPENDIX 2

**PUBLICATIONS AND UNPUBLISHED REPORTS RESULTING FROM DPIF RESEARCH ON MIMOSA, INCLUDING THAT CARRIED OUT IN COLLABORATION WITH OTHER INSTITUTIONS.**

[Reference was made to some of these publications and to others published by CSIRO in preparing this submission].

- Benyasut, P. And Pitt, J.L. (1992). Preventing the introduction and spread of *Mimosa pigra*. In: A Guide to the Management of *Mimosa pigra* (Harley, K.L.S. ed). CSIRO, Canberra, pp 107-108.
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Miller, I.L and Pitt, J.L. Response of *Mimosa pigra* to tebuthiuron.

Miller, I.L. Response of *Mimosa pigra* to dicamba based herbicides.

Miller, I.L. Screening of herbicides to control *Mimosa pigra*.

Miller, I.L. and Pitt, J.L. Basal bark application of herbicides to control *Mimosa pigra*.

Miller, I.L. The potential of Arsenal to control *Mimosa pigra*.

# RAMINGINING HOMELANDS RESOURCE CENTRE ABORIGINAL CORPORATION

PMB 123, WINNELLIE  
NORTHERN TERRITORY 0820

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FAX (08) 8979 7903

## FAX-IT FAST

TO: The Chairman YOUR FAX NO: 89412437  
FROM: Craig Martin OUR FAX NO: .  
DATE: 31/1/97 NO. OF PAGES INCL. THIS ONE: 3  
ATTN: The chairman SUBJECT: Sessional Committee  
MESSAGE: of the Environment  
Mimosa pigra project.

Apologies for our late  
Submission. We ask the chairman for his  
grace in consideration of this submission.

Yours sincerely  
Craig Martin

Should you have any difficulties or queries in transmission, please contact the sender by phone

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# RAMINGINING HOMELANDS RESOURCE CENTRE

## ABORIGINAL CORPORATION

PMB 123  
Via WINNELLIE  
NORTHERN TERRITORY

PH: (08) 89797915/20  
FAX: (08) 89797903

29 January, 1997

The Chairman  
Sessional Committee of the Environment  
*Mimosa pigra* Project  
GPO Box 3721  
DARWIN NT 0801

Dear Sir

Ramingining Community is the closest main center adjacent to the Arafura Wetlands. Arafura Wetland and its catchment incorporates the traditional lands of the Djinba, Ritharrngu and Wagilak speaking Yolngu groups.

The Arafura Wetland is the largest freshwater ecosystem in East Arnhem Land and has the largest contiguous paperbark wetland in Australia. At the end of the wet season Arafura Wetland covers about 130,000 ha. It is possibly the only tropical wetland in Australia where a diverse natural landscape is being maintained by an unbroken Aboriginal land management tradition. The Aboriginal people who live there are traditionally orientated and depend heavily, through hunting and foraging, on the diverse natural resources of the area. The traditional interactions between Aboriginal people and the natural landscape, including the use of fire to manage the environment, have continued through to the present with relatively little impact by Europeans and introduced plants and animals. However, if the satellite outbreaks of *Mimosa pigra* are not controlled then this pristine situation will deteriorate rapidly. Arafura Wetland and its eastern catchment is registered on the interim National Estate list and full listing is expected in the near future.

Arafura Wetland has always been an important resource for the people of this area, both materially and spiritually. In contemporary life a large component of diet is derived from bush foods both plant and animal from these wetlands. This reliance on bush foods is also an important contributing factor to the health of the people. Recently economic projects such as the harvesting of crocodile eggs and the possibility of future harvesting of wildlife for sale in local stores and ecotourism will certainly cease if *Mimosa pigra* spreads.

The Arafura Wetland is under serious and very immediate threat of massive invasion by *Mimosa pigra*. The wetland provides the ideal habitat for *Mimosa pigra*. It remains flooded for a relatively long time and the extended availability of moisture in the dry season prolongs the annual growing and seed production. There are now ten known *Mimosa pigra* infestations within

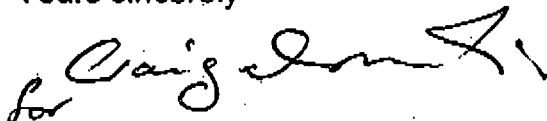
the wetland. The first two were found in 1991/92, a further one in 1993, three more in 1994, two more in 1995 and in 1996, a further two infestations have been located. Despite repeated treatment of all known infestations with herbicide, new plants have been found at all of the sites.

While these infestations are comparatively small, they are widely separated. The Northern Territory Department of Primary Industries and Fisheries (DPI&F) has treated *Mimosa pigra* infestations in the Arafura Wetland by helicopter since 1991, on an *ad-hoc* basis, using Commonwealth funding from the Oenpelli Project. During 11/9/95-17/9/95 helicopter survey was carried out and follow up ground work by the Australian Nature Conservation Agency (ANCA) and DPI&F staff. This revealed the location of three more infestations and another reported by a Traditional owner. The systematic survey and treatment in the eradication of *Mimosa pigra* needs to be more intensive in the small period of time that the wetland is accessible. Future management options must empower Aboriginal people to continue the sustainable management of their country at a community level and guarantee self reliance.

The majority of the wetlands is only surveyed and areas of *Mimosa pigra* are treated by DPI&F and ANCA on an occasional basis. No funding for vehicles used in ground survey or equipment for eradication are available to the Traditional owners who are charged under their law with the responsibility of maintaining their land. It is imperative that access to funds for these people be made available.

The exponential impact of *Mimosa pigra* on the environment cannot be underestimated when examples such as the rapid spread and destruction of the unique ecosystems on the Oenpelli flood plain and Adelaide River flood plain are looked at. The effect this will have for the people of the Arafura Wetland on the traditional maintenance, use of resources, culture and lifestyle will be devastating.

Yours sincerely



Gilbert Pollock  
Administrator



# RAMINGINING HOMELANDS RESOURCE CENTRE

## ABORIGINAL CORPORATION

PMB 123  
Via WINNELLIE  
NORTHERN TERRITORY

PH: (08) 89797915/20  
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29 January, 1997

The Chairman  
Sessional Committee of the Environment  
*Mimosa pigra* Project  
GPO Box 3721  
DARWIN NT 0801

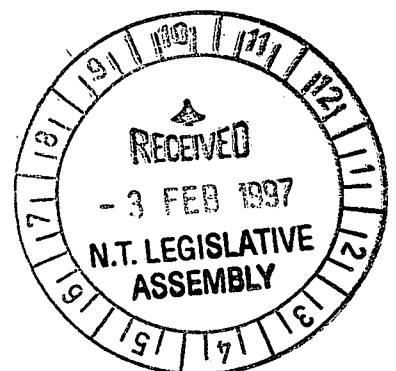
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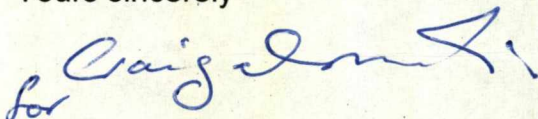
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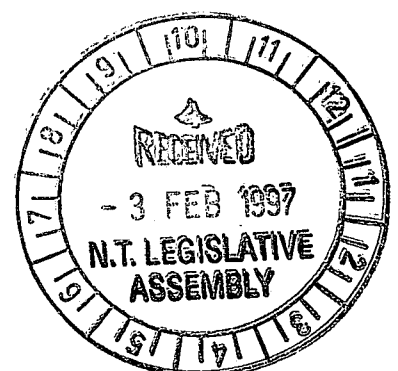
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Yours sincerely

A handwritten signature in blue ink, appearing to read 'Gilbert Pollock', with a stylized flourish at the end.

Gilbert Pollock  
Administrator



## PARKS AND WILDLIFE COMMISSION OF THE NORTHERN TERRITORY

## WILDLIFE DIVISION



1st Floor Gaymark Building  
PO Box 496  
PALMERSTON NT 0831

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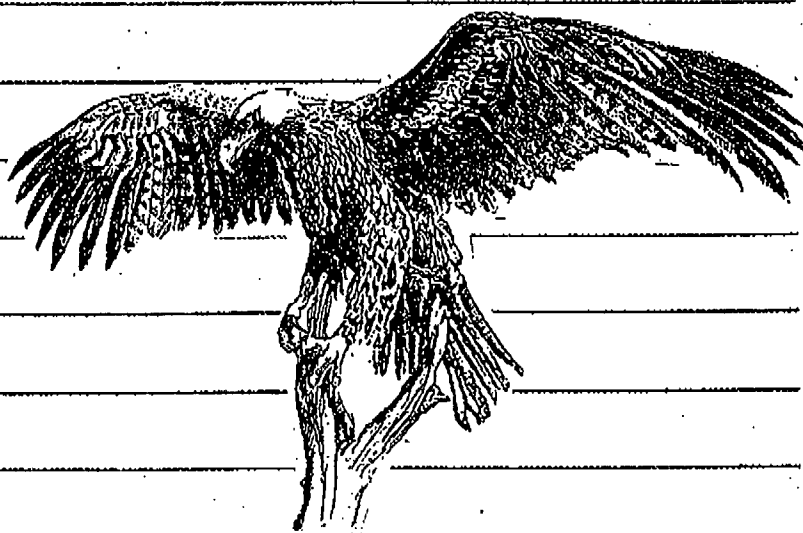
TO: MR GRAHAM GADD FAX N°: 8941 2437

FROM: COLIN WILSON

N° of pages: 7 Date: 30-1-97

MESSAGE: Following is the PWCNT Submission to  
the Sessional Committee on the Environment inquiring  
into Mimosia pigra Management.

*Colin Wilson*



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Northern Territory Government



PARKS & WILDLIFE COMMISSION OF THE NORTHERN TERRITORY  
Wildlife Division, Wildlife Management Unit, PO Box 496, Palmerston NT 0831



28 January 1997

Dr Richard Lim MLA  
Chairman, Sessional Committee on the Environment  
Legislative Assembly of the Northern Territory  
G.P.O. Box 3721  
DARWIN NT 0801

Dear Dr Lim

### *Mimosa pigra* Management

The Parks and Wildlife Commission of the Northern Territory manages a number of important natural areas which are actually or potentially subject to invasion by the exotic noxious weed *Mimosa pigra*. We are therefore pleased to have the opportunity to make a written submission to the Sessional Committee on the Environment for its inquiry into matters relating to the occurrence, spread, future management and impact of *Mimosa pigra* in the Northern Territory.

### The national significance of *Mimosa pigra*

*Mimosa pigra* is considered under the Draft National Weed Strategy as meeting the criteria of a 'weed of national significance'. It is listed in 'Australia: State of the Environment 1996' as one of Australia's worst environmental weeds.

By forming vast, dense thickets on tropical and sub-tropical floodplains, wetlands and river banks, *Mimosa pigra* has direct negative impacts on primary industry, public recreation, tourism, Aboriginal aspirations and environmental values.

A number of nationally and internationally important wetland areas in the Northern Territory are at risk of degradation through invasion by *Mimosa pigra*. Kakadu National Park (Stage 1 and Stage 2) and Gurig National Park are listed under the Ramsar Convention as Wetlands of International Importance. Kakadu National Park is on the World Heritage List, largely due to the exceptional value of its wetland habitats. Arafura Swamp, Kakadu and Gurig National Parks, and parts of the Adelaide, Finnis, Mary and Daly River floodplains are on the Register of the National Estate or on the Interim List. The Adelaide River floodplain system, Arafura Swamp, the Blyth-Cadell floodplain and Boucaut Bay system, the Cobourg Peninsula system, the Daly-Reynolds floodplain-estuary system, the Daly River middle reaches, the Finnis River floodplain and Fog Bay system, the Mary River floodplain system, the Moyle River floodplain and Hyland Bay system, and the Murgarella-Cooper floodplain system are all listed in the Directory of Important Wetlands in Australia.

All of the above wetlands have either existing infestations of *Mimosa pigra* or are facing imminent invasion.

These areas are all within the Northern Territory but, if allowed to spread unimpeded, *Mimosa pigra* could become a serious problem in many other tropical or sub-tropical areas with rainfall exceeding 750 mm per annum.

### **The appropriateness and effectiveness of Government programs**

#### ***Strategic versus Tactical Control***

Territory and Commonwealth mimosa control programs have to date focussed almost exclusively on the tactics of control (choice of herbicides and rates, methods of application etc.) rather than on longer-term strategic considerations. A widely-quoted paper by Michael Moody and Richard Mack ('*Controlling the spread of plant invasions: the importance of nascent foci*' *Journal of Applied Ecology*, 1988: 25, 1009-1021) shows that the best strategy to employ in controlling the spread of a weed species involves a concentration on satellite outbreaks rather than the more usual emphasis on large and conspicuous stands. Much of the effort and funds expended to date on mimosa control has involved visually spectacular, largely ineffective and strategically inconsequential aerial spraying of core infestations, frequently at the downstream end of infested catchments. This has been at the expense of tedious, less rewarding but ultimately far more effective search-and-destroy operations against scattered plants in areas that are so far largely free of mimosa.

An example of the discredited approach is the specially-funded Sampan Creek mimosa control operation, in which hundreds of thousands of dollars have been spent treating a corridor of mimosa along the lower reaches of the Mary River, with mimosa infestations present on either side and upstream. Another has been the Commonwealth-funded Mimosa Control on Aboriginal Lands project near Oenpelli. Many millions of dollars were expended treating the core area of 7,000ha over several years before any systematic search for satellite infestations was contemplated. The eventual systematic search revealed many incipient outbreaks. The delay in discovering them has greatly increased the cost of their control and ensured a further scattering of incipient outbreaks to be discovered.

#### ***Mimosa Control Assistance Scheme***

The Mimosa Control Assistance Scheme (MCAS) has entrenched and codified the emphasis on tactics as against strategy. Subsidies for the control of mimosa have applied for 10 years since 1986-87. For the first 8 seasons a 50% subsidy was available to landholders for the cost of aerial spraying. For the last 2 seasons this scheme expanded to include herbicides applied from the ground, subject to approval by the District Weeds Officer of a submission from the landholder. The MCAS provides no mechanism for ensuring that control actions are coordinated within catchments or persisted with over time. It provides no encouragement or incentive for landholders to integrate other control measures with their chemical control programs. In fact it provides a positive disincentive.

The MCAS has been essentially random in its application. If an individual property manager has had the funds and the inclination to carry out control operations against mimosa and claim the subsidy, then it has been paid, regardless of other activities within the catchment or on any commitment to long-term follow-up work. Some of the recipients of the largest amounts of subsidy funding manage properties at the bottom end of heavily-infested catchments, while upstream properties remain untreated.

The application of the MCAS has created areas of land temporarily free of mimosa infestation at high cost, led to the chronic problem of continued surveillance and herbicide usage for ever to avoid losing the expensive gains made, but has had almost no strategic value in preventing the spread of mimosa or leading to the long-term integrated management of mimosa infestations.

### *Integrated Control*

In spite of numerous references in documents produced by DPIF, CSIRO and the Mimosa Steering Committee that biological control provides the only long-term solution to mimosa control, there has been virtually no serious attempt to even partially integrate biological control with chemical/mechanical control.

Large-scale aerial applications of herbicides to core mimosa infestations leave no room for biological control. Release sites for biological control agents require several years of security from herbicide applications in order to allow the agents time to establish breeding populations, build up in numbers, and begin to spread. If biological control is not fully incorporated into a mimosa catchment management strategy at the start, the herbicide control program must continue until the last mimosa plant has been killed and the last buried seed has risen to the surface and germinated. This is effectively impossible to achieve in most cases, and managers are left with a long-term chronic problem requiring continued expenditure for ever to protect the gains made from previous expenditure.

The experience at Oenpelli should provide valuable lessons. An area of about 7,000 ha of mimosa has been 'controlled' with herbicides, but what do we mean by 'controlled'? Do we mean the continued scouring of the landscape for a reduced, fugitive weed population and expensive applications of herbicides forever just so we don't lose existing gains, or do we aim to eventually stop most input of resources and move on to tackle other problems? If releases of all biological control agents had been incorporated into the Oenpelli Plains strategic plan at the outset, we may soon have reached a stage where most of the resources that are now going into just maintaining existing gains could have been diverted to achieving similar gains elsewhere.

With the potential of biological control to substantially assist in the long-term management of mimosa infestations, it must be fully incorporated at the outset of any strategic management program. This can be done without jeopardising any long-term control operations even if the success of biological control proves disappointing. There is nothing to lose and a very great deal to gain.

### *Efficacy of Herbicides*

There has been consistent overstatement of the efficacy of herbicides in controlling mimosa infestations. The original Public Environment Report (PER) of the Proposal to Control *Mimosa pigra* on Aboriginal Land (April 1991) implied that a single application of Tebuthiuron (Graslan), with a small quantity of other foliar herbicides would suffice to control the infestation. It was claimed that Graslan would lead to a 98% kill of mimosa, Fluroxypyr (Starane) a 90-98% kill and Hexazinone (Velpar) a 98% kill. In reality, the entire area of the Oenpelli infestation has been treated with Graslan on average three times, with large quantities of foliar herbicides also used.

G Schultz and P Barrow claimed (Wetland Research in the Wet-Dry Tropics of Australia, Workshop, Jabiru, 22-24 March 1995, pp 197-199) that all aerial herbicide applications on the Oenpelli plains would be finished at the end of the 1994-95 season. However on 27 October 1995 DPIF requested from the Mimosa Steering Committee a total of \$230,000 for aerial spraying at Oenpelli, and in 1996 a further \$395,000 was requested for the same purpose. In other words, \$625,000 worth of aerial spraying of mimosa has been sought by DPIF after all aerial applications had been listed by their officers as "finished". Approximately 20% of the area still requires aerial application of foliar herbicides, 6 years after the program began. The experience of Park Rangers has also been that effective kill rates in the field for foliar and pelleted herbicides against mimosa are far below those claimed by DPIF Weeds Branch Officers.

A striking example of the failure of facts to get in the way of deeply held beliefs is illustrated in the Annual Report 1995-96 of 'The Control of *Mimosa pigra* on Aboriginal Land' (DPIF, August 1996). According to Appendix 3, one single mimosa plant required a dose of Graslan applied from the ground in 1994, and then aerial applications of both Starane and Velpar herbicides in 1995. In Appendix 4, a single mimosa plant at Murgarella was aerially sprayed with Starane foliar herbicide on 3 consecutive years (1994-96). In Appendix 6, a single clump of mimosa at Mt Borradaile was aerially sprayed with Starane for 8 consecutive years (1989-96 inclusive). In Appendix 5, scattered mimosa plants on a sandbank at Mekinj Valley were treated from the ground annually for 6 years (1990-95 inclusive), 4 times with Velpar and twice with Graslan. At the end of this period the conclusion was reached that "sand does not hold herbicides". Why has it taken 6 years to reach this conclusion and (we can but hope) try another method, unless the DPIF Officers are so habituated to seeing plants surviving repeated herbicide applications that it took 6 years to notice anything unusual?

There has also been a degree of unprofessionalism in the conduct of some herbicide operations as evidenced by the attempts to drive unwashed machinery from mimosa control operations on the Oenpelli plains through Kakadu National Park (Mimosa Steering Committee Minutes, 21/1/92), and the haphazard and illegal disposal of used herbicide drums above ground near Oenpelli and many other instances detailed in the report of G Cook to the Mimosa Steering Committee ('An Assessment of the Program to Control Mimosa on Aboriginal Lands', December 1996, CSIRO unpublished report).

### *Data Collection*

A basic requirement for strategically managing a weed such as mimosa is good data on distribution over time and a clear record of control actions and outcomes. This basic requirement is largely lacking. The oft-quoted figure of 80,000 ha of mimosa in the Northern Territory has been used for about 10 years. It was based on a rough estimation and no data has ever been collected to show whether this figure is accurate, exactly how much mimosa is present or exactly where it is.

A report to the Mimosa Steering Committee on 'Control of Mimosa at Oenpelli. The new GIS and Data Base: Contents and Utility for Program Evaluation' (K Sanford-Readhead, February 1995) highlighted the manifold deficiencies in the available data and the data collection regimes for evaluating control efforts and program efficacy. Information on herbicide applications was missing or difficult to access, mapping was either not carried out or was inadequate, areas treated with herbicide were calculated after the fact by multiplying rates by quantities (thus compounding errors), and the DPIF Noxious Weeds Database was found to have "fallen into disuse". When the extraction of data from the Weeds Database was requested it was found that no programs had been written to produce reports to summarise the data for management, to check the data entered or to support the activities of the Weeds Branch staff.

The report by K Sanford-Readhead made a number of recommendations to improve the acquisition of information essential to assessing the progress of the mimosa control program. Among them was the establishment of a well supported system that stores data in digital form on the distribution of mimosa in the NT, from which information is freely available

### **Future management options**

#### *The Northern Territory Weeds Management Strategy*

The Northern Territory Weeds Management Strategy is a fine document and, if diligently followed and fully funded, will provide a sound basis for long-term management of mimosa. The Strategy has Cabinet endorsement and there is now an obligation to follow its principles, objectives and actions. However, we cannot have brave new words but continue to operate in the same old ways.

There has been some evidence recently with a modified management structure, that the DPIF Weeds Branch may be willing to shift emphasis towards a more strategic approach to weed control. However the change required is profound and far-reaching.

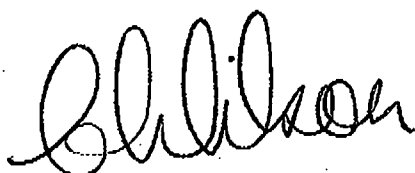
- The whole approach to weed control requires a change from the present concentration on short-term tactics involving large, spectacular assaults on core infestations, to a major re-emphasis on long-term strategy.
- The Mimosa Control Assistance Scheme requires heavy modification to ensure funds are spent wisely and strategically towards long-term management of mimosa infestations within entire catchments and bioregions rather than *ad-hoc* within individual properties.



- It is imperative that all control measures available, including and especially biological control, be fully integrated from the very beginning of any mimosa management operation.
- Continued research is needed into the efficacy, integration and impact of herbicides, biological control agents and other management options.
- There should be active support for a program that develops, maintains and supports the digital acquisition of data on control operations, and a regular assessment of distribution. One data collection and management system with access assured to all stakeholders should be established to avoid duplication of effort and to ensure a strategic approach is maintained across different land tenures. Continuous monitoring of the progress of control operations, of environmental impacts and revegetation is fundamental to a strategic approach.
- Most catchments in the Northern Territory are comprised of a mosaic of pastoral properties, Aboriginal lands and Parks. For effective catchment management to occur, it is essential that past hostilities between the DPIF Chemical Control group, other land managers and Territory and Commonwealth Government agencies be overcome. There must be communication, collaboration and cooperation amongst all stakeholders.
- All mimosa management operations must be carried out to the highest standards of practice and integrity.

These comments are delivered to you in good faith. I look forward to expanding upon the matters raised herein at the Public Meeting before the Committee on Wednesday 5 February at Parliament House, Darwin.

Yours sincerely



COLIN G WILSON  
Senior Weed Management Officer

## MURWANGI COMMUNITY ABORIGINAL CORPORATION

**'Murwangi Station'**  
**Ramingining NT**

**PMB 165**  
**Winnellie**  
**N.T. 0821**

**Phone : (08) 8979 0319**  
**Fax : (08) 8979 0353**

**The Chairman**  
**Sessional Committee on the Envirment**  
**GPO Box 3721**  
**Darwin**  
**N.T. 0801**

Dear Sir

We are situated on the Arafura Swamp. Murwangi Station is a small scale enterprise. Operations including processing cattle, harvesting crocodile eggs and to small extent tourism.. Except for egg harvest we utilise only a small proportion of the wetlands. The Murwangi operation is owned and run by 34 voting members being Murwangi Community Aboriginal Corporation..

As any developing enterprise our budget is limited. Considerable funds sourced from enterprise income are devoted to weed control within paddocked areas, mainly weeds such as hiptus and cidatusus. These funds are yet insufficient to adequately control these weeds, as such we have received some assistance from ATSIC Land Management.

Naturally our most serious concern is Mimosa. As yet no known live mimosa plants exist in our cattle areas. There is one fertile site. The cattle areas both fenced and unfenced account for approximately 30% of the peripheral wetland.

For the first time ATSIC Land Management funded Murwangi in the 1995-96 year to directly act against Mimosa, to the extent of a \$15,000.00 helicopter survey, \$10,000.00 Herbicide and \$25,000.00 wages. Invariably the budget was varied, ie a greater proportion to survey work - \$25,000.00 survey, \$5,000.00 Herbicide as the wetlands is 700 sq Klms, probably the largest in Australia. Survey is of a high cost and extreme priority. During 1996 we discovered two new mimosa sites - isolated from other known sites - these were irrespective of DPI & F discoveries who spent \$45,000.00 in 1995 on helicopter hire for survey alone. In 1997 during egg survey (crocodiles) we discovered two new plants, in a main channel, in a flowering cycle.

At presant due to this support, economic and secondary survey work there is no known live plants in the wetlands, however there now amounts to ten fertile sites. Naturally in the future as our enterprise becomes more successful we will dedicate additional funds to direct Mimosa control. In the interim we are desperately concerned that revelant bodies will not prioritise the eradication of Mimosa from the Arafura Swamp.

This area should be prioritised for the following reasons:

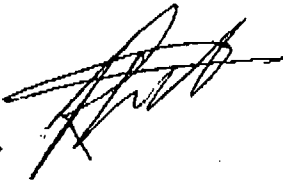
1. The area is at present the most easterly location of the plant.
2. The wetland is heritage, and enterprise will be secondary to to the preservation of the swamp  
- Concentrating more on natural resource utilisation, ie crocodile harvest.
3. Is still in a pristine state.
4. Most importantly to us the people of Ramingining still rely heavily on the wetlands as a source of physical and cultural existance. This can be directly linked to health, paticularly during the dry season when vehicle access improves to the swamp.

5 Unlike financially successful cattle stations with direct access to the live export markets (generally it is understood the best Top End properties are coastal black soil) we do not have adequate self generated funds to deal with the Mimosa threat.

A second point of concern is that more Aboriginal people should be educated on the importance of vehicles traveling from invested areas to clean areas, (All known sites in Arafura, with the exception of one, can be linked to the Mirranajdja Track) the appearance of the plant and reporting it and the benefits of looking for the plant during hunting.

With a reasonable budget we are certain mimosa can be controlled at this point east of the original source, probably the headwaters of the Adelaide River. This an opportunity for serious control and possible eradication. An opportunity that was not taken in 1958 on the Adelaide River.

Joe Wilson  
Manager  
for Murwangi





61 9

# AUSTRALIAN TRUST FOR CONSERVATION VOLUNTEERS

A T C V is a member of the World Conservation Union

Patrons: Sir Rupert Myers, K.B.E., A.O. Janet Holmes à Court, A.O.

30th January, 1997

The Chairman,  
Sessional Committee on the Environment  
GPO Box 3721,  
DARWIN, N.T. 0801

Dear Sir,

Please find attached a submission from the Australian Trust for Conservation Volunteers for the "Future Management of Mimosa Pigra" as called for by advertisement in the N.T. News.

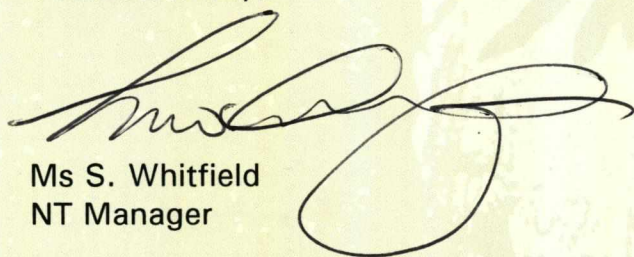
Our submission addresses two of the five terms of reference -  
Appropriateness and effectiveness of Government programmes  
Future management options

A number of recommendations are listed at the end of each of these.

Many of the control programmes presently being undertaken are broadscale in nature and it is our contention that there is also the potential for small-scale, intensive control methods and that these are equally viable methods.

We thank you for the opportunity to make comment and recommendation to your committee.

Yours faithfully,



Ms S. Whitfield  
NT Manager



Submission for  
The Future Management of *Mimosa pigra*

**ATCV as a Component of an Integrated  
Management Strategy**

**Introduction**

The Australian Trust for Conservation Volunteers (ATCV) is a national non-profit, non-political community-based organisation which seeks to assist land managers with practical conservation projects.

Our organisation undertakes projects Australia-wide and has operated in the Northern Territory for the past five years. Projects in the NT include environmental weed control, habitat revegetation and protection, flora and fauna survey and monitoring, tree planting and endangered species protection.

ATCV works with a diverse range of land managers and conservation organisations including private landholders, government authorities, research organisations, landcare groups, mining companies and pastoralists.

We provide equipped and supervised teams of volunteers to help with labour-intensive projects. Our supervisors are skilled personnel who are trained in basic occupational health and safety and environmental repair techniques and are well versed in working in Northern Territory conditions. Each team is fully self-sufficient and has the ability to travel and work in remote areas.

In the Northern Territory we undertake work throughout the year, and normally operate with up to 4 teams per week during the Dry/Winter season. We average 130 project weeks each year and volunteers are circulated amongst a number of projects to maintain their interest and commitment.

As a community-based organisation, ATCV works on a cost-recovery basis for each project that is undertaken. This is charged at a basic rate per day plus kilometres.



## ● Previous ATCV Involvement

ATCV has worked with a number of organisations on *Mimosa pigra* eradication programmes. As part of our charter, we conduct practical environmental protection work for the betterment of the Australian environment. *Mimosa pigra* is a serious environmental weed across the Top End of the Northern Territory, and as a practical conservation group operating in this area we feel a responsibility to assist in weed control.

In 1995, ATCV teams were involved in an experiment trialling the effectiveness of physical removal of *Mimosa* from a billabong near Woolner Station on the Adelaide River system. The *Mimosa* infestation was estimated to be 4-5 years old at this lagoon. Within three weeks, effective physical removal of *Mimosa* from around the billabong had been achieved. Seeds were removed from plants to prevent seed fall during removal. Large trees were pulled out with chains and seedlings were removed by hand pulling.

Upon returning to the lagoon after the 1995-6 wet season, there had been no regrowth at all from the mature plants which had been removed (ref. ATCV report, Eldridge and Tory). Seedling growth had taken place, and seedlings that the team had been unable to remove before the wet season, (no larger than 20cm tall at that stage) had grown into a dense bush up to 3m high, and many were mature enough to have commenced seeding. This indicates the necessity to undertake follow-up work on a regular basis - an activity that would take place as a matter of course as part of an overall management strategy.

A significant result of this trial was the amount of regeneration of native plant species in and around the billabong and the presence of native wildlife in the area, particularly birdlife. This is in direct comparison to an adjacent billabong which had been treated with chemical control methods at the same time as our treatment of the billabong with physical removal methods. The second billabong contained dead *mimosa* plants (with some regrowth) and we saw no indication of native flora or fauna being present within the area.

From this trial we have witnessed that physical removal of mature *Mimosa* plants can be achieved and is feasible. This was achieved in part because the lagoon is situated on higher ground and is not subjected to reinfestation from water runoff over the wet season. Complete removal is an effective control method for *Mimosa* in an integrated control program, which also uses biocontrol agents targeted towards preventing the regrowth.



● ATCV has also been involved in Mimosa control work in conjunction with a number of land managers and government agencies. We have worked on Melaleuca Station, with DPIF and have undertaken revegetation trials with P&WCNT and ERISS. We have the ability to coordinate work programmes which go beyond the boundaries of fences.

## **TERMS OF REFERENCE**

### **Appropriateness and effectiveness of Government programs.**

#### Chemical Methods

Spraying by chemical means has been widely used as a control method by government agencies and others. Chemical application requires a number of years of repeated spraying to achieve a result. Whilst herbicides will initially kill mature growth, regrowth from the root bases and seedbank is rapid. Where herbicide treatment has been used as the only method, the dead stems of mature plants in their dense thicket remain for a number of years after the herbicide application, restricting access to regrowth for additional treatment. These dense thickets prohibit the regeneration of native plant species as well as denying access to animals (both native and introduced). Removal of the dead plants by mechanical blade plough is necessary in order to rehabilitate the land.

It is important that chemical control is used as a part of an overall strategy. Broad-scale chemical application needs to be carried out in conjunction with other control techniques. e.g. aerial spraying followed by the release of a biological agent which would control regrowth. Chemical control may not be the most practical method where mimosa has penetrated the edges of the forest and is not visible or accessible for aerial spraying. It is also not appropriate where it may be detrimental to rare and endangered plant species such as the native palm *Ptychosperma bleeseri*.

Consideration of the residual effects of chemical control is also important, particularly in environmentally sensitive areas.

#### Search and Destroy - Satellite Outbreaks

As noted by Cook & Setterfield (1996), mimosa continues to invade new areas. In addition, density continues to increase in a number of areas. This shows that current methods of control are not working. Cook & Setterfield (1996) argue that the focus for removal methods must be on satellite outbreaks, a method which has been successful within the boundaries of Kakadu National Park. Consistent physical removal of satellite outbreaks and follow-up for periods of up to 7 years has enabled park managers to control the mimosa on the park, however, this does not



address the problem of the core infestation providing the seed source from which the satellites are originating.

### Biological Control

Where biological control agents are used in an overall management strategy there is potential to undertake an effective control programme. One important aspect of utilising biological control agents is the requirement to release these agents in the field. A significant number of releases at key times exponentially increases the effectiveness of the agent. Departments and agencies would be better able to trial these agents if they had access to a labour resource such as ATCV and the release co-ordinated with other control methods.

### Total Catchment Planning

Mimosa control programs must address the issue of total catchment planning. Total catchment planning means looking at the catchment as a whole system, rather than as packages of land with different managers and owners. Total catchment planning must cross land tenure boundaries, involving cooperation between different agencies and land managers.

A number of government and non-government organisations have been involved in eradication programmes. Whilst many of the programs have had some success, the overall spread of *Mimosa pigra* throughout the Territory continues and the large infestations on which large sums of money are spent most often remain, and require repeated follow-up.

### Recommendations

1. That consideration be given to undertaking control measures on a catchment basis. Seed is predominantly dispersed by water flow from a catchment area to areas of floodouts at the bottom of the catchment. It would seem feasible therefore, to attempt control first from the top of a catchment where threat of continual reinfestation on an annual basis would be lessened, and also reduce the amount of seed stock moving down the catchment.
2. That a strategic plan be developed which places into context the efforts of each agency or land manager or control method, and is able to determine and allow for opportunities where neighbours or catchments or control methods could work together.
3. That the present chemical control programmes be reappraised with the aim of integrating this method with other control measures.
4. That the Standing Committee support the initiative of water monitoring programmes to ascertain the residual chemical levels in areas which have been treated by the chemical control method.
5. That the Committee recognise the importance of follow-up and monitoring as an integral part of all programmes and strategies.



## ● Future management options

### ATCV's role In An Integrated Control Strategy

An integrated systematic control campaign combined with sustained follow-up and reintroduction of native flora can be achieved. Many trial methods have been refined over the last decade, to the point where it can be seen that a combination of control methods (previously trialled independently) may in fact be the most effective method of controlling Mimosa, especially in environmentally sensitive areas.

ATCV's contribution to the success of these strategies will be the provision of volunteers to undertake the labour-intensive component of some programmes where the work can be undertaken in a cost-effective manner in environmentally sensitive or strategically important areas.

#### Physical Removal

ATCV has participated in this activity on a number of occasions. Volunteers undertake hand-pulling of seed and cutting of seedpods. This reduces the amount of seed stock available for regeneration. The mature plants are either cut at the base just above ground level, or pulled out by chain, and the top of the plant is removed. The plants are destroyed by burning and/or biological control.

#### Biological Control

ATCV volunteers can be utilised to undertake release of biological control agents and participate in regular monitoring of the release sites.

#### Revegetation Techniques

ATCV has also assisted with trial planting of native vegetation in areas where Mimosa has been removed. More work is required to ascertain which species are most viable and the most appropriate time for replanting.

In conjunction with the appropriate agencies, teams would be able to assist with seed collection, transplanting of native species, establishing and maintaining trial plots, and monitoring of these areas.

#### Preventative Measures

There is also a role for ATCV to assist in some preventative programmes. Mimosa seed can be dispersed by man and animals - adhering to fur, clothing or vehicles. Preventative measures to be undertaken could include:-

- temporarily fencing out stock and feral animals from badly infested areas to prevent further spreading while control measures are introduced,
- establishing and running vehicle wash down facilities in known traffic areas through large infestations,



- quarantining locations where biocontrol agents have been released in order to monitor these areas.

#### Community Education Programmes

ATCV is in a unique position to encourage community participation and thus raise awareness of the general community. Our local volunteers could also be involved in public education programmes which alert others to the dangers of the spread of mimosa via animals and vehicles and to disseminate information in relation to the latest programmes and developments.

#### Monitoring Programmes

Assisting with monitoring programmes is a regular activity for ATCV. Water monitoring, regular monitoring of biological control release sites, follow-up control/monitoring of physical removal sites and other science/research projects are all achievable using ATCV resources.

#### Recommendations:

1. That the committee consider that there are many control options for Mimosa but the way for the future is to integrate control methods to gain a synergistic effect (for example - physical removal methods followed by dispersal of biocontrol agents continual follow-up and revegetation with native species is more effective than any single effort).
2. That the Committee recognise the benefits of small-scale, intensive control methods and accept that these are equally viable methods as the broad-scale methods presently undertaken for control and eradication .
3. That there is a role for preventative programmes and community liaison and involvement.
4. That ATCV's existing and potential contribution be accepted as a viable option for cost effective control programmes in environmentally sensitive and strategically important areas.

#### Summary

The Sessional Committee has called for submissions which will enable them to develop strategies for reduction of *Mimosa pigra*. A major component of these strategies will be the co-operation of scientists, practionists and organisations, each with their own particular expertise.

#### Benefits of ATCV to Mimosa control

- \* resources to undertake labour-intensive mimosa control activities
  - . fully experienced team leaders
  - . committed conservation volunteers
  - . administrative back-up support
  - . ability to work in remote areas
  - . fully-self sufficient teams with four-wheel drive vehicle



- \* expertise in all aspects of physical removal of mimosa
- \* capacity to eradicate isolated small patches and riparian corridors
- \* cost-effective control
- \* availability to undertake follow up work in terms of location and time
- \* proven track record to undertake work of this nature
- \* able to liaise effectively with all land managers
- \* ability to work in all facets of the community to encourage participation and raise awareness.

**References:**

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CSIRO

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29 January 1997

Richard Lim, MLA  
Chairman  
Sessional Committee on the Environment

Dear Mr Lim,

***Mimosa pigra* Management**

CSIRO has had a long collaboration with the Northern Territory Government in research directed towards the management of *Mimosa pigra*. Therefore we welcome this opportunity to make a submission to the Sessional Committee on the Environment. We also welcome any questions when we meet with the Sessional Committee in early February.

Sincerely,

A handwritten signature in cursive script that reads "Garry Cook".

Garry Cook

and

Wendy Forno  
CSIRO Entomology  
Private Bag No. 3  
Inooroopilly Q 4068



**CSIRO Submission**  
**to the**  
**Northern Territory Government**  
**Sessional Committee on the**  
**Environment**

**regarding *Mimosa pigra* management**

## The Territory and national significance of *Mimosa pigra*

Mimosa is a threat to biological diversity because it is a weed of natural ecosystems. Its potential range extends from Broome in Western Australia to northern New South Wales. Over this range, mimosa threatens natural wetland, riparian and rainforest ecosystems, Aboriginal land use, the sustainability of pastoral enterprises, tourism, fisheries and commercial wildlife harvest. In Queensland and northern New South Wales, mimosa could invade and devastate pastoral and cropping industries escalating costs of production. In the Wet Tropics, mimosa could also become a weed of rainforest margins particularly where they boarder pastoral and crop holdings.

In the Territory, 80 000 hectares are infested with mimosa and a further one million hectares of wetlands are susceptible to invasion by mimosa. At its western and eastern extremities, it is a major threat to the Victoria and Ord River systems and to Aboriginal culture and biodiversity throughout Arnhem Land.

## Regional and catchment differences

At present, most infestations occur on the floodplains of the Adelaide, Mary, Finniss, Daly, Moyle, Reynolds and East Alligator rivers in the Top End. Most of these floodplains have been heavily damaged by feral water buffalo in the past. The development of large stands of mimosa can therefore be seen as a local manifestation of the widespread phenomenon of woody weed invasion of overgrazed rangelands.

On some river systems e.g Adelaide, Mary, East Alligator, mimosa has replaced floodplain native grasses (eg *Oryza rufipogon*, *Leersia hexandra*, *Pseudoraphis spinescens*), sedgeland ( *Eleocharis dulcis*, *Fimbristylis* spp.) and swamp paperbark woodlands (*Melaleuca viridiflora*, *M. argentea*, *M. nervosa*). On others (e.g. Daly), mimosa has invaded woodlands dominated by such species as *Excoecaria parvifolia* (Gutta Percha), *Cathormium unbellatum*, *Nauclea orientalis* (Leichardt tree) and *Melaleuca* spp. (Paperbarks). In time it could outcompete some of the native shrubby species and prevent recruitment of the trees.

Despite regional and catchment differences, the one thing in common to all mimosa habitats is year round water supply; whether this be from flooding or high water tables. Mimosa has the capacity to grow in a wide range of habitats (eg floodplains, riparian areas of rivers, small tributaries and lakes, monsoon vine forests, melaleuca woodlands, billabongs). In South-east Asia it colonises disturbed areas away from wetlands (eg roadside ditches, spoil dumps), and is a major weed of rice-paddies and other irrigated cropping systems. This has not occurred to any major extent in Australia. Preventative measures will be critical to ensuring that mimosa does not become a weed in these situations.



## **Responsibilities of land owners, land managers and Government**

The tolerance level of mimosa should be established by land holders, land managers and traditional land owners before management strategies are implemented. It is not possible to eradicate mimosa from the entire area infested though it maybe possible to eradicate satellite infestations or single isolated plants on an invasive front.

The control of large infestations is the primary responsibility of land owners who stand to benefit most from the control efforts. The techniques to control large stands need continued development and Government should support that through research in collaboration with land owners. Research needs to be directed towards integrating all potential control methods and sound land management practices to achieve low-input long-term control. Very occasionally, government may find it necessary to recommend that an area be quarantined to prevent spread of mimosa.

## **The appropriateness and effectiveness of Government programs**

Substantial Federal and Territory funding has been put to controlling and stopping the spread of mimosa in the NT, particularly over the past 6 years.

### ***Biological Control***

The Federal and Territory governments have supported the implementation of biological control for 16 years and during the past 6 years the Federal government has boosted funding for this control strategy. The program is on target with 10 agents established, a further 6-8 under study and the agents are causing visible signs of reduction in plant growth and reproduction. The collective damage from the final suite of agents is expected to increase over the medium term (5-10 years). The continuation of the biological control program is contingent on Federal and Territory funding in 1997 and beyond.

The state of the research and implementation projects are such that research can commence on how to integrate this control option with other control strategies. The development of successful integrated control will be crucial to reducing the current high cost of mimosa control when chemical and mechanical means are used alone.

### ***The Program to control Mimosa pigra on Aboriginal lands in the NT by chemical and mechanical methods (1991-1996)***

Over the period 1991 to 1996, this program has focused mainly on the large stand of mimosa at Oenpelli in western Arnhem Land. CSIRO has been responsible for monitoring the effectiveness and efficiency of the program during that period, and recently completed an assessment of the last 5 years of the program.

The Oenpelli infestation doubled in area every one and a half years during the 1980s reaching about 7000 ha by 1991. Large-scale chemical and mechanical control of this infestation commenced in 1988. To date, the initial and follow-up control has cost a conservative \$750 to \$1000 per hectare. Control has allowed native vegetation and waterbirds to return to much of

area, and the plain has become useful again for Aboriginal hunting. However, the introduced grass, Para Grass is invading some areas and if its spread continues will be as deleterious as mimosa for native fauna and Aboriginal traditional use.

The Oenpelli experience has given two main lessons for other projects.

- The potential for rapid expansion of infestations illustrates the need to act quickly when new infestations are found. The net benefits are probably much greater from searching for and controlling small outbreaks in otherwise uninfested areas rather than from attempting to control very large infestations.
- The substantial requirement for ongoing control on a decadal time-scale makes it highly questionable whether it is cost-effective to rely on chemical and mechanical methods alone to control large outbreaks. The aim for the future should be the integration of different control options and sound land management practices to ensure low-input, sustained control of mimosa across large areas.

### ***Kakadu National Park***

The vigilant procedures adopted in Kakadu National Park have successfully kept the park free of mimosa while surrounding wetlands have developed large stands. The success of this 'search and destroy' program has shown what can be done given resources and commitment.

### ***Mary River Reserves***

The NT Parks and Wildlife Commission has adopted similar procedures to those in Kakadu in some of its reserves on the Mary River (e.g. The Flora Reserve). Mimosa patches have been visited and treated regularly for at least 5 years from air-boats, quad-bikes or vehicles. This has kept the natural vegetation intact and has prevented vast stands of mimosa from establishing, such as those that have developed further upstream.

### ***Brucellosis and Tuberculosis Eradication Campaign***

The eradication of feral water buffalo under the Government Brucellosis and Tuberculosis Eradication Campaign appears to have allowed natural vegetation of the wetlands to recover and has slowed the expansion of mimosa. There is increasing evidence that natural vegetation can inhibit the spread of mimosa. The increase in live cattle exports from Darwin may increase grazing pressure on the floodplains from agistment and breeding operations while the possible development of a disease-free buffalo industry could increase the rate of expansion of mimosa. Multiple use of NT wetlands in a way that has minimal impact on its biodiversity may require a commitment from stakeholders to accept some constraints on individual goals. Management of stock and feral animals will be an important tool in long-term control of mimosa.

### ***Subsidised control***

The NT Department of Primary Industry and Fisheries advise land-owners about the best methods for controlling mimosa. The overwhelming emphasis has been on chemical control through the subsidies scheme. Nevertheless, DPIF have supported biological control as being the best long term cost-effective method but this option needs greater marketing to land holders for it to be adopted.

## **Future management options**

### ***Prevention***

Preventing mimosa from establishing and spreading is critical. Prevention can avoid serious ecological and economic damage and negate the need for costly control programs. This will require an active program to search for and control satellite outbreaks of mimosa at the extremes of its distribution. These outbreaks will range in size from single plants to small hectare-scale stands. At present, follow-up control of satellite outbreaks will be required for at least a decade. This is a separate issue from the control of large stands.

Better use needs to be made of preventative measures to stop mimosa from establishing. These will include vehicle wash down facilities; control of feral animal vectors; quarantining infestations which have a high risk of transmitting seeds to new areas.

### ***Control Options***

#### ***Biological Control***

Biological control has a major role to play in the future management of mimosa. Most of the research needed to apply this method has been completed by CSIRO Entomology and NT DPIF over the last 16 years. There are now 10 introduced biological control agents attacking mimosa in the NT. Several of these have only been released in recent years (1994-96) and a new agent is due this wet season. A final suite of 6-8 agents are being studied in quarantine facilities in Brisbane and in Mexico, and if specific would be released over the next 5 years. The program is therefore at the exciting stage of 'starting to take effect'. The damage inflicted by recent and new biological control agents is forecast to increase. A new weevil due in March-97, that damages young mimosa seeds will complement a weevil being currently released that damages mature mimosa seeds. Other recent releases (1995-96) include two defoliating pathogens, which function in the wet season and dry season, respectively. Large scale aerial release of one of the pathogens is been tested. The security of all biological release sites is paramount to the success of biological control. More specific information about Biological Control can be obtained from CSIRO Entomology (Dr Wendy Forno, tel: 07 3214 2853; Dr Naomi Rea, tel: 08 8944 8418).

#### ***Chemical and Mechanical Control and Fire***

Herbicides are the primary control method applied to mimosa in the NT. Large scale aerial applications account for most herbicide use. Until 1996, the subsidy scheme favoured aerial control with the NT Government providing a 50% rebate. However, follow-up ground control is essential if aerial programs are to succeed. For example, the overall cost of aerial control of mimosa on the Oenpelli floodplain (1988-96) was between \$750 - \$1000 per hectare, with ongoing expenditure still required.

Herbicide control is often followed by burning, and mechanical ripping, rolling, chaining or chopping. There are strong indications that mechanical control and fire alone can give similar levels of control to that provided by herbicides, but at a lower cost. Future research needs to focus on the use of mechanical treatments and fire for controlling mimosa as a low-cost alternative to herbicides, and as part of integrated control.

### **Ecological Control**

Increasing anecdotal evidence suggests that native vegetation can inhibit the establishment and spread of mimosa. Research is needed to confirm or refute the role of healthy stands of native plants in preventing mimosa from establishing. The return of competitive native species that are resilient to invasion is a critical component of a weed management strategy. If mimosa control is to succeed, then strategies for revegetation need careful consideration. Regardless of the method of control, care is needed to encourage desirable replacement species, and preventing other weeds from invading. Replacing mimosa with ponded pasture grasses,, could exacerbate the ecological problems that already face NT floodplains. A revegetation strategy requires further study, to capitalise on depletion of mimosa on the floodplains. Such grasses may have considerable off-site effects through their spread into other areas, and through their impact on mobile fauna such as Magpie Geese that require suitable habitats across many river systems to survive. A revegetation strategy requires further study, to capitalise on depletion of mimosa on the floodplains.

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use  
Pana grass

## **Recommendations**

We recommend that:

The collaborative program between CSIRO and NT DPIF to complete the introduction and establishment of biological control agents for mimosa be supported;

Integrated control techniques and sound land management practices be developed with the aim of providing low-input ongoing control of mimosa in those areas that presently have large infestations. Research is needed to show that the control methods are not causing deleterious environmental impacts;

The spread of mimosa be prevented through support for dedicated programs to search for and eradicate new, small outbreaks of mimosa in otherwise uninfested areas;

A coordinated mimosa control strategy be developed by representatives of land owners and Government research and management agencies with an interest in mimosa.

**CSIRO has had a long history of research in wetlands and mimosa control in the Northern Territory. CSIRO looks forward to continuing its fruitful collaboration with the Northern Territory and Commonwealth Government Departments, the land owners and their representatives.**





# TIPPERARY GROUP OF STATIONS

NORTHERN DIVISION

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## Facsimile

To:	The Chairman	From:	Ned McCord
Fax:	(08) 89412437	Pages:	3
Tel:	(08) 89461424	Date:	29 January, 97
Re:	Sessional Committee on the Environment CC:		

### Submission -

Future Management of Mimosa Pigra

Regards

Ned McCord

• If you did not receive all pages, please call (08) 89

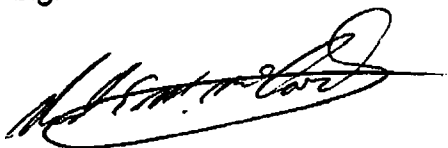
29 January 1997

**Recommendations**

That the NT Government agrees to: -

- Continue its support of MCAS subsidies at no less than 50% for the use of approved chemicals and methods of application.
- MCAS subsidies including the cost of land preparation and chemical application by approved methods of ground control eg the operational costs of the ground application of chemicals and the operational costs of land preparation.
- Introduce a policy that all aerial spraying aircraft are fitted with Global Positioning System Measuring Units eg GPS Flying Flagman. This will enable accurate spraying of Mimosa and an up to date map to be obtained.
- The introduction of best management practices to improve the effectiveness of spraying and reduce costs.
- A 5-year management and funding program after consultation with landowners and Government.
- Increased funding for research into Biological Control methods.
- Education Programs on Mimosa Control in Aboriginal Areas to increase awareness of the existing problem so that Aboriginal communities can commence their own control programs.

Signed



Ned E. M. McCord  
General Manager

22 January 1997

The Chairman  
Sessional Committee on the Environment  
GPO Box 3721  
Darwin NT 0801.

The Chairman

Re **Future Management of Mimosa pigra**

Following the call for written submissions advertised in the Northern Territory News 19 October 1996. I have included the following information for your consideration. I have been supervising and developing programs for both private and government landholders for the last 15 years. The largest project was at Oenpelli where we controlled over 8,000 ha of mimosa over a 7 year program. A similar program is being implemented on Melaleuca station in the Mary River system and at Elizabeth Downs on the lower Daly River. We were able to show you aspects of this work on 1 November 1996. The need for assistance by landholders in controlling mimosa can be demonstrated by the increase in Mimosa Control Assistance Subsidy since 1994/95. That the Mary River is largely clear of this weed upstream of Shady Camp is due to our efforts in conjunction with landholders.

**1. The national significance of Mimosa pigra**

Mimosa pigra is only known to occur in the Top End of the Northern Territory of Australia. Large areas within mimosa's current range could become infested if programs carried out by many agencies are not maintained. Mimosa only covers approx 80,000 ha but it is the capacity of this plant to out compete other species that makes it such a dangerous introduction to Australia. Of equal importance is the fact that mimosa is not known to occur on the Victoria River, much of Arnhem Land, Gulf rivers or on most of the offshore Islands.

This plant has the capacity to occupy many other areas. This includes being a nuisance weed of much of coastal Queensland and a serious weed in the headwaters of streams flowing inland from the Great Dividing Range or in the Gulf country. Much of north Western Australia is not suitable for mimosa but the Ord and Fitzroy Rivers are considered to be suitable mimosa habitat.

In size mimosa is only a minor weed of Australia. Plants like Rubber Vine, Prickly Acacia and Parthenium in Queensland cover millions of hectares. Mimosa is still at a size where it could be reduced to a minor plant provided there is a long term commitment. The Northern Territory could achieve a major environmental cue of world significance if this was undertaken.

## **2. Regional and catchment differences**

The current area infested with mimosa can be considered as a single region. On a catchment basis large variations occur in how an approach should be made to the control of this weed. This variation also occurs within catchments. In some cases this variation reaches down to individual plants. How this occurs takes many years of experience to learn but I will give several examples to demonstrate this point.

### **Example 1. Mimosa in Arnhem Land.**

Mimosa in this area at present occurs as isolated plants and clumps on the Oenpelli floodplain to single plants in the Arafura Swamp. Aboriginal people see mimosa as a "white man" weed and want it removed. They also like working on mimosa and see that employment and training opportunities exist. With this in mind, the aim should be to eradicate mimosa from all catchments of Arnhem Land over the next 20 years. Weed control is an ideal way to reach these communities and allows other programs to be introduced.

### **Example 2. Mimosa in Kakadu National Park.**

Mimosa does not belong in this important area so long term eradication must be the aim of any program.

### **Example 3. Mimosa on the Mary River.**

The Mary River floodplain system covers 127,600 ha. Mimosa probably occupies only 10,000 ha of this. Eradication is possible for upstream of the Arnhem highway bridge and continuation of control maintained downstream. Properties like Marrakai, Opium Creek, Annaburroo and Swim Creek have reduced mimosa to a level where pastoral production can be maintained. There is a need for control options like biological to keep mimosa to this level of infestation without large costs to the landholder. Melaleuca Station has the last major infestation of mimosa within the Mary River catchment. Here a difference in the catchment becomes apparent. Mimosa in 1991 was a dense monoculture covering over 7,000 ha. In 1996 this has been reduced to below 5,000 ha. Weed's Branch DPIF undertook the difficult area along the banks of the river and the station the fringing melaleuca swamps. Different



techniques applied in each case and also complimented the total program. Salt water intrusion is both a help and hindrance in controlling mimosa in the lower Mary River. Salt has stopped the expansion of mimosa further downstream but also makes access difficult for surveys. There is 600 ha of mimosa still to be treated on the western side of the river system. This seed source will allow mimosa to invade any area with reduced salt levels.

#### Example 4. Mimosa on the Daly River Port Keats Land Trust.

This area can be considered similar to Arnhem Land. The largest known infestation is only 600 ha but many small infestations are scattered over several floodplains. The total area under mimosa is 4,500 ha threatening 140,000 ha of country. There are 13 communities in the area who also would like the employment opportunities that mimosa can generate. Provided assistance is given to communities post BTEC, eradication of mimosa is possible on the Moyle, Little Moyle systems and control achieved in other areas. This then gives an increased buffer zone to other areas in the west like the Victoria and Ord systems.

#### Example 5. Mimosa on the Adelaide River.

I considered mimosa pre 1994 to be too difficult to control on much of the Adelaide River catchment. In 1997 this does not apply. The live cattle trade has made much of this land too valuable to leave under mimosa. Integrated control is possible in open areas with biological control being used along the actual river. The first section to be controlled should be from the Tortilla Road to the Adelaide River township. Mt Kepler, Tortilla Produce and Wamar Farm cut across the catchment and all have active control programs. A new Landcare group at Adelaide River township should be encouraged to participate in this program.

#### Example 6 Mimosa in the Darwin Rural.

Mimosa exists within the Darwin area. Care needs to be taken in how these plants are to be removed and or controlled. Many herbicides are not suitable and others used with care. The long term use of the area is also a consideration as other trees may need to be planted in the place of mimosa or even the soil moved to a different site. Considerable environmental benefit would be obtained if mimosa was controlled in this area. The Commonwealth Government initiative "Green Corps" could be used in such a program.

### **3. Responsibility of land owners and managers**

It is recognised that weed control is the responsibility of all land holders. Where these landholders are gaining a living from the land some input from them can be expected in controlling mimosa. The difficulty arises where the cost of control is greater than the value or possible returns to be achieved from that piece of land. In most cases pastoral land holders are spending as much as they can afford on mimosa control as a part of overall land management. It must be remembered that the Mimosa Control Assistance Scheme supports 50% of what the property can afford not 50% of the actual mimosa on the property.

Aboriginal land is more difficult. They do not have the financial resources to control mimosa but often are happy to be trained and employed in mimosa control. They also control the upper catchments in areas like Elizabeth Downs. The Tipperary group is spending more on mimosa control than Elizabeth Downs returns but is being recontaminated each year from Aboriginal land. It is doubtful that Northern Territory legislation could be applied to force the control of weeds in these Aboriginal areas.

Crown land can be the most difficult to control of all. River banks need special care or an area of mimosa may revert to the crown because the cost of control is too high for private individuals. Crown land if not controlled can act as a source of contamination to other areas. Parks and Wildlife have an active and successful control program on several areas in the Mary River area. The Marrakai hunting reserve is only partly treated. Transport and Works and Power and Water Authority also treat their areas with the assistance of Weeds Branch DPIF. Other crown areas are not treated at all.

### **4. The appropriateness and effectiveness of Government Programs.**

The Northern Territory is unique in that it covers 1/6 of the land mass of Australia but has only 180,000 people. This has meant that Government programs need to have a large component of hands on control. We have been the envy of weeds' officers in Queensland because we have in the past had this capacity. The key to the control of mimosa is to find that isolated plant or small area missed by other control methods and treat it on the ground. Land holders find it difficult to allocate resources to this aspect as the mimosa may be growing in an area they are not using or only visit once a year. For example, It was the efforts of a DPIF weeds team that has kept Corroboree billabong free of mimosa. Resources for these field teams have been reduced to a level so that isolated plants are now appearing around the billabong and within 5 years Corroboree billabong will be lost to mimosa unless this program is reinstated.

It has been easier to get resources for major projects like Oenpelli and Sampan Creek than continue in the control of mimosa in key areas. In some cases these major projects have been at the expense of other areas.

The Mimosa Control Assistance Scheme has been a major support in controlling larger areas of mimosa. It has allowed for more mimosa to be controlled than landholders could otherwise afford. This is particularly true in the years post BTEC and before the live cattle trade developed. As most properties are still developing property infrastructure the scheme needs to continue. The scheme only covers 50% of the cost of approved herbicides and their aerial application. Most landholders also use other methods of control and so are spending much more than that supported by the scheme. Technical support is generally given in planning programs and helicopter operation but resources for this have not kept pace with demand. This support is necessary as control needs to be kept on the expenditure of public funds and where application rates are in grams per hectare. In my experience, station staff are not suited in maintaining this program.

Weeds Branch DPIF also had a key area approach where areas that threatened a larger area were treated at Government cost. This program has almost stopped due to lack of resources.

As stated on your field inspection on 1 November 1996 there are few surprises in mimosa control except for the use and integration of biological control agents. Research and experience have been developed into the use and fate of herbicides, application techniques, off target damage, mechanical clearing, burning, and revegetation in a range of catchments and situations. Research into the use of biological control options needs to continue with particular reference in how this fits into current and future land use. No research is currently being carried out into other weeds that may develop into a mimosa of the future.

The current legislative power of the Noxious Weeds Act 1 April 1980 has many shortcomings. Many of these will be corrected by the new draft Weeds Management Act 1996. The problem still remains that if the Act is enforced, funds come out of existing programs and if recovered are taken back into consolidated revenue.

## **5. Future management options**

The most important future option is to maintain existing programs. These programs have stood the test of time and the group undertaking the work over 60 man year's experience. At present there is a danger this experience is being lost. Funds for Survey Control and Extension have decreased from \$250,000 to \$120,000 in the last few years. It is this fund that supports the Darwin integrated control group's program on all weeds including mimosa. Some top up funds are found each year but the trend on actual control has always been

downwards. This is despite assurances that more money is to be spent on weed control.

Weed Control requires staff willing and allowed to actually go into the field and control weeds like mimosa. For many years this was allowed and actually encouraged. Many areas have minimal mimosa due to this attitude. This program is steadily being reduced even though the reason of large areas, limited population and inexperienced land holders still applies. I have spent considerable time thinking why this reduction has occurred. It would appear that DPIF is undergoing a cultural change which does not include the dirty difficult job of controlling weeds like mimosa.

Therefore I would propose the committee considers this and the following as a possible option.

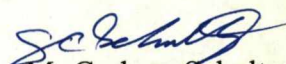
1. Recommend that Weeds Branch be taken out of DPIF and included into the Northern Territory Bush Fire Council with Feral animals also under its umbrella. This new organisation BWFC (Bushfires, Weeds, Feral Animal Commission) would be a uniquely Territorian organisation that could fit the needs of the community.

There are several advantages in this approach.

- Field Staff of both organisations have a common work ethic of handling difficult situations.
  - The BFC network of radios, community groups and equipment would allow weed programs to be better included into communities.
  - A council would allow weed control programs to recover a percentage of costs.
  - Weeds staff in some cases are already trained as Bush Fire personnel and the reverse could apply
  - Weeds Branch has considerable equipment and personnel throughout the NT which would support both groups
  - The need for Weed Management Plans, Weed Advisory Committees could fit with the current Bush Fire Plans and Committees
  - Research into many aspects of mimosa control needs to fit into other management aspects of rangelands such as the use of fire.
  - Amalgamation would increase the available coverage to all areas including Aboriginal lands.
  - Stop duplication of resources for staff.
  - Make mimosa control more accountable to landholders
2. Recommend that resources for Weeds Management Plans be allocated. These plans would be similar to the BTEC approach and run for 3-5 years.



3. Recommend that the Mimosa Control Assistance Scheme be continued and strengthened under Weed Management Plans.
4. Recommend that Survey Control and Extension budget be returned to its level of previous years of \$250,000.
5. Recommend that Biological control programs be strengthened and a NTG Officer review the introduction of agents from Mexico to Qld to the NT.
6. Recommend that extra funds be allocated starting in 1997-98 for control of mimosa in the following key areas.
  - Next to the Salt Water intrusion area on the Mary River. \$60,000 per year for 5 years.
  - Continuation of Sampan Creek project from 1998-2002 to achieve complete control on Melaleuca Station. \$100,000 per year.
  - Adelaide River township to Tortilla Road. \$30,000 per year for 5 years.
  - Control of mimosa along the Daly River from Stray Creek to the mouth, including the aboriginal land near Elizabeth Downs and Litchfield Stations. \$50,000 per year for 5 years
7. Recommend that the Sessional Committee meet in 2001 and review the completion of the Biological control introduction program and progress in controlling this weed.

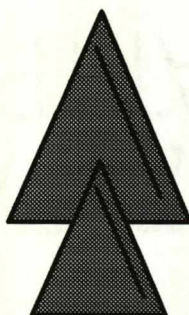
  
Mr Graham Schultz

26 Copperfield Cres  
Anula NT 0812

**Aplex Pty Ltd**  
(ACN 077 035 940)

c/o Tony Metcalf  
9 Corconda St  
Clearview, SA 5085

ph/fax (08) 8262 4384



**Promoters:**

Tony Metcalf (CEO)  
John Fielke  
Yuri Obst  
Corinne Turner  
Barry Wright

The Chairman  
Sessional Committee on the Environment  
GPO Box 3721  
Darwin NT 0801

25.1.97

Dear Sir,

*Aplex Pty Ltd* (ACN 077 035 940), is a company that was formed as a result of the South Australian Enterprise Workshop course to promote new business ventures. This group won the Australian National Enterprise Institute's AusIndustry Award for best overall business plan in 1996. It also won the Engineering Employers Association SA Award in 1996.

A feature of this company is its multidisciplinary directors who will ensure the success of the project. Their professional skills cover the fields of chemical and mechanical engineering, finance and marketing.

In addition, the company is contractually aligned with the University of South Australia to carry out a comprehensive Research and Development programme to commercialization.

*Aplex* aims to :

- harvest the noxious weed *Mimosa Pigra* which is growing rampant in the Northern Territory
- extract vegetable tannins from the *Mimosa Pigra*
- market these tannins on the domestic and international markets

**MISSION**

To produce high quality, price competitive tannins from Australian plants for the Australian and International leather tanning and wood product industries and to develop associated by-products for the industrial chemical and cellulose fibre markets.



## **VISION**

To create a profitable Australian business by utilising a noxious weed in the Northern Territory and in doing so make a contribution to preserving and enhancing our environment.

## **OBJECTIVES**

The key objectives are :

- to produce a range of high quality tannin products for use by leather and wood product manufacturers
- to assist in creating profitable and environmentally friendly leather tanning and reconstituted wood product industries utilising vegetable tannins
- after successful implementation of the tannin extraction operation, develop and produce a range of high quality chemical by-products.

## **MARKET**

As there is no commercial production of vegetable tannin extract within Australia, *Aplex* will gain a strong position in the Australian market by providing a reliable service and a consistent product while progressively developing export sales.

In Australia the total market for vegetable tannin extracts was \$9,291,000 (Source: Dept of Foreign Affairs & Trade - United Nations Imports for 1994 calendar year) or, about 6 million kilograms. Our market research verified this figure and showed this level of importing was maintained for 1995.

The total international trade for vegetable tannins between United Nations countries for 1994 was \$207,158,000 (DFAT, 1994)

## **OPERATIONS**

The strategy is to operate a tannin extraction facility on-site with the Mimosa infestation. The most suitable land within the site will be selected for harvest and processing. Importantly, the harvested Mimosa will be processed daily so that its quality is not compromised by oxidation.

The harvesting and processing of the Mimosa is a proven, simple operation. While existing technology will be used initially, *Aplex* will undertake a research and development programme to improve the equipment and processing requirements.

As sales increase, the production process will be expanded to meet the demand, thus minimising the initial capital investment.

## **RESOURCE**

The 80,000 hectares of Mimosa Pigra growing in the Northern Territory is the *world's single largest resource of vegetable tannin*.

Our estimate of the commercial value of this resource (excluding regeneration) is in excess of \$90 million.



## **BENEFITS TO THE NORTHERN TERRITORY**

The utilising of the noxious weed , Mimosa Pigra to produce vegetable tannin will be a new Australian industry which will turn an environmental disaster into a profit making venture.

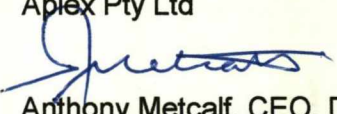
As it is a new industry, *Aplex* will be amenable to a joint venture with the Northern Territory Government or landholder groups in this commercial development.

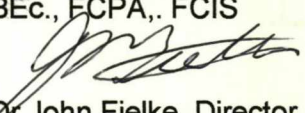
We see the commercial use of Mimosa Pigra being compatible with the current control strategies.

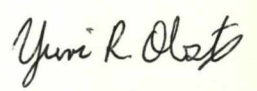
Our planned commercialisation by way of joint venture could provide income in excess of \$600,000pa to assist in the control of the spread and its eradication.

We look forward to the upcoming meeting on February 4th.

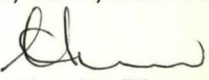
Yours faithfully,  
*Aplex Pty Ltd*

  
Anthony Metcalf, CEO, Director  
BEc., ECPA., FCIS

  
Dr John Fielke, Director  
BEng., MEng., PhD. SMIE Aust., CPEng.

  
Yuri Obst, Director  
BE., B.Sc., Grad IE Aust., PEng.

  
Corinne Turner, Secretary, Director  
B.Sc., DDM, MemberSAEC, MemberAIM,

  
for Barry Wright, Director



**A joint submission on the future management  
of *Mimosa pigra* by the Northern Land Council  
and the Environmental Research Institute of  
the Supervising Scientist**

Northern Land Council  
PO Box 42921  
Casuarina NT 0811

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**January 1997**

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## Executive summary

1. Aboriginal people now own, or have under claim, nearly 50% of the NT, including 85% of its coastline. Most of the major wetlands in the Top End are on Aboriginal land. Wetlands are perhaps the most important part of the landscape to Aboriginal people but are particularly susceptible to invasion by weeds. Certain weed species, *Mimosa pigra* (mimosa) being a prime concern, can affect both the structure and function of an ecosystem. Further disruption to the environment will result in increased dependence of Aboriginal people on outside assistance.
2. Aboriginal people recognise that weeds are an environmental problem. The Northern Land Council (NLC) have emphasised there is a need for better planning and prioritization in weed management on Aboriginal lands. In response they have developed a proposal to employ an expert to draft an overview paper on weed management issues with the aim of developing a weed management strategy for the lands under their jurisdiction. The proposal is currently under consideration for funding by Environment Australia.
3. Weed control in general should be approached in a strategic manner, and the basic management of mimosa should be a component of a weeds management strategy. The underlying philosophy of any weeds management strategy should be to establish why weeds are present and address the causes, rather than simply addressing the effect. The emphasis should be placed on prevention, early intervention and controlling the factors that allow weeds to thrive.
4. Economic activity on Aboriginal land contributes significantly to the NT and the Australian economy. However, Aboriginal people's relationship with the land is primarily non-productive in the western economic sense and currently they do not have the independent resources to manage major environmental issues, such as those posed by weeds. Aboriginal people therefore need assistance, primarily financial, to control weeds on their lands.
5. Aboriginal people are often not able to access mainstream land management funding programs. The funding sources that they are able to access are short-term in nature creating problems in the planning and implementation of ongoing programs.
6. Mimosa control on Aboriginal land is coordinated by a steering committee (with representatives from the NLC and Federal and Territory government agencies). The steering committee has limited terms of reference (ie specific to Aboriginal lands), however, it is often used as a forum for broader issues for the control of mimosa. The NLC and the Environmental Research Institute of the Supervising Scientist (ERISS) would welcome involvement in a broader-referenced committee that would deal with mimosa control throughout its current range. (ERISS currently has no role on the existing committee).
7. Much useful work has been undertaken in regard to the management of mimosa. However, there are gaps in our knowledge. Many of these gaps could be elicited through a rigorous Ecological Risk Assessment (ERA) and further, a more effective and comprehensive monitoring program. This is in line with recommendations from the CSIRO, DPI&F and the P&WC.
8. ERA is a structured process involving the quantitative estimation of the probability of adverse effects occurring as a result of exposure to a stress, often through human activity. Such stresses include chemical contamination, and physical alterations of habitats, both of which are relevant to the management of mimosa in northern Australia. The process of

risk assessment involves; i) identification of a hazard or hazardous incident; ii) determination of the likelihood of such an event; iii) determination of the consequences of such an event; iv) estimation of the risk and its acceptability; and v) management of the risk.

9. The risk assessment model could potentially be applied to three phases of a weed problem: introduction, establishment and control. ERISS have commenced a risk assessment of wetland weeds in tropical Australia with an initial emphasis on weed control using herbicides. The research to date has focused on the ecotoxicological consequences of herbicides (eg graslan for mimosa control) for relevant aquatic systems, but will develop into a more holistic assessment as other factors are considered.
10. An effective monitoring program is needed to produce relevant information on the nature of the problem, the cause of the problem and the effectiveness of management procedures and actions. A framework for assisting with the design of a monitoring program for wetlands has been adopted by the Ramsar Convention for Internationally Important Wetlands and has been offered in this submission.
11. Management of mimosa requires greater attention to monitoring the effectiveness of control and rehabilitation success in addition to a closer assessment of existing information. Three areas have been identified where further monitoring and possibly technique development could usefully assist the mimosa control program: i) distribution and rate of spread of mimosa; ii) effectiveness of control measures; and iii) post-control rehabilitation.
12. There is need for ongoing and increased cooperation between the parties who have a contribution to make to mimosa control including the DPI&F, Environment Australia, CSIRO, ERISS, the NTU and the NLC.



## 1 The submission

The Northern Land Council (NLC) has the statutory responsibility to assist Aboriginal landholders in land management in the northern half of the Northern Territory (NT). The Environmental Research Institute of the Supervising Scientist (ERISS) is part of the Environment Protection Group of Environment Australia, and is based in Jabiru. Through research, ERISS provides advice to government and other management agencies on environmental management issues of national importance. A large part of ERISS' research effort is into the protection and management of wetlands and is providing national and international leadership in this rapidly developing field. Currently ERISS is providing significant technical input into the NLC's *Top End Indigenous People's Wetlands Program* which was implemented to help Aboriginal communities prepare management plans for water catchments on their lands. Weed invasion has been identified by Aboriginal land managers as a significant threat to the contribution that wetlands make to the local economy. Of these weeds mimosa is one of the most significant.

The NLC and ERISS are keen to further utilise the scientific expertise that exists at ERISS to address, through research activities, provision of technical advice and coordination of data and existing information. The opportunities for greater collaboration are well recognised and both organisations are committed to developing these to ensure that critical information is made available to wetland owners, managers and users.

## 2 Background

Aboriginal people now own, or have under claim, nearly 50% of the NT, including 85% of its coastline. Most of the major wetlands in the Top End, and therefore most of the area susceptible to mimosa invasion, are on Aboriginal land. The land involved is highly significant to its owners, and is of importance to other NT residents and to all Australians. Much of the land described by the Australian Heritage Commission as having wilderness value is on Aboriginal land and this is particularly so for northern Australia where sparse human population and low levels of industrial and agricultural development have tended to minimise the impact of European settlement. However, pastoralism and feral animals have caused widespread low-level degradation making natural ecosystems, particularly wetland and riparian habitats, more prone to weed invasion. Certain weed species, including *Mimosa pigra* (mimosa), can degrade both the structure and function of an ecosystem.

Aboriginal people continue to be reliant on the natural environment for both their spiritual and physical well being; practices such as hunting and foraging have an important place in contemporary Aboriginal life. Hunting and foraging not only provide people with food, but are closely tied to spiritual beliefs and traditional law and allow each generation to share their extensive environmental knowledge with succeeding generations. Over at least the last 60,000 years Aboriginal land management practices, particularly the use of fire, have shaped the ecosystems of the Australian continent. This relationship has been seriously disrupted since European colonisation when a range of unfamiliar plants and animals and land management practices were introduced. Further disruption of land use practices of Aboriginal people will result in increased dependence on outside assistance. For example, invasion by weeds reduces future management options such as in tourism, wildlife harvesting (commercial and subsistence) and primary production as well as making cultural management (access to sacred sites) more difficult.

Economic activity on Aboriginal land contributes significantly to the NT and the Australian economy. Most of the major tourist destinations in the NT are on Aboriginal land as are most of the major mines and on-shore oil and gas wells. In addition Aboriginal land management practices have a significant impact on the local economy and play a vital role in the maintenance of environmental diversity. However Aboriginal people's relationship with the land is primarily non-productive in the western economic sense. Although Aboriginal people are initiating and running enterprises or negotiating land use agreements with non-Aboriginal entrepreneurs and companies, currently they do not have the independent resources to manage major environmental issues, such as those posed by weeds.

### **3 Strategic weed management for Aboriginal lands**

Aboriginal people of the NT recognise that weeds are an economic and environmental problem. The NLC has emphasised a need for better planning and prioritization in weed management on Aboriginal lands. Expansive natural areas combined with small human populations necessitates a strategic approach to tackling insidious environmental problems, such as those posed by weeds.

The NLC has developed a proposal to employ an expert to draft an overview paper on weed management issues in the NLC region. The overview will act as the basis for the development of a regional weed management strategy to be undertaken in consultation with Aboriginal landowners. The aim is to develop a weed management strategy for Aboriginal land under the Northern Land Council's jurisdiction that integrates with the NT Weeds Management Strategy and the National Weed Strategy. This work would be undertaken in close collaboration with the appropriate personnel from the CSIRO, NT Department of Primary Industries and Fisheries (DPIF), Parks and Wildlife Commission of the NT (PWC) and ERISS. The proposal is currently under consideration for funding by Environment Australia.

Weed control in general should be approached in a strategic manner, and the basic management of mimosa should be a component of a weeds management strategy. The underlying philosophy of any weeds management strategy should be to establish why weeds are present and address the causes, rather than killing weeds *per se*. This 'holistic' approach to weed management is the most appropriate for natural areas, but it is seldom undertaken. Area management rather than species management should be the focus, which is to say, mimosa should be viewed as a symptom of inappropriate management practices rather than the central issue itself. In developing such a strategy the following components should be considered.

#### **3.1 Prevention**

One of the most powerful weapons against weed incursions is to prevent them in the first place. Large areas of wetlands are currently free of weeds (including mimosa) and the emphasis should be placed on keeping these areas free. Procedures for the quarantining of areas, the implementation of restrictions on movements of soil, construction material and vehicles, the provision of washdown facilities, and education of the public should all be enhanced. On a broader level, Ecological Risk Assessment (see below) should be undertaken on potential introductions of plants before they enter the country or the NT.

#### **3.2 Surveillance and early intervention**

Another powerful weapon against weed invasions is early intervention. The strategy adopted against mimosa in Kakadu National Park has been to eradicate small infestations as they are found and, more importantly, to prevent further spread. A small team of people is employed

full-time in a search-and-destroy operation in a program that has been running for over 10 years and has been remarkably effective with Kakadu being described as 'an island in a sea of mimosa'. Procedures for regular surveillance of uninfested areas should be enhanced along the lines of the DPI&F's recent efforts in undertaking mimosa surveillance operations in the Arafura swamp. Further training of on-ground managers (eg community rangers) in weed identification and control is needed as is public education - videos, radio and posters.

### **3.3 Identification of habitats prone to invasion**

Certain types of habitat are more prone to invasion by weeds than others. Wetland and riparian areas were found to be particularly prone to weed invasion in studies carried out in Kakadu National Park. It is thought that tropical wetlands are in particular danger and management emphasis should therefore be placed on these areas. However studies are needed on the weed flora of regions so that we can better generalise and identify areas that are most vulnerable to weed invasion. Naomi Rea of the CSIRO Division of Entomology is looking at habitat suitability for mimosa.

### **3.4 Decreasing an areas susceptibility to invasion**

A key strategy for weed management is the minimisation of disturbance. For instance, within the scientific community it is well accepted that the proliferation of mimosa was largely due to disturbance by, and rapid removal of, the feral Asian buffalo. The control of feral ungulates, management of development, rehabilitation using native species, and the use of fire all need to be integrated into a weed management strategy. The NLC is seeking to regulate and monitor pig numbers, environmental impact and control activities on Aboriginal land.

However, studies are needed to identify the major agents of environmental disturbance and ways of minimising the disturbance itself. Controlled experiments are needed to describe the key features of different types of disturbance and how they change an ecosystem's susceptibility to invasion. It would be useful to ascertain under what conditions particular problem species become a dominant element of the flora. In addition, strategies need to be developed for the rehabilitation and restoration of disturbed areas (including areas subject to weed control measures); this entails gathering more knowledge of the biology of the indigenous species that may compete successfully with the introduced weeds in a revegetation program.

### **3.5 Management of existing infestations**

The long-term aim is to maintain alien plant populations at an acceptable level by managing the habitat through control of the conditions that allow weeds to thrive. Thus, the strategy should attempt to treat the underlying causes of weed problems, rather than simply trying to eradicate individual species. Weed control is then subsumed within the overall goals of land management.

Where invasive weeds already exist in a region (eg mimosa), a weed management program needs to be instituted. Certain major invasive species need to be highlighted for special treatment. Mimosa, because of its aggressive nature and potential area of spread, has particular national significance. A prerequisite for instituting such a program is to firstly undertake an Ecological Risk Assessment (see Ecological Risk Assessment, below) of the weed. Concurrently, a detailed survey of the area needs to be undertaken to highlight the key parts of the landscape threatened, and priorities resources accordingly. Physical, chemical and biological control, especially when integrated, the manipulation of fire regimes and the promotion of indigenous plants, all should play a part in management. The continuation of

long-term research projects (CSIRO and DPI&F) to investigate the ecology of mimosa (and other aggressive weed species) and their biological control is most important.

#### **4 Current weed control on Aboriginal lands**

As is the case with other land, the legal responsibility for weed control rests with the owners or managers of Aboriginal land. However, this does not recognise Aboriginal peoples' primarily non-economic relationship with the land. Aboriginal lands are often vast, but the people are few and often without the physical, financial and technical resources available to control weeds.

Aboriginal people in the NT are sometimes able to access land management funding programs from various sources for the purposes of weed control, although programs currently available are targeted mainly at commercial operators on agricultural and pastoral land in long-settled areas. Aboriginal activities in land management are mostly financed from sources outside mainstream land management programs. Funds have been available from Commonwealth Government sources such as the Department of Employment, Education and Training (DEET), the Bureau of Rural Sciences (BRS) the Australian Nature Conservation Agency's (ANCA) Contract Employment Program for Aborigines in Natural and Cultural Resource Management (CEPANCRM), and the National Landcare Program (NLP). However most of these funding sources are short-term in nature, creating problems for the planning and implementation of ongoing programs.

The NT Government commits funds to weed control on Aboriginal land in key areas, as on some other land holdings, though the NT Government has been reluctant to expand funding specifically for Aboriginal land as it is believed that other landholders would expect the same treatment. However, the effective management of weeds on Aboriginal land using public monies is in the long-term interest of Australia. The inescapable alternative is the wide-scale degradation of some of the most biologically intact habitats in the country. This principle has, in part, been accepted by the Commonwealth and NT Governments with attention focussed on the control of mimosa (see below).

#### **5 Coordination of management of *Mimosa pigra***

In 1991 the NLC put forward a proposal for the control of mimosa on the Oenpelli floodplain and adjacent areas of western Arnhem Land. Most of the funding (~\$7 million) was received from the Commonwealth Government. A Mimosa Steering Committee (MSC) was formed to design and implement the 5-year program. The MSC is chaired by Environment Australia and members include representatives from the NLC, CSIRO, DPI&F and PWC. The control of the Oenpelli infestation is the largest single program ever undertaken in Australia to prevent weed spread and restore a wetland following weed invasion. An independent review of the MSC's activities in 1995 determined that 'MSC activities have almost certainly provided net benefits to the community at large'. A further, refined, proposal has been prepared that covers the mimosa control program for the period 1997/98–1999/2000. The proposal includes follow-up work in western Arnhem Land, the eradication of satellite outbreaks in eastern Arnhem Land, eradication of stands in areas to the south of 14°S on the Daly River Port Keats Land Trust (DRPKLT), control of mimosa in the remainder of the DRPKLT to the north of 14°S, and the containment of mimosa within the Wagait Reserve. Funding of \$9.69 million over five years has been sought from the Commonwealth Government.

MSC activities are specific to control of mimosa on Aboriginal lands. The NLC favours maintaining this situation because of the particular circumstances of funding land management



works on Aboriginal lands described above. However, the NLC and ERISS would welcome involvement in a broader-referenced committee that would deal with all aspects of mimosa control throughout its current range in the NT. Mimosa knows no bounds, and all organisations and control techniques should be included. This would enable a broad-scale approach that could lead to efficiencies in management.

## **6 Future options for the management of *Mimosa pigra***

To date there has been very much useful work undertaken in regard to the management of mimosa. However, there are believed to be gaps in our knowledge. It is suggested that some of these gaps could be elicited through a rigorous Ecological Risk Assessment (ERA) and further, it is suggested that an effective monitoring program should be instituted. These proposals are expanded below.

### **6.1 Ecological Risk Assessment**

#### **6.1.1 What is Ecological Risk Assessment?**

ERA is a structured process involving the quantitative estimation of the probability of clearly defined adverse biological effects occurring as a result of exposure to a stress, often through human activity. Such stresses include chemical contamination, and physical alterations of habitats, both of which are relevant to the management of mimosa in northern Australia. The science of ecological risk assessment is in a phase of rapid development in the United States and Europe, but is relatively new to Australia. While past environmental assessment techniques have often incorporated aspects of ERA, they have generally lacked a formalised structure.

In brief terms, the process of risk assessment involves; i) identification of a hazard or hazardous incident; ii) determination of the likelihood of such an event; iii) determination of the consequences of such an event; iv) estimation of the risk and its acceptability; and v) management of the risk. While a number of different frameworks exist for ecological risk assessment, they generally follow a similar series of steps, as summarised below.

- *Hazard identification and quantification:* A hazard can be defined as a human activity, or the result of a human activity, that is considered to potentially cause undesired effects on the environment, either directly or indirectly. For an ERA, the hazard must be clearly defined (eg the infestation of mimosa in ecologically and economically important wetland areas) so as to gain a better understanding of the potential effects, and to determine appropriate endpoints for assessment.
- *Environmental pathway analysis:* Having defined the hazard, its behaviour in the environment must be determined or predicted. Knowledge is required about the processes by which a hazard can enter, and subsequently move about within the environment. It involves issues such as transport, fate and interactions, and is linked to exposure assessment. Modelling is often utilised to determine such processes, as is previous experience.
- *Exposure/effects assessment:* Exposure is the process that links the source, or the hazard, with its effects. Exposure assessment attempts to quantify the exposure of the hazard to the environment/organism of interest, by utilising information gathered from environmental pathway analysis. Effects assessment is concerned with determining the relationship between exposure of the hazard and the effects on endpoints of concern. Ecotoxicology, or specifically, toxicity testing, plays a major role in effects assessment of chemicals and industrial effluents.

- *Determination of dose-response relationships:* Dose- or concentration-response relationships are linked to effects assessment. As the names imply, they relate the response of the environment/organism, to some measure of exposure to the hazard, and aim to demonstrate that the effect increases as the magnitude of exposure increases.
- *Risk characterisation, comparison and management:* The major component of risk characterisation is the integration of the results of the above three stages to obtain an estimate of the level of effects that will result from the exposure. Risk comparison involves comparing the risks of alternatives to the hazard, as the majority of alternatives will also have hazardous properties. Risk management is the final decision-making process that utilises the information obtained from the risk assessment and attempts to minimise the risks without compromising other societal values.

### **6.1.2 Development of an ecological risk assessment framework**

ERISS is currently in the process of developing and formalising a risk assessment framework for use in wetland environmental management, primarily, but not solely for northern Australia. The framework will generally follow established approaches as described above, as well as build on current scientific expertise at ERISS. In addition, it will utilise previous research on the development of wetland-specific risk assessment procedures. Given ERISS' expertise and the critical nature of weed invasions of wetland regions, a risk assessment of wetland weeds in tropical Australia has already commenced, with an initial emphasis on weed control using herbicides. The research to date has focused on the ecotoxicological consequences of herbicides for relevant aquatic systems (see Ecotoxicological testing at ERISS, below), but will develop into a more holistic assessment as other factors are considered. The ultimate goal of the research is to utilise the wetland weed issue as a case study for developing a rigorous risk assessment framework for identifying and addressing research and management issues. Current expertise in ecotoxicology, environmental chemistry, ecology, biomonitoring and wetland management, should enable ERISS to successfully undertake ecological risk assessments.

In undertaking ecological risk assessments for wetland-related issues, the diverse range of ecosystems that exist within wetlands must be recognised. The term *landscape ecotoxicology* has recently been used to describe the process of examining the potential adverse effects of chemicals on biological systems, including humans, over large spatial scales. The concept can also be extrapolated to dealing with the effects of non-chemical stresses, such as physical alterations in habitat, and would most likely be applicable to many wetland-related issues, such as mimosa infestation and control. In conducting landscape ecotoxicology, it has been postulated that the best basis for decision-making is in prediction that includes integrating information from;

- existing, damaged systems
- relevant toxicity testing
- simulation models
- biomonitoring of natural, undisturbed systems

The above steps can be considered important components of effects assessment. Therefore, in developing a suitable risk assessment framework for wetland issues, effects assessment might require the consideration of effects from a "landscape" perspective. In doing so, the risk assessment framework could easily be directed towards assessing landscape scale issues when required.

### **6.1.3 Application of ecological risk assessment**

With regards to the management of the control of mimosa, or other exotic weeds for that matter, the risk assessment model could potentially be applied to three phases of a weed problem: introduction, establishment and control. These are briefly discussed below. As previously stated, current research has primarily been aimed at the control phase, but will broaden to encompass the other two phases.

#### *Introduction*

Mimosa, salvinia and para grass all resulted from deliberate introductions, albeit many years ago. Para grass continues to be introduced to new sites on the floodplains of northern Australia as a pasture species, and to recolonise areas denuded of vegetation following control of mimosa, despite wide recognition of its pest potential. Furthermore, other introduced pasture species are actively being encouraged by government agencies without due attention to their potential as pests. Risk assessment should be mandatory for all potential plant introductions (eg pastoral, nursery, cut flower, aquarium), with plants qualifying as potential weeds being refused entry into Australia or distribution between biogeographic regions. Methods for predicting weed characteristics will assist in developing rigorous guidelines and preventative strategies at both a national and international level with regard to trade, transport and quarantine.

#### *Establishment*

In northern Australia, few weeds have had their ecological impact formally assessed, despite such information being essential prior to control operations. We contend that a formal assessment process is required, and stress that it should be seen in the same essential light as environmental impact assessment procedures are now seen, after much resistance following the introduction of the concept several decades ago.

The impacts of weeds on natural ecosystems need to be identified. It is insufficient to produce lists of 'major environmental weeds' without demonstrating what effects, if any, they have at an ecosystem level. There have been very few studies on the effects of weedy vegetation on native fauna and flora, and in most cases, it is not known if weeds actually modify natural habitats significantly.

#### *Control and rehabilitation*

Control programs for mimosa have proceeded without any risk assessment, environmental impact assessment, or full cost-benefit analysis. With the costs, efficacy and impacts of individual or integrated control methods generally unknown, resources have been expended without a full knowledge of the outcomes. It is little compensation for a worsening problem that authorities are seen to be doing something and landholders feel that the problem is not being ignored. Ecological risk assessment would provide information that would result in managers being better informed in decision-making and in the process of wetland restoration.

In considering the control of mimosa, the effects of control methods on the environment need to be determined. Herbicides are often the first resort of weed control. As such, more research is required on the ecological consequences of the use of specific herbicides (see Ecotoxicological testing at ERISS, below), given that such use may conflict with the aims of ecologically sustainable development.

### **6.1.4 Ecotoxicological testing at ERISS**

Ecotoxicological testing to assess the impact of chemicals or waste waters on aquatic ecosystems in Kakadu National Park has been used successfully by ERISS for over ten years. Test protocols were initially designed for assessing the toxicity of pre-release retention pond

waste waters from ERA Ranger Mine, and still form an integral component of the regulatory mechanisms for the mine. They have been modified to have the capability to assess a broader range of potential environmental contaminants to northern wetlands.

Several local aquatic organisms were chosen for use in the tests, and form part of a suite of protocols developed by ERISS. The choice of suitable test organisms was based on the following criteria:

- sensitivity to selected toxicants
- suitable test endpoint
- ability of organism to be cultured under laboratory conditions
- suitability of life-cycle
- wide range of trophic levels (eg from primary producer to consumers)
- organisms are representative of a wide range of phyla

On the basis of this information, three test organisms have been used routinely for determining dilution rates for the potential release of mine waste waters into Magela Creek and downstream wetlands of the Alligator Rivers Region. They are the water-flea, *Moinodaphnia macleayi*, the green hydra, *Hydra viridissima*, and the purple-spotted gudgeon fish, *Mogurnda mogurnda*.

These test species have since been used to assess the potential effects of herbicides on non-target aquatic organisms. To date, testing has been undertaken on toxic constituents of AF 100, a herbicide used in the control of salvinia, and graslan the major herbicide used to control the Oenpelli mimosa infestation. ERISS plans to continue and expand this area of research.

A recent Master of Science project carried out at ERISS investigated the effects of tebuthiuron, the active ingredient of Graslan, on hydra and purple-spotted gudgeon. The results indicated that significant adverse effects occurred at concentrations as low as 75 and 270 mg/L tebuthiuron for the two species, respectively. A more comprehensive investigation on the toxicity of tebuthiuron to the above two species, as well as the water-flea, has since been undertaken, the preliminary results of which are presented in Table 1.

**Table 1** Results of acute toxicity tests of tebuthiuron, the active ingredient of the herbicide, graslan, on three local aquatic species. The EC<sub>50</sub> indicates the concentration of tebuthiuron estimated to result in a 50% reduction in the test endpoint.

Test organism	Test endpoint	EC <sub>50</sub> (mg/L tebuthiuron)
Water-flea	reproduction	87
Hydra	population growth	125
Gudgeon fish	percent survival	254

The results represent the first assessment of the potential impact of the application of Graslan to wetlands of northern Australia. While they indicate significant differences in the sensitivities of aquatic organisms to tebuthiuron, it is difficult to conclude as to the relevance of the results without knowledge of other factors, such as the concentrations of tebuthiuron in waterways. However, this only serves to emphasise the need for an integrated approach to the control of mimosa in northern Australia, such as that provided by a risk assessment framework. Further



Investigations will involve assessments of the toxicity of tebuthiuron to non-target aquatic plant species, and the collection of data relevant to the behaviour of the herbicide in the aquatic environment. In addition, terrestrial ecosystems should also be considered.

## **6.2 An effective monitoring program**

### **6.2.1 Effective monitoring of wetlands**

Environmental monitoring has received a lot of attention in recent years. Within Australia this has arisen as awareness of the extent of environmental degradation and habitat loss has increased. Wetlands have not been exempt from this general and widescale degradation and such is the concern at the extent of wetland degradation that more and more effort is being directed towards developing effective management processes and responses to problems. However, in many instances this effort is being held back by a lack of relevant information on the nature of the problem, the cause of the problem and the effectiveness of management procedures and actions. Effective **monitoring** programs can help overcome such problems.

In a general sense monitoring addresses the broad issue of change or lack of change through time and at particular places. Monitoring is built upon survey and surveillance, but is more precise and oriented to specific targets or goals.

**Survey** is an exercise in which a set of qualitative observations are made but without any preconception of what the findings ought to be.

**Surveillance** is a time series of surveys to ascertain the extent of variability and/or range of values for particular parameters.

**Monitoring** is based on surveillance and is the systematic collection of data or information over time in order to ascertain the extent of compliance with a predetermined standard or position.

Thus, monitoring is built on a time series of surveys and differs from **surveillance** by assuming that there is a specific reason for collecting the data or information and that this can be tested.

Even a well designed monitoring program could have little value if the information that is collected is not utilised or does not influence the management process. Ideally, the locality or site will be subject to an interactive and holistic management plan that provides the means of responding to the information obtained from the monitoring program. If a formal or official management plan does not exist or is not being effectively implemented it is critical that mechanisms to make use of the information collected from a monitoring program are identified and developed. Essentially, monitoring provides the means of measuring the output of the management procedure - that is, it provides the means of measuring the (observed) state of the environment and the extent to which it may have been altered.

### **6.2.2 A framework for monitoring**

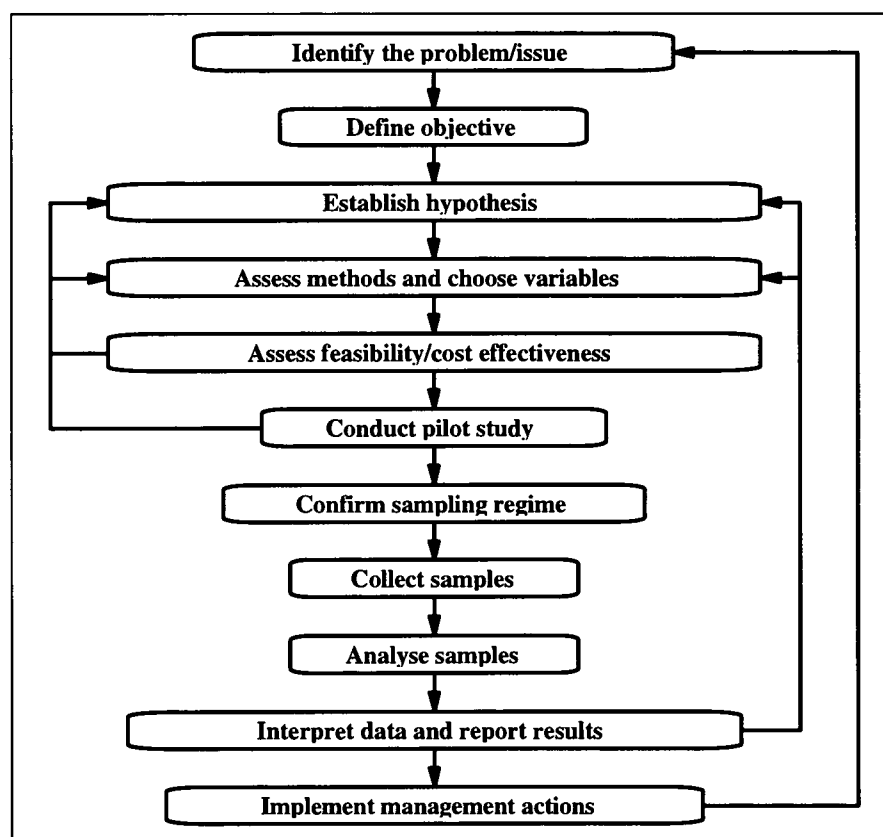
The existence of a monitoring program does not guarantee that it is an effective management tool. For example, monitoring programs that are data rich and information poor are not effective management tools. Effectiveness is further reduced if the program provides misleading information. Frameworks for designing monitoring programs are tools to assist managers and planners. It is important to reiterate that the framework does not provide the answers - those responsible for the design provide the answers and others can check them (ie audit the information).

In an ideal situation the development of a monitoring program would be a straightforward and cooperative process between managers (who make decisions) and scientists (who provide

expert advice and interpret data). In a simple sense, the managers would outline the need for a monitoring program and the scientists recommend the most appropriate techniques and, by an iterative process, an approach that has both scientific rigour and meets the management objectives will be developed. But, how often do we come across examples of monitoring programs that do not meet the management objectives or, even worse, provide misleading information? Adherence to a logical framework for designing monitoring programs cannot eliminate such situations, but it can provide the means to identify the limits of a program and thereby potentially reduce the incidence of such cases.

A framework for assisting with the design of a monitoring program for wetlands has been adopted by the Ramsar Convention for Internationally Important Wetlands (fig 1). The framework is not prescriptive. It presents a series of steps that will assist those charged with designing a monitoring program make decisions suitable for their own situation. The framework is not a substitute for knowledge or expertise.

The framework is presented pictorially in figure 1. A summary of the points to consider when using the framework is given in Appendix 1. As the framework is not prescriptive there is no expectation that every step should be given equal attention in every case. Managers and designers will make their own decisions based on local circumstances - the framework provides a guide to assist them in making these decisions.



**Figure 1** A framework for designing a wetland monitoring program

### 6.2.3 Future monitoring

Management of mimosa will require greater attention to monitoring the effectiveness of control and rehabilitation success in addition to a closer assessment of existing information. Thus, further rigorously collected information will be required, but we should also be making sure

that we have made the best use of existing information, after due validation. In addition, given the ongoing expense associated with monitoring we also encourage independent scientific audit of existing programs. An audit could be conducted under a contract arrangement with competency in tropical wetland ecology and monitoring being key requisites. The monitoring framework given above coupled with access to all relevant planning documents could provide the basis for such an audit.

It is also essential that further and possibly more innovative monitoring techniques are considered. This would potentially require expertise from outside the current consortium of agencies involved in the mimosa control program. With any such monitoring we would stress that it would require rigorous testing before being implemented on a broad basis.

We have identified three areas where further monitoring and possibly technique development could usefully assist the mimosa control program. These are given in brief below and could be expanded upon if required by the Sessional Committee.

#### *Distribution and rate of spread of mimosa*

Maps showing the occurrence of mimosa on the floodplains of the NT have been produced over the last decade. These show an increasing number of sites where mimosa has been found. They do not provide information on the status of the weed in these situations - stand age, density or height for example. Maps of the areas potentially prone to invasion by mimosa have also been produced. These tend to be at the broad scale of the wet-dry tropical belt across the Top End or at a finer scale of the floodplain habitats. They do not provide an indication of the characteristics of these areas that make them prone to invasions - soil characteristics, period of inundation, level of disturbance. Thus, whilst the general impression may be that extensive areas are prone to invasion we do not seemingly have a great deal of information on the potential for such invasion.

The rate of pest invasion is a vital piece of information that can guide managers by giving them an estimate of the time in which they have to respond. Whilst we have records of individual occurrences we do not have an accurate measure of the rate of invasion. For this we require the above mentioned information on stand characteristics and areas prone to invasion. Such an estimate would need to consider both the broad front of the large stands and the smaller satellite stands.

Our initial monitoring proposals, with collaboration through the NTU Centre for Tropical Wetland Management, would target the rate of spread of mimosa into the available habitat. For this to be done we would need access to historical satellite imagery and agency records and to characterise specific characteristics of the invaded habitats (from records or further sampling). From this information we would ascertain the basic information on the past rates of floodplain invasion and ascertain the potential rates based on spatial and temporal data. Further sampling of stand characteristics, referred to above, would not be done until this basic and missing piece of information had been acquired. Our objective is to provide some basic and hitherto missing quantified data on the past and future rates of spread of mimosa. The importance of this data can be illustrated by asking the question - Have we witnessed the worst of the mimosa invasions?

#### *Effectiveness of control measures*

Due to the concern expressed over mimosa there have been many attempts to control and eradicate the weed. In some instances spectacular results have been achieved when opportunity, resources and commitment have been available. The investment has been enormous and is ongoing. Based on the premises developed in the discussion on Ecological Risk Assessment we propose that the cost effectiveness of all control measures is monitored. The baseline

information would come from existing records on infestations and control measures, including real costs.

Monitoring programs could be specifically directed towards different control techniques or combinations of techniques. Whilst specific measurements may mimic biological, chemical and physical measurements undertaken in past programs it is proposed that this data should be firstly integrated with that for resource costs and then with an analysis of net economic and ecological benefits. The financial cost data would provide the least complicated aspect of the program. It is anticipated that determining the cost-benefits from a strictly economic basis would require a mixture of skills not generally closely associated with traditional wetland management monitoring. The larger challenge would encompass the identification and valuation of ecological values that should be protected or redeemed under a mimosa control program. Wetland valuation is becoming more and more important and is dependent on high quality data collected for that purpose and not merely extracted from some other convenient report.

Under such a monitoring program careful attention to the design of effective data collection techniques would be of paramount importance.

#### *Post-control rehabilitation*

A large amount of effort has been directed towards removing, by one form or other, mimosa from the floodplains of the Top End. In instances where this has been successful the immediate issue of post-control rehabilitation is raised. We are unsure of whether or not the floodplains will naturally rehabilitate and establish vegetation communities compatible with surrounding land uses. There is every expectation that alien weeds such as para grass could establish faster and more successfully than native grasses. In grazing situations para grass has previously been deliberately planted following control of mimosa.

Our knowledge of floodplain vegetation is not sufficient to determine which species will establish and dominate in habitats denuded of vegetation after chemical treatment. Simple models of floodplain vegetation succession are available and could be used as an initial indicator of likely scenario. What is required is a thorough analysis of the soil-vegetation characteristics of features of the site and nearby that could affect the vegetation succession (eg seed availability in the soil or nearby). Once the baseline conditions have been ascertained monitoring of the actual change is required. Such monitoring of the vegetation change would be necessary in either a grazing or conservation zone and would be undertaken in full consultation with managers who will determine the post-control land uses.

The essence of this program is that it requires adequate characterisation of the factors likely to affect plant invasion and establishment once mimosa has been removed. This requires a broadscale ecological analysis, especially for the vegetation and the ability of individual species to germinate and/or establish. Then physical and chemical factors would be introduced as necessary. Ongoing vegetation analysis could be done by remote imagery under some circumstances.

## **7 Conclusion**

Aboriginal people recognise the importance of weed management. However, for reasons outlined above Aboriginal people do not have the independent resources to undertake general weed control operations. We recommend a strategy that attempts to treat the underlying causes of weed problems, rather than simply trying to eradicate individual species.



The management of mimosa on Aboriginal land is vital. Much good work has been done but we need to go further. A change in emphasis in the Oenpelli program has taken place with more attention placed on surveillance and the control of satellite infestations. It is recommended that further moves in this direction take place.

As well there are gaps in our knowledge and it is recommended that an Ecological Risk Assessment be instituted to elicit those gaps. Further to this, a properly designed monitoring program would address some of those gaps in knowledge and would also compliment and enhance the existing management of mimosa in the NT.

Above all there is need for ongoing and increased cooperation between the parties who have a contribution to make to mimosa control including the DPI&F, Environment Australia, CSIRO, ERISS, the NTU and the NLC.



## Appendix 1

### Summary of key points to consider when using a framework for designing a wetland monitoring program

<b>Identify the problem or issue</b>	<p>State clearly and unambiguously</p> <p>State the known extent and most likely cause</p> <p>Identify the baseline or reference situation</p>
<b>Set the objective</b>	<p>Provides the basis for collecting the information</p> <p>Must be attainable and achievable within a reasonable time period</p>
<b>Establish an hypothesis</b>	<p>Supports the objective and can be tested</p>
<b>Choose the methods &amp; variables</b>	<p>Specific for the problem and provides the information to test the hypothesis</p> <p>Able to detect the presence of and assess the significance of any change</p> <p>Identifies or clarifies the cause of the change</p>
<b>Assess the feasibility &amp; cost effectiveness</b>	<p>Determine whether or not it can be done regularly and continually</p> <p>Assess factors that influence the sampling program: availability of trained staff; access to sampling sites; availability and reliability of specialist equipment; means of analysing and interpreting the data; usefulness of the data and information; means of reporting in a timely manner</p> <p>Determine if the costs of data acquisition and analysis are within the budget</p>
<b>Conduct a pilot study</b>	<p>Time to test and fine-tune the method and specialist equipment</p> <p>Assess the training needs for staff involved</p> <p>Confirm the means of analysing and interpreting the data</p>
<b>Collect the samples</b>	<p>Staff should be trained in all sampling methods</p> <p>All samples should be documented: date and location; names of staff; sampling methods; equipment used; means of storage or transport; all changes to the methods</p> <p>Samples should be processed within a timely period and all data documented: date and location; names of staff; processing methods; equipment used ; and all changes to the protocols</p>
<b>Analyse the samples</b>	<p>Sample and data analysis should be done by rigorous and tested methods</p> <p>The analyses should be documented: date and location; names of analytical staff; methods used; equipment used; data storage methods</p>
<b>Interpret the data and report the results</b>	<p>Interpret and report all results in a timely and cost effective manner</p> <p>The report should be succinct and concise and indicate whether or not the hypothesis has been supported and contain recommendations for management action, including further monitoring</p>
<b>Evaluate the project</b>	<p>Review the effectiveness of all procedures and where necessary adjust or even terminate the program</p>

MIMOSA PIGRA  
Written Submission

By

White Eagle  
Aboriginal Corporation

To

The Chairman,  
Sessional Committee  
of the Environment-Mimosa Pigra,  
G.P.O. Box 3721  
Darwin N.T. 0801

January 1997

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Page 1	Introduction
Page 1	Future Management Options
Page 2	Responsibility of Land Owners and Managers
Page 2	Appropriateness and Effectiveness of Government Programs
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Page 3	The National Significance of Mimosa
Page 4	Conclusion

WHITE EAGLE ABORIGINAL  
CORPORATION  
P.O. BATCHELOR  
N.T. 0845

P.H. (08) 8976 0143  
FAX.(08) 8976 0239



## Synopsis

White Eagle Aboriginal Corporation has been involved in its own Mimosa control and eradication program for the past five years. Much of the funding for this program has been self generated from Aboriginal land.

During 1996/97 the program was expanded into other areas of Mimosa infestation on the area known as Wagiat Reserve. White Eagle Aboriginal Corporation represents the Rak Mak Mak Marranunggu people, recognised Traditional Owners of the Eastern Wagait Reserve.

Contrary to popular belief the above mentioned land has huge areas that is still unaffected by Mimosa and is currently being utilised as a fattening property for live cattle exporters.

It is extremely important that the Lower Finnis River not be "written off" and be looked at as a viable area for Mimosa control, in order to protect the Wetlands for ecological, spiritual and economic development.

## ● INTRODUCTION.

White Eagle Aboriginal Corporation is the incorporated body representing the Rak Mak Mak Marranunggu people, found by the Northern Land Council in 1996 to be the Traditional Owners of the Eastern Wagait Reserve.

During the 1980's and early 1990's the area was caught in a dispute over Traditional Ownership and the B.T.E.C program. While these events took place the Mimosa Pigra received only minimal attention, this being on a small area in the north west .

Many people believe this area to be totally over run with Mimosa and not worth touching, upon inspection they are suprised to find huge areas of open Flood Plain and large Waterholes with clear fresh water.

It is imperative that Governments and their representatives be made aware and a concerted effort be made to protect the Finniss River system in its entirety from further Mimosa degradation.

### FUTURE MANAGEMENT OPTIONS

It has become obvious over the last few years that a piecemeal approach to Mimosa control has evolved along the Finniss River system. There have been concerted efforts from some landowners to eradicate the problem from their properties while adjoining land owners have made no effort at all.

Future management of the eradication campaign needs to be coordinated in a proper manner to ensure the maximum benefit is achieved for every dollar spent.

An Autonomous body must be set up to manage the eradication program. The current system of a steering committee must be adapted into an organisation with its own independence. The land owners, who spend in some cases, considerable amounts of money must have adequate representation on this management program.

This autonomous body should be an umbrella for regionalised groups, eg: Finniss River System Land Care Group.

Regionalised Land Care Groups would have an advantage over larger organisations because they have local knowledge of the area and are motivated to achieve the best result, moreso than outsiders.

● The organisation should have access to enough money in its own right over a considerable period of years to control the spread and reduce the incidence of infestations.

Another option is to legislate to ensure that properties with infestations of Mimosa have a control program in place and are part of the regional program to control the noxious weed. This would make sure all areas in the system are being targeted and stop reinfestation of clean areas and areas under rehabilitation.

#### **RESPONSIBILITY OF LAND OWNERS AND MANAGERS**

Responsibilities of land owners and managers should include the identification of new outbreaks to the coordinating organisation to ensure accurate mapping of all outbreaks.

This would give feedback to the planners and assist them in evaluating the effectiveness of control programs in place and to plan new initiatives in managing the Mimosa infestation.

#### **APPROPRIATENESS AND EFFECTIVENESS OF GOVERNMENT PROGRAMS**

The Biological control program maybe a promising aid in controlling Mimosa infestations in areas where access is difficult.

However it must be used in conjunction with chemical control to reduce Mimosa, thus making Biological control a more viable option to land owners. The biological control program needs to be retained and have more funds made available for research. As more biological controls are released the rapid expansion of infestations will be slowed making the more expensive chemical controls less of a burden on land owners.

The rebate scheme for land owners who purchase chemical and hire spray equipment is also a successful and crucial part of the control/eradication program. This allows land owners to fund larger programs than would otherwise be possible.

A public education program needs to be introduced to inform recreational fishermen, hunters and FWD enthusiasts about the dangers of spreading seed. Road contractors and miners also need to be included in the education program. It may be necessary to close off some areas from public use.

## **REGIONAL AND CATCHMENT DIFFERENCES**

The Finniss River catchment is unique, it has a large and diverse range of activities and economic enterprises including a National Park.

These activities include Industry, Tourism, Horticulture and Pastoral. In addition the town of Batchelor and numerous subdivisions along the full length of the catchment also rely heavily on the Finniss River system for economic and recreational activities.

Neglect of this Mimosa infestation along the Finniss River Catchment will have disastrous affects on Real Estate and economic activity in the region. It is imperative that the Catchment be given a high priority in all future considerations with funding and resources.

Further south in the Daly Reserve there are outbreaks of Mimosa appearing, it is our opinion that the communities in that area use labour and resources from C.D.E.P. programs to assist them to monitor and control the problem before it becomes overwhelming and inundates their land. This would assist in containing costs, protect hunting areas and Sacred Sites.

## **THE NATIONAL SIGNIFICANCE OF MIMOSA**

The National Significance of Mimosa is that, if left uncontrolled it has the potential to infest the Kimberley Region of Western Australia, spread East into the World heritage listed Kakadu National Park and continue via the Gulf of Carpentaria into Queensland and Cape York Peninsula.

The Federal Government must see the Mimosa Pigra as a major threat to both the environmental and economic wellbeing to Northern Australia.

Every assistance must be given to the Northern Territory Government and a longterm commitment made to control this potentially national problem.

## CONCLUSION

White Eagle Aboriginal Corporation have made a financial commitment to controlling and managing Mimosa Pigra on their land.

It is necessary that an organised and financial longterm commitment be made by Government in conjunction with Land Owners if there is to be any real gain made to arrest the spread of this aggressive Noxious Weed.

A balanced group representing all affected parties including the land owners themselves should be formed on a regional or catchment basis to achieve the most cost effective result possible.

In closing White Eagle Aboriginal Corporation wish to thank The Chairman of the Sessional Committee of the Environment- Mimosa Pigra for this opportunity to present this submission on behalf of the Rak Mak Mak Marranunggu people.





White Eagle Aboriginal Corporation  
C/- PO Batchelor  
via BATCHELOR NT 0845

Telephone: Office: 089 760143  
Fax: 089 760239  
Outstation: 089 782385

To: Graham Gadd

From: Mark Ford

Your Fax: 8941 2437

Date: 29/1/97

Pages: 8

#### Mimosa Submission

Graham,  
Please find attached a submission for the Sessional Committee - Mimosa Pigra, we will send the hard copy by post.

It should reach your office before the hearings next week.

Regards

Mark Ford

Phoned 456 PM - Mark will try and have some clear photographs delivered & copied for a visual presentation. He will let me know on Friday 31/1/97 if they can give oral evidence.

MIMOSA PIGRA  
Written Submission

By

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To

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# PEPPIMENARTI COMMUNITY COUNCIL INC

Telephone: (08) 89782377  
Facsimile: (08) 89782370

PMB 56  
WINNELLIE NT 0821

The Chairman  
Sessional Committee for the Environment - *Mimosa Pigra*  
GPO Box 3721  
DARWIN NT 0801

January 24, 1997

Dear Sir

## MIMOSA CONTROL & ERADICATION

The Peppimenarti Council is concerned with the long-term operation of the Mimosa Control Program. There must be more council involvement in the eradication of mimosa on the lands surrounding Peppimenarti.

In the past, teams from the Department of Primary Industries and Fisheries have used helicopters to a large extent, as well as ground control methods. Many small infestations of mimosa are occurring that are not easily located by helicopter.

The Peppimenarti Council feel that helicopter use should be reduced, where possible, with a greater emphasis placed on the training and development of effective ground control teams. These teams could be used most effectively where access to infestations is possible, with helicopters used only in the most inaccessible areas.

As these Aboriginal lands have no pastoral income it is important that grant funds are made available for the continuation of the program. Because of our people's relationship with the land the Council should be involved with the long-term implementation of the program.

Yours sincerely



Harold Wilson  
President

5  
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Yours sincerely



Harold Wilson  
President





Northern Territory Government

4 1  
Arid Zone Research Institute  
South Stuart Highway  
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Alice Springs NT 0871  
AUSTRALIA  
Phone (089) 51 8111  
Fax 51 8112 Telex AA81222

Our Ref: AS95/0025

Phone: 89 518195

13 January, 1997

**The Chairman**

Sessional Committee on the Environment

GPO Box 3721

Darwin NT 0801

**RE:           Comments on the Future Management of *Mimosa pigra***

**The following comments are submitted as requested in the call for submissions in the Northern Territory News, Friday, October 25, 1996.**

**Future management options**

Clearly considerable progress has been made in developing effective control options for *Mimosa pigra*, and these should form the basis for ongoing management. Any lack of success of these options has generally resulted from insufficient or lack of continuity of funding, rather than flaws in the management approach. Address the continuity of funding problem and mimosa control should improve.

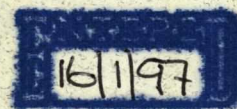
**Responsibilities of land owners and managers.**

In my view it is important and necessary for landholders to retain the responsibility for weed management. Government assistance, however, is equally as important to provide financial and technical assistance and to coordinate weed management activities throughout catchments. Increased regulatory powers of government officers could also assist in promoting effective weed management by landholders.

**Regional and catchment differences**

Some landholders are less able to carry the financial burden of mimosa control, have less skilled labour available or lack weed management skills. These deficiencies must be recognised and addressed if an overall management programme is to be successful. In my opinion, more resources need to be directed towards weeds education and the provision of personnel trained in weed management.

DEPARTMENT OF  
PRIMARY INDUSTRY  
AND FISHERIES



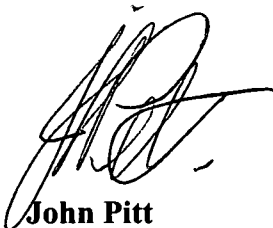


3

**The national significance of *Mimosa pigra*.**

Mimosa threatens a much larger area than it currently occupies. The economic and environmental threat to the live cattle export industry, conservation and tourism are becoming widely recognised. Aboriginal landholders are also keen to see mimosa and other weeds eliminated from their hunting areas. Certainly, mimosa threatens Western Australia and Queensland, as well as the Northern Territory. The mimosa problem should be viewed as a national problem, as should rubber vine, prickly acacia and other serious weeds. Possibly all weeds should be assessed as candidates for Federal funding as most species threaten a number of states. Increased funding of mimosa management at the expense of other weed management programs in the NT should be avoided at all costs. This will simply result in mimosa being replaced by another weedy species, either in terms of location or in terms of economic significance.

**Yours sincerely**



**John Pitt**

**Regional Weeds Officer, Department of Primary Industry and Fisheries, , Alice Springs**



# Legislative Assembly of the Northern Territory

Telephone (089) 46 1411  
Telex AA85154  
Fax 81 2528  
41 2567

G.P.O. BOX 3721  
DARWIN, N.T. 0801

20 December 1996

Mr John Hicks  
Assistant Secretary  
Parks Australia North  
GPO Box 1260  
DARWIN NT 0801

Dear Mr Hicks,

On behalf of the Secretary to the Sessional Committee on the Environment, Mr Graham Gadd, I acknowledge receipt of your letter dated 11 December 1996, advising of your intention to provide the Committee with a written submission on its program, The Integrated Control of *Mimosa pigra* on NT Aboriginal Lands.

An appointment at 1.30pm on Wednesday 5 February 1997 for you to make an oral presentation to the Committee has been confirmed on your behalf. Hearings will be held in the Ormiston Room, Level 3 Parliament House, Darwin.

If you require further assistance, please call me on telephone 89 461 556.

Yours sincerely,

Liz McFarlane

**FAXED**  
19/12/96

## **\*\*\* TRANSMISSION REPORT**

**S.I.D. :**

**N° :**

<b>Date/Time</b>	<b>4-09 20:41</b>
<b>Dialled number</b>	<b>89813497</b>
<b>Subscriber</b>	<b>61 89 813497</b>
<b>Durat.</b>	<b>0'37"</b>
<b>Mode</b>	<b>FINE</b>
<b>Name</b>	
<b>Pages</b>	<b>1</b>
<b>Status</b>	<b>Correct</b>







# **PARKS AUSTRALIA**

Mr Graham Gadd  
Committee Secretariat  
Legislative Assembly of the NT  
Sessional Committee on the Environment  
GPO Box 3721  
DARWIN NT 0801

Darwin Office  
Parks Australia North  
GPO Box 1260  
Darwin NT 0801  
Tel: 08 89464300  
Fax: 08 89813497

Kakadu National Park  
Parks Australia North  
PO Box 71  
Jabiru NT 0886  
Tel: 08 89381100  
Fax: 08 89381115

Dear Mr Gadd

## ***Mimosa pigra* Management Submission**

I am writing to confirm that the Mimosa Steering Committee intends to provide the Sessional Committee with a written submission on its program, The Integrated Control of *Mimosa pigra* on NT Aboriginal Lands. As discussed with Robin MacGillivray, unfortunately this submission will not be available in final form until mid February following the next meeting of the Committee. I will, however, be pleased to give verbal evidence on 5 February at 1.30 pm as previously arranged.

Uluru - Kata Tjuta  
National Park  
Parks Australia North  
PO Box 119  
Yulara NT 0872  
Tel: 08 89562299  
Fax: 08 89562064

Government  
Conservator

By way of a brief background in the work of the Committee, Control of *Mimosa pigra* on NT Aboriginal Lands Program. The project is guided by the Mimosa Steering Committee made up of members from Northern Land Council, CSIRO, Dept of Primary Industries, Parks and Wildlife Commission of the NT, Parks Australia North and an independent expert on human ecology. Parks Australia North administers this Program.

The Control Program aims to develop effective biological control of mimosa, while controlling its spread through ground and aerial control methods. Funding of \$800,000 for the work in 1996/7 has been allocated from the National Weeds Strategy.

Yours sincerely

John Hicks  
Assistant Secretary  
Parks Australia North

11 December 1996

19/12/96. —  
SEE CORRESPONDENCE  
FOLIOS 139-145.

Government  
Conservator  
Parks Australia North  
Coxes (New) Islands  
Indian Ocean 5799  
Tel: 081 538178  
Fax: 081 538880

The Australian Nature  
Conservation Agency  
was re-named the  
Biodiversity Group,  
Environment Australia  
on 15 November 1996.

Parks Australia  
manages the  
Biodiversity Group's  
protected areas  
responsibilities.



