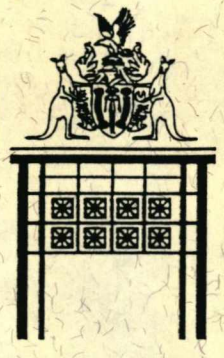

LEGISLATIVE ASSEMBLY OF THE NORTHERN TERRITORY

SESSIONAL COMMITTEE ON THE ENVIRONMENT

REPORT OF INQUIRY INTO MATTERS RELATING TO THE OCCURRENCE, SPREAD, IMPACT AND FUTURE MANAGEMENT OF *MIMOSA PIGRA* IN THE NORTHERN TERRITORY

APRIL 1997

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APRIL 1997

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FOREWORD

Mimosa pigra was introduced to the Northern Territory late last century. It became known as a weed in the early 1900s, but it did not have a major impact until the mid to late 1970s when it invaded the Adelaide River floodplain. It now occurs in wetlands from near the Fitzmaurice River in the west to Arnhem Land in the east, and on Bathurst Island.

Mimosa has many characteristics that make it very effective as a weed. Therefore, the task of finding and implementing a cost-effective long-term solution to the Territory's mimosa problem is a formidable one.

In 1978 it was realised that mimosa would never be eradicated from the Territory. A long-term plan was developed to carry out research into biological control and to integrate this with other methods such as herbicides, mechanical control, fire and ecological control. Much has been achieved and it is now opportune to realise the process of integrated control.

This inquiry generated a range of opinions and much valuable information from landholders and scientists. This will be useful in determining the direction for the future management of mimosa.

It is clear that the successful management of mimosa requires coordination of ideas, the use of specialist skills and the prudent application of resources. In particular, cooperation, tolerance and lots of patience are important.

On behalf of the Committee comprising Mr Peter Adamson (Member for Casuarina), Mr John Bailey MLA (Member for Wanguri), Mr Phil Mitchell MLA (Member for Millner), and Mr Maurice Rioli MLA (Member for Arafura) I would like to formally express my thanks and appreciation to all those people who appeared as witnesses or who prepared written submissions.

I am particularly grateful to Mr Ian Miller, specialist mimosa consultant to the Committee. He provided professional advice, analysed the information and ensured that the report was completed.

My thanks also go to Mr Graham Gadd, secretary to the Committee for administrative assistance.

Dr Richard Lim, MLA
Chairman

1. INTRODUCTION

1.1 Sessional Committee on the Environment

The Sessional Committee on the Environment is a Northern Territory Parliamentary Committee which was first formed by resolution of the Legislative Assembly on 30 November 1977. The appointment of an Environment Committee has been made at every subsequent new Session of Parliament or following a general election.

The Committee was originally established to inquire into, report on and make recommendations on all matters relating to uranium mining and processing activities, and their effects on Kakadu National Park.

Subsequently the Legislative Assembly decided that the Committee should have a wider responsibility for environmental inquiry in the Northern Territory. Hence, on 28 April 1987, the Terms of Reference of the Committee were amended to allow for any matter relating to mining and/or the environment to be referred to it by the Assembly or a Minister.

Members of the current Sessional Committee on the Environment are:

- Dr Richard Lim MLA, Chairman (Member for Greatorex);
- Mr Peter Adamson (Member for Casuarina);
- Mr John Bailey MLA (Member for Wanguri);
- Mr Phil Mitchell MLA (Member for Millner); and
- Mr Maurice Rioli MLA (Member for Arafura).

1.2 Terms of Reference

The Sessional Committee on the Environment has been empowered to -

"inquire into and from time to time report upon and make recommendations on:

(a) all matters relating to uranium mining and processing activities and their effects on the environment within the Alligator Rivers region; and

(b) any matter relating to mining and/or the environment within the Northern Territory which is referred to it by -

(i) the relevant Minister; or
(ii) resolution of the Legislative Assembly.

During the course of its inquiry the Committee is empowered -

> *"to send for persons, papers and records, to sit in public or private session notwithstanding any adjournment of the Assembly, to adjourn from place to place and have leave to report from time to time its proceedings and the evidence taken and make such interim recommendations as it may deem fit, and to publish information pertaining to its activities from time to time;*
>
> *to publish from day to day such papers and evidence as may be ordered by it, and unless otherwise ordered by the Committee, a daily Hansard be published of such proceedings to take place in public;*
>
> *to consider the Minutes of Proceedings, evidence taken and records of similar Committees appointed in previous Assemblies."*

Mimosa pigra **inquiry**

On 20 August 1996, the Minister for Primary Industry and Fisheries, Hon Michael Palmer, made a statement to the Legislative Assembly on the spread and impact of weeds in the Northern Territory. In doing so, he tabled a new Northern Territory Weeds Management Strategy, 1996-2005. The strategy has as its goal "to protect the Northern Territory economy, community, industries and environment from the adverse impact of weeds."

In his statement to the Legislative Assembly, the Minister referred to *Mimosa pigra* as a serious woody weed which, in Australia, occurs only in the Top End of the Territory. At the same time, he announced his intention to refer the issue of *Mimosa pigra*, to the Sessional Committee on the Environment.

Consequently, on 17 September 1996, in accordance with the Committee's Terms of Reference, the Minister for Primary Industry and Fisheries formally requested the Sessional Committee on the Environment, to investigate:

> **"matters relating to the occurrence, spread, future management and impact of *Mimosa pigra* in the Northern Territory with particular emphasis on:**
>
> - **future management options;**
> - **responsibilities of landowners and managers;**
> - **the appropriateness and effectiveness of Government programs;**
> - **regional and catchment differences; and**
> - **the national significance of *Mimosa pigra*."**

1.3 Procedure adopted by the Committee

A briefing by three officers of the Department of Primary Industry and Fisheries on 9 October 1996 provided the Committee with a broad outline of the issues to be investigated.

On 1 November 1996, the Sessional Committee carried out aerial inspections of mimosa on the Adelaide River floodplain, the East Alligator River floodplain near Oenpelli, and the Mary River floodplain.

In the Mary River area, ground inspections were also carried out. At Shady Camp, officers of the Department of Primary Industry and Fisheries gave presentations to the Committee on mimosa management at Oenpelli, in the Mary River catchment, and in other areas. These presentations gave the Committee an insight into the use of herbicides, mechanical control, fire, biological control, revegetation for the management of mimosa, and introduced the concept of integrated control.

At the same time the Committee had the opportunity to talk to representatives of Mary River landholders about the mimosa problem on their land.

These inspections and presentations gave members first hand exposure to the magnitude of the mimosa problem and the vulnerability of uninfested areas to invasion by mimosa. They also gave the Committee an insight into the type of operations required to control mimosa, and the knowledge that mimosa can be successfully managed, given sufficient resources for on-going control.

In October and November 1996, the Sessional Committee called for written public submissions on the future management of mimosa, by advertisement in the *Northern Territory News*. In addition, an article about the inquiry was published in *Working with the Wetlands*, the newsletter of the Lower Mary River Landcare Group Inc. Twenty one written submissions were received.

Further advertisements were placed in the media in January 1997 inviting submissions to public hearings on 4 and 5 February 1997. Twenty two witnesses gave evidence at the public hearings, four of which gave evidence in camera.

All submissions, both written and oral, were carefully considered in compiling the recommendations in this report.

2. EXECUTIVE SUMMARY

Mimosa pigra (mimosa) is a prickly leguminous shrub growing up to up to six metres tall. The native range of the plant is in tropical America. It was probably introduced to the Darwin Botanic Gardens in the 20 years prior to 1891, either accidentally with animals, in seed samples, or intentionally as a curiosity because of its sensitive leaves.

In Australia, mimosa occurs only in the Top End of the Northern Territory. It is an aggressive weed especially in the northern wetlands. It now occurs from near the Fitzmaurice River in the west to Arafura swamp in the east, and on Bathurst Island. The area of mimosa in the Territory has been estimated at 80,000 hectares.

Mimosa is nationally and internationally recognised as having serious environmental and economic impacts. On 17 September 1996 the issue of mimosa was referred to the Sessional Committee on the Environment by the Minister for Primary Industry and Fisheries.

Through written submissions and public hearings, landholders and persons involved in developing and implementing control programs impressed upon the Committee the importance of effectively managing the weed.

The inquiry revealed that much has been learnt about mimosa management over the past 32 years through research and practical application. This experience will be invaluable in planning and implementing any new strategy or plans.

The Committee's recommendations resulting from the inquiry relate to principles rather than details. Further details can be developed by the appropriate responsible bodies or persons that have been mentioned in this report.

While small infestations of mimosa can be eradicated to prevent its spread to new areas, most witnesses (landholder and scientist) agreed that mimosa will never be completely eradicated from the Northern Territory. Nevertheless, it is being, and can continue to be, controlled and contained.

The Committee agrees that the decision in 1978 to commence a biological control program on mimosa, and to eventually integrate it with other control methods, was the correct one. Therefore, the Committee recommends continuation of an integrated approach, as it is still the best long-term option for the management of mimosa in different land use situations.

The Committee is firmly convinced that the key principle for the effective management of mimosa at the Territory and national level is improved communication, coordination and cooperation, and an agreed approach to

the problem by all stakeholders. Establishment of a single Mimosa Advisory Committee, to take prime responsibility for developing and implementing a mimosa management strategy covering both Territory and national interests, will go a long way to achieving this.

New Northern Territory weeds legislation, which is currently being developed, will be an essential part of a cooperative approach. It will provide for improved management of mimosa and other weeds.

Landholders are responsible for the management of mimosa on their land. High priority must be given to the control of satellite infestations to prevent the further spread of mimosa.

However, all satellite infestations have a source and there is a need for strategic control of large infestations using an integrated management regime that is most appropriate for the land use. The integrated control of large infestations is also necessary to preserve biodiversity and to rehabilitate land required for livestock production.

It is recommended that the Mimosa Advisory Committee investigate the feasibility and practicality of establishing voluntary washdown stations in key areas to prevent the spread of mimosa.

Formation of catchment management groups, with an identified coordinator, and development of catchment and property management plans, will support implementation of the overall mimosa management strategy at the local level. These groups will also assist in identifying problem areas and in monitoring the success of control.

However, implementation of control at the local level requires assistance. The level of assistance will vary depending on the land use situation. It may be in the form of assistance through the Natural Heritage Trust, Green Corps, the Indigenous Land Corporation, the Mimosa Control Assistance Scheme, government control of satellite infestations in key areas, release of biological control agents, and technical advice on the preparation of mimosa management plans.

Of utmost importance for the management of mimosa is education and training. The public must be informed of the dangers of spreading mimosa and appropriate action to take when infestations are found.

The mimosa management strategy must be backed by a strong research and development effort, particularly into the integration of control methods. As there are different agencies involved, the Committee recommended that the research program be coordinated through a Technical Working Group which consults landholders in developing its program. Suggestions on areas of research have been made in the report, but there will be others that the Technical Working Group will, no doubt, develop.

A function of the Technical Working Group should be to monitor options for possible uses of mimosa.

A submission to the inquiry proposed that mimosa be harvested to extract vegetable tannins for the Australian and international leather tanning and wood product industries. The Committee supports the concept of research into the controlled harvest of mimosa for this purpose. This proposal may lead to a new industry for the Northern Territory and may also provide an alternative method of control that can be integrated with other methods.

Economic analyses and adopting the concept of tolerance levels of mimosa will assist landholders and administrators in making decisions on future management plans for different land use situations. Such analyses must take into account the value of conserving biodiversity as well as industry values.

The Committee recognises the logistical difficulties faced by landholders and government officers in controlling a fast growing weed in a tropical wetland environment. It is certainly not easy to control mimosa over large areas in a region of low human population density. The fact that economic returns from land use in mimosa infested areas are marginal does not help the cause of mimosa control.

Further developments in the effectiveness of cheaper control methods, such as biological control and integrated control, will improve the situation.

Despite the presence of mimosa in the Territory for over 100 years, it is still relatively restricted in its distribution. However, given the right conditions such as those that existed in the 1970s mimosa can spread very rapidly. Many areas throughout tropical and sub-tropical Australia are at risk from invasion.

Therefore, the nation and the Territory have a duty to protect the natural wetland environment, and the industries based on wetlands or irrigation, from the detrimental impacts of this weed.

3. RECOMMENDATIONS FOR FUTURE MANAGEMENT

3.1 Government Programs

3.1.1 Legislation

Currently there are two Committees for mimosa management. The Mimosa Steering Committee was established in 1991 to oversee a Commonwealth funded program for mimosa control on Aboriginal land and, subsequently, biological control. The Interim Mimosa Planning Group was established by the Minister for Primary Industry and Fisheries in 1996 to recommend a plan of action to protect the Territory environment from the adverse impacts of mimosa.

For maximum effectiveness, there must be coordination of the management of mimosa throughout its range. A new *Weeds Management Bill* has been drafted which should enable improved coordination and management of mimosa and other weeds.

The Committee recommends:

1. **That the draft *Northern Territory Weeds Management Bill* be tabled in the Legislative Assembly and enacted as soon as possible.**

2. **That a single Mimosa Advisory Committee be established on 1 July 1997 consisting of appropriately experienced or qualified persons, including landholder representatives.**

3. **That the above Committee be approved by the Minister for Primary Industry and Fisheries as a Weed Advisory Committee under the proposed *Northern Territory Weeds Management Act,* as soon as it is enacted.**

3.1.2 Program management

The knowledge base for the management of mimosa is constantly improving. A new Northern Territory Weeds Management Strategy was released in 1996, new weeds management legislation is about to be introduced and, in some respects, funding arrangements are changing.

The Committee is of the opinion that previous mimosa strategies and management plans require review. A single mimosa management strategy needs to be developed which can be used as a basis for planning and

funding by the Commonwealth Government, the Territory Government and other stakeholders.

The Committee recommends:

4. **That the proposed Mimosa Advisory Committee (Recommendation 2) prepare a 10 year mimosa management strategy for all lands in the NT which is consistent with the NT Weeds Management Strategy 1996-2005, the National Weeds Strategy and the proposed *NT Weeds Management Act*.**

5. **That the basic principle of integration of biological, chemical, mechanical, fire and ecological management of mimosa be adopted for all lands, where appropriate.**

6. **That in developing a new mimosa management strategy, the Territory and Commonwealth Governments consult all stakeholders and make recommendations for funding of research, strategic management and educational aspects from Commonwealth and Northern Territory Government sources, landholders and industry.**

7. **That administrators of funds for weed control in both the public and private sectors are made aware of the long-term nature of weed management and the need for long-term program funding.**

3.1.3 Control operations

The inquiry found general agreement between stakeholders that the control of satellite infestations is vital to prevent the spread of mimosa to clean areas. However, all satellite infestations have a source. Therefore, large infestations need to be strategically controlled using an integrated management regime that is appropriate for the land use situation.

The Committee recommends:

8. **That the highest priority be given to control of satellite infestations of mimosa in regions and catchments which pose the greatest risk of further spread to important environmentally susceptible regions and to areas of pastoral land. For example, at mimosa's eastern extremity in the Arafura swamp, at its south-western extremity in the Daly River/Port Keats Land Trust, on Stray Creek at Jindare Station and all isolated occurrences along roadsides.**

9. **That the survey and control function within the DPIF Weeds Branch be enhanced so that control of satellite infestations of**

mimosa in high priority areas can be re-instated to the level prior to 1991.

10. **That the weeds function within the Parks and Wildlife Commission be resourced at a level that allows it to effectively manage mimosa in its area of responsibility.**

11. **That survey and control teams in all government agencies coordinate with each other and landholders, and that the use of specialist weed control contractors be investigated for both private and public work.**

12. **That control of large infestations be carried out using integrated control methods that are appropriate to the specific situation.**

13. **That mimosa in areas that pose a high risk of spread by man and animals be quarantined under the proposed new NT weeds management legislation.**

14. **That the feasibility and practicality of establishing unstaffed, voluntary vehicle and equipment washdown stations in key areas be investigated by the Mimosa Advisory Committee.**

15. **That Commonwealth mimosa control programs be fully funded so that NT Government or other personnel are not removed from existing programs on mimosa or other weeds without being replaced.**

3.1.4 Government assistance

There is still uncertainty about the final outcome of biological control. Without assistance, many land holders will be faced with the prospect of doing little or no control, and mimosa will continue to spread.

The Committee recommends:

16. **That the Mimosa Control Assistance Scheme continue in its present form at no less than a 50% subsidy, pending a review.**

17. **That the Mimosa Control Assistance Scheme be reviewed by DPIF and consideration be given to monitoring outcomes of the assistance and the inclusion of other methods of control in the scheme, eg mechanical clearing of mimosa, fire, land preparation, pasture improvement, labour costs for ground control and biological control.**

18. **That a rolling five year management and funding program be developed by both government and landholders for the efficient management of the Mimosa Control Assistance Scheme.**

19. **That the Northern Territory and Commonwealth Governments improve the existing support for leasehold, private and Aboriginal landholders to control mimosa. This could take the form of:**

- **employment programs;**
- **use of the Natural Heritage Trust and "Green Corps" for control of mimosa on all lands;**
- **training in control techniques, including rearing and release of biological control agents;**
- **assistance with the preparation of mimosa management plans on properties and in catchment areas;**

20. **That where grant funds are provided for control of mimosa on Aboriginal Land, Aboriginal communities have improved access to long-term funding for labour, herbicides, vehicles and other equipment used in ground control.**

3.1.5 Research and development

The Committee is convinced that the decision made in 1978 to pursue biological control, and to eventually integrate it with other control methods, was the correct one. Major advances have been made which can be built on to progress the cause of long-term, cost-effective management of mimosa.

3.1.5.1 Research coordination

The Committee recommends

21. **That the Mimosa Advisory Committee appoint a Mimosa Technical Working Group consisting of persons with expertise in research and development of all mimosa control methodologies, and their integration for different land use situations.**

22. **That the Technical Working Group determine the need for incorporating ecological risk assessment into mimosa control programs and develop protocols for monitoring the environmental impact and effectiveness of control programs.**

23. **That the Technical Working Group design and implement a research program aimed at developing the integrated control of mimosa.**

3.1.5.2 Biology and ecology

The Committee recommends:

24. **That ecological studies be conducted to determine susceptibility of areas to invasion of mimosa and the potential impacts on flora, fauna and industries.**

25. **That studies be conducted to determine all factors influencing the revegetation of areas after control of mimosa, including the ability of native and introduced flora to compete with regenerating stands, and the desirability of the replacement flora.**

26. **That mimosa establishment in salt affected areas of the Mary River system be investigated and monitored, especially when barrages constructed to reduce salt water intrusion take effect.**

27. **That research be carried out into the revegetation of salt affected areas with salt tolerant plants which may prevent establishment of mimosa.**

3.1.5.3 Biological control

The Committee recommends:

28. **That the collaborative biological control program between CSIRO and DPIF continues to be funded by the Territory and the Commonwealth so that introduction and establishment of all potential agents can be completed.**

29. **That support by the Northern Territory Government for the mimosa biological control program be given beyond the introduction, release and establishment stage so that the collective damage of agents can be monitored and assessed over the next 10 years.**

3.1.5.4 Herbicides

The Committee recommends:

30. **That the proposed Mimosa Technical Working Group, or its delegate, maintain a register of herbicides that are or may be suitable for control of mimosa and make recommendations on trials for their assessment.**

31. **That monitoring the effects of herbicides on Northern Territory flora and fauna be continued for mimosa control programs, with funds provided by government and agricultural chemical companies where appropriate.**

32. **That Environment Australia reassess the environmental data on herbicides used for mimosa control, in particular the effects on aquatic flora and fauna and, if necessary, recommend tests on local species and use restraints.**

3.1.5.5 Integrated control

The Committee recommends:

33. **That the Territory Government and CSIRO collaborate in carrying out research into all aspects of the integrated control of mimosa, as determined by the Mimosa Technical Working Group.**

34. **That plans for re-vegetation of mimosa affected areas be developed, based on the results of research on ecological and integrated control.**

3.1.5.6 Economic analyses

The Committee recommends:

35. **That further economic analyses be carried out to determine the economic impact of mimosa and its management in different land use situations. The concept of tolerance levels of mimosa in different land use situations needs to be incorporated into these analyses.**

3.1.5.7 The use of mimosa

The Committee recommends:

36. **That the Northern Territory Government and landholders cooperate in research into the harvest of wild mimosa for extracting tannins.**

37. **That, if the commercial harvesting of mimosa proves to be a viable proposition, the Northern Territory Government, on advice from the Mimosa Advisory Committee, make recommendations for its controlled use under permit, as proposed in the new NT weeds management legislation.**

3.1.5.8 Mapping

The Committee recommends:

38. **That high priority be given to development of a system which allows for accurate mapping of mimosa and other weeds (locations and areas), including the storage of data on management practices adopted and the effectiveness of programs.**

3.1.6 Education and training

The Committee considers that education of the public on the dangers of spreading mimosa, on the management program, and on how the public can assist, is of the highest priority.

The Committee recommends:

39. **That the existing mimosa education program be continued, targeting students, remote communities, recreational fishermen, hunters, four wheel drive enthusiasts, tourists, road contractors, miners and all landholders.**

40. **That the education program aim at:**

- **the dangers of spreading mimosa to clean areas, and the need to be ever-vigilant for the plant;**
- **instilling an ethic of abstaining from driving through mimosa, and the use of vehicle washdown stations after unavoidably passing through mimosa;**

- appropriate action to take if isolated plants are found;
- expectations of the biological control program; and
- the value of integrated control.

3.2 Landholder Programs

The NT Weeds Management Strategy 1996-2005, and the proposed new weeds management legislation, emphasise landholder responsibility for weeds management.

The Committee recommends:

41. That pastoral, Aboriginal and government landholders continue to be responsible for management of mimosa on their land.

42. That landholders actively participate in development of the overall Mimosa Management Strategy (Recommendations 4 & 6), and catchment management processes (Recommendation 47).

43. That all landholders prepare property weed management plans, in accordance with the proposed weeds management legislation. These will include a responsibility to survey for, report and control satellite infestations of mimosa, to control traffic and other movements through mimosa infested areas on their property, and to wash down vehicles and equipment.

44. That all landholders adopt biological control, increase the integration of weed management into all land management, and adopt appropriate vegetation management to prevent initial invasion or reinfestation by mimosa.

45. That, when it is proposed to control large, dense infestations of mimosa, only as much area be controlled as can be financially maintained and revegetated.

46. That landholders actively participate in relevant education and training programs.

3.3 Catchment Issues

The Committee recognises that catchment management is desirable, but it requires the cooperation of all landholders. It may not always be successful because of the varying circumstances of individuals. It is more likely to be successful when the effectiveness of biological control improves.

The Committee recommends:

47. **That a mimosa management group be established in each catchment to develop mimosa management plans under the proposed weeds management legislation and to coordinate operational programs.**

48. **That, in each catchment, a locally acceptable person be identified to motivate landholders and to coordinate control.**

3.4 National Responsibilities

At present, mimosa infests a relatively small area of the Northern Territory, but it poses a threat to all of Australia's tropical wetlands. The damage that mimosa causes is clearly evident in the Northern Territory and in Asia. There is a need to preserve the natural Australian wetland resource for future generations, and to protect Australia's industries that are based on wetlands and irrigation.

The committee recommends:

49. **That the Territory and Commonwealth Governments ensure that mimosa management remains a significant part of any strategy or plan under the National Weeds Strategy.**

50. **That access to Commonwealth funds for control of mimosa be given for all areas of land, regardless of ownership.**

51. **That, if isolated infestations are found outside of the current area of distribution, on any land, funding assistance for eradication be given to the Territory or State where it occurs, with contributions by the Commonwealth and Territory or States as appropriate.**

SESSIONAL COMMITTEE ON THE ENVIRONMENT - REPORT INTO THE OCCURRENCE, SPREAD, FUTURE MANAGEMENT AND IMPACT OF MIMOSA PIGRA IN THE NORTHERN TERRITORY

(WHEN MR SPEAKER CALLS FOR PAPERS)

DR LIM

MR SPEAKER I LAY ON THE TABLE THE REPORT OF THE SESSIONAL COMMITTEE ON THE ENVIRONMENT INTO THE OCCURRENCE, SPREAD, FUTURE MANAGEMENT AND IMPACT OF MIMOSA PIGRA IN THE NORTHERN TERRITORY TOGETHER WITH WRITTEN SUBMISSIONS RECEIVED AND A COPY OF THE TRANSCRIPTS OF EVIDENCE TAKEN AT PUBLIC COMMITTEE HEARINGS ON THE 4TH AND 5TH FEBRUARY 1997.

DR LIM

MR SPEAKER I MOVE THAT THE REPORT BE PRINTED.

(WHEN MOTION AGREED TO)

DR LIM

MR SPEAKER I MOVE THAT THE ASSEMBLY TAKE NOTE OF THE REPORT.

PLEASE SIGN REPORT

4. BACKGROUND

4.1 The origin of mimosa in Australia

The native range of *Mimosa pigra* (commonly known as mimosa or giant sensitive plant) is in tropical America. How it came to occur in the Northern Territory is not definitely known, but investigations of old records suggest that it was probably introduced to the Darwin Botanic Gardens in the 20 years prior to 1891, either accidentally with animals, in seed samples, or intentionally as a curiosity because of its sensitive leaves. The intentional introduction of mimosa is possible because, at that time, large quantities of seed of various plants had been introduced to the Botanic Gardens from botanical and agricultural institutions in all parts of the world.

Studies of mimosa seeds have shown that in its native range there is a large genetic variation amongst mimosa populations. On the other hand, in the Northern Territory, mimosa is genetically uniform, suggesting that all Australian populations may have come from a single introduction. Mimosa was known to occur in Indonesia as far back as 1844 and there is evidence that populations in Australia are derived from those in Asia.

4.2 The biology of mimosa

Mimosa is a leguminous shrub growing up to up to six metres tall. The stems, branches, leaf petioles and rachis carry prickles 5 to 10 mm long. Mature leaves are 200-250 mm long with up to 15 pairs of pinnae, each composed of fine leaflets that are sensitive to touch (Figure 1).

The growth pattern of mimosa is related to seasonal fluctuations in rainfall, with a peak flowering and seeding period in the mid to late wet season. 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. The process from flower bud to ripe seed takes about five weeks. Seed pods are covered with bristles that facilitate floating and spread by water. The seeds themselves vary in colour from light brown, to brown, to olive green. They are 2.2-2.6 mm wide and 4-6 mm long.

Mimosa is hard seeded, meaning that after the seed becomes desiccated, germination depends on breaking down the impermeable seed coat. The half life of seed varies from 9.4 weeks at the surface of black cracking clay soils to 99 weeks at 10 cm depth. However, it has been observed that in sandy soils seeds can last for at least 23 years. Hence, it is generally recognised that on any soil, control measures need to be maintained for many years after eradication of mature plants.

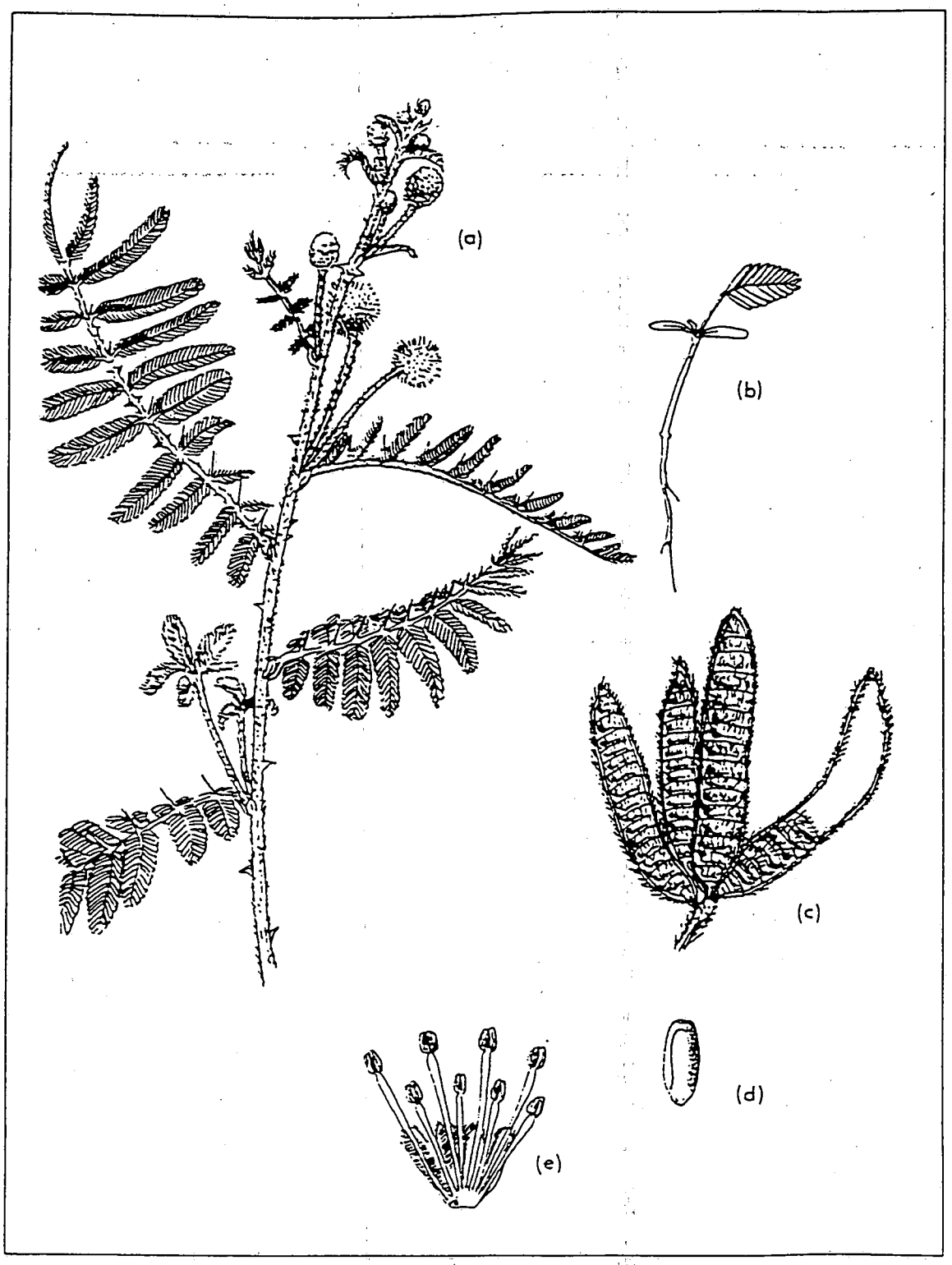

Figure 1. *Mimosa pigra* (a) part of flowering stem, (b) seedling, (c) pods, (d) seed, and (e) flower, opened out (a, d and e after Brenan 1959).

A typical stand density is about 1 plant per square metre and about 9,000 seeds per square metre of plant canopy are produced per year. However, isolated plants have larger canopy areas and can produce up to 220,000 seeds per year.

4.3 Distribution and spread

In Australia, mimosa occurs only in the Top End of the Northern Territory. Although it occurred in Darwin late last century, mimosa was not recorded outside of the Darwin city area until 1952 when it was first noticed upstream from the Adelaide River township. From there it spread downstream and, by 1968, it reached Marrakai crossing, later spreading onto the floodplain. Before the late 1970s, seed had also been carried away from the Adelaide River catchment to the Finniss River, Margaret River and Reynolds River. In the early 1980s it was recorded on the Daly River floodplain, on the Mary River, at Yellow Waters in Kakadu National Park and on the east Alligator River floodplain.

Mimosa now occurs from near the Fitzmaurice River in the west to Arafura swamp in the east, and on Bathurst Island (Figure 2). Close to the southern corridor from the Territory, infestations occur in the Pine Creek area. It is not widespread in most of Arnhem Land, and it does not occur on the Victoria River, Katherine River, Gulf of Carpentaria Rivers and most of the offshore islands.

The size of infestations varies between river systems, the largest infestations are on the Adelaide River (approximately 30,000 hectares), the Mary River, Finniss River and in the Daly River/Port Keats Land Trust. The area of mimosa in the Territory has been estimated at 80,000 hectares. This estimate was made in 1989/90 and has not since been revised. A far greater area is susceptible to invasion by mimosa than is currently infested.

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

Two factors were important in accelerating the spread of mimosa within a catchment during the 1970s and 80s. It is believed that overgrazing of the floodplains by uncontrolled feral buffalo herds prior to the late 1970s, combined with rapid spread of seed by water, led to the formation of dense, practically monospecific stands of mimosa. At specific sites, the sizes of infestations have been recorded to double in a period of about one to 1.5 years.

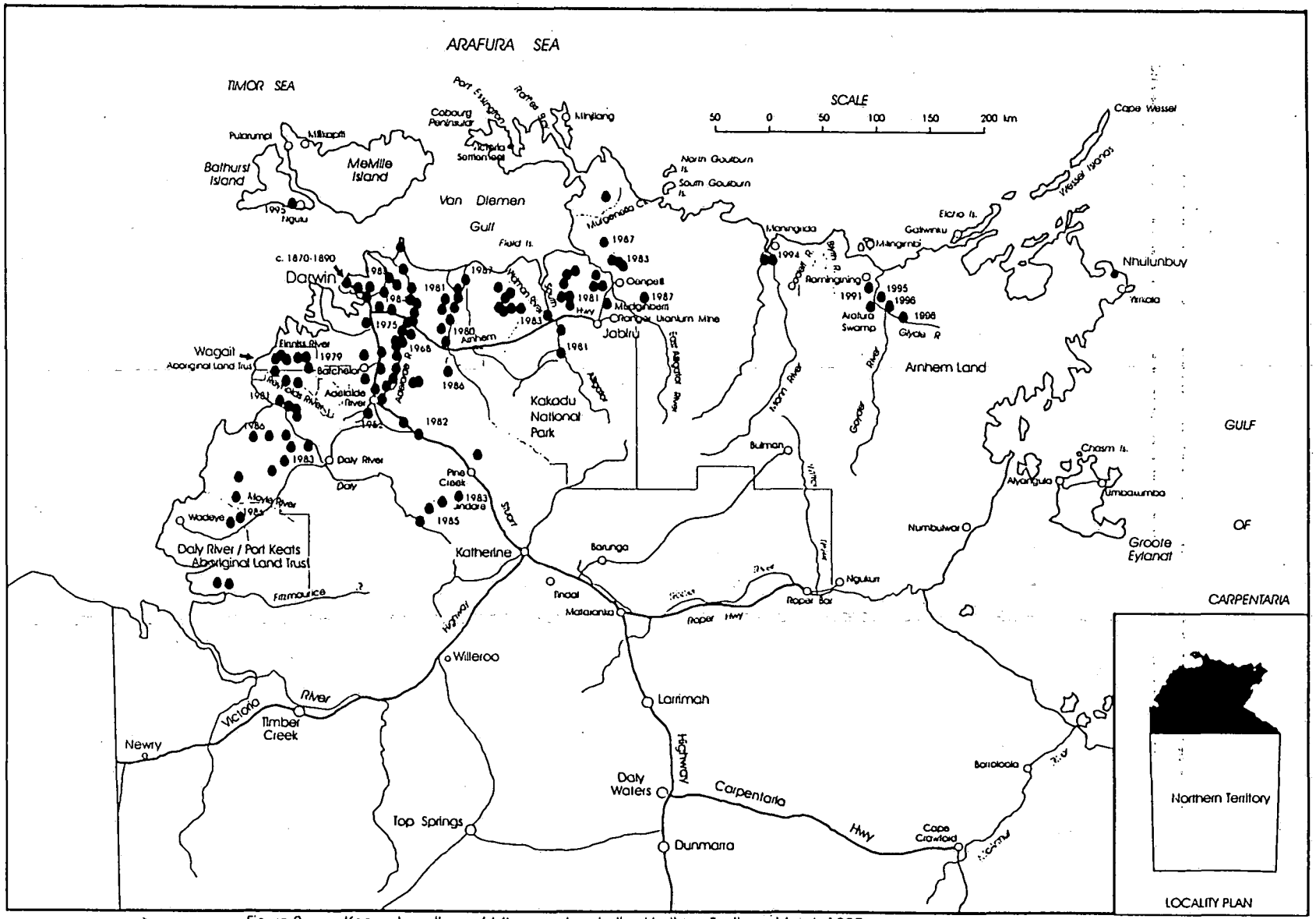

Figure 2. Known Locations of *Mimosa pigra* in the Northern Territory, March 1997 updated from Miller (1988) by G.J. Flanagan and L.A. Hills.

Spread from one catchment to another is by man and animals. Sand was removed from the Adelaide River before 1970 to use in concrete for railway and bridge culverts. This spread mimosa to the Batchelor - Rum Jungle area. Buffalo catching vehicles and other human movements spread seed to clean areas further afield. Mimosa is also spread by buffalo, cattle, feral pigs, horses and wallabies, and it has been speculated that spread occurs by birds. Buffalo nibble on mimosa, and seeds have been found in their dung, spreading the weed as they graze.

Within a catchment, spread of seed occurs during floods. However, it is believed that the large infestations are not spreading as rapidly now, due to removal of the feral buffalo during the Brucellosis and Tuberculosis Eradication Campaign (BTEC). This has resulted in increased competition for mimosa seedlings from pasture growth.

In addition, the cessation of issuing permits for sand removal in infested areas since 1970, publicity about the dangers of spread of mimosa by man, publicity requesting reports of new infestations, a roadside weed control program and control of satellite infestations has reduced the rate of spread of mimosa between catchments. But obviously it has not completely prevented spread as small new infestations continue to occur each year. For example, a single plant was found at Nguiu on Bathurst Island and treated in 1995, and new infestations were recorded in Arafura Swamp in 1996.

Mimosa can tolerate a range of conditions. It is both flood tolerant and drought resistant. While the favoured habitat of mimosa is the river systems and their associated wetlands, it will grow on a range of soils from sands to heavy clays. It is not restricted to wet lowland areas. This is evidenced by its growth on well drained roadsides and in other upland sites in the Territory, and by its growth in upland habitats overseas. It has been found at an altitude of 1,670 metres in Thailand, at 2,000 metres in Mexico, and in rainfall zones from 800 mm to 2600 mm.

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 and in Egypt, India, Indonesia, Papua New Guinea, Singapore, Thailand, Vietnam, Cambodia, Myanmar, Laos, the Philippines and Florida.

4.4 Impacts of mimosa

In the early years of mimosa's introduction, while still confined to the Darwin area, concern was expressed about its weed potential. In 1892, Holtze included *Mimosa rubricaulis* - probably a misnomer for *Mimosa pigra* - in a list of species which had become "comparatively numerous". There is a record of control being undertaken in the Darwin Botanic Gardens in 1913.

The weed potential of mimosa was further recognised after its spread to the upper Adelaide River and this is why a control program was initiated in 1965. However, the impact that we see today was not evident until after it spread to the Adelaide River floodplain in the early 1970s.

The present situation with mimosa was predicted. In 1978, when the infestation was relatively small (about 200-300 hectares), a Northern Territory Government Report stated: "...it won't be long before mimosa is located on the river systems and plains east of the Adelaide River. This will affect the potential of the pastoral, agricultural and tourist industries in the area. It will have a debilitating effect on the natural vegetation in reserves and national parks."

Mimosa is generally believed to invade disturbed areas, but it has been known to invade pristine sites. Dense 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 the biodiversity of flora and fauna, and reduces the wilderness value of these areas. Hence, mimosa has an impact on the tourist industry. Mimosa is said by many to be the most serious environmental issue facing the Northern Territory. Economic impacts of mimosa are further discussed in Section 5.5.2.6.

That mimosa was having impacts on the tourist industry was demonstrated in 1982 when the Tourist Commission lobbied the Territory Government to clear a wall of mimosa from north of the Arnhem Highway because it blocked the view of wild herds of buffalo grazing on the Adelaide River floodplains. Even before that time, mimosa had affected the operations of a river safari on the Adelaide River and its tributaries. Part of the area was removed from the safari program because mimosa prevented access and reduced visibility of the wildlife - both native and introduced.

On Aboriginal land, mimosa disrupts and poses a threat to the traditional Aboriginal way of life such as hunting and food gathering. It also has a potential impact on Aboriginal economic development, for example tourism, livestock enterprises and the commercial use of wildlife using wetland resources.

Other detrimental effects of mimosa, which have not yet been realised in Australia, are well illustrated in Thailand where it is spread over a greater geographic area than in Australia, in a more complex land use situation and in an area of far greater human population density.

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. Even in its native Mexico it has been the subject of control by cutting and the use of herbicides.

4.5 Uses

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. Mimosa has a high protein content and studies have been carried out to evaluate its use as a substitute for *Leucaena leucocephala* in animal feed.

Samples of fibre board have been made from the wood in Thailand. However, the board was found to absorb an unacceptable amount of moisture for commercial use and the additional chemical treatment to prevent this was expensive. It has also been used as a novelty and medicinal plant.

In areas where mimosa grows profusely it increases the soil fertility and redistributes nutrients from the lower soil profile to the surface. This may have benefits for establishing native or introduced vegetation after clearing mimosa.

Recently, the harvesting of mimosa to extract vegetable tannins has been proposed (Section 5.5.2.7).

5. THE APPROPRIATENESS AND EFFECTIVENESS OF GOVERNMENT PROGRAMS

5.1 Legislation

5.1.1 The current Act

Weed management in the Northern Territory is administered by the Northern Territory Government through the Department of Primary Industry and Fisheries.

The current weeds legislation is the *Northern Territory Noxious Weeds Act 1962*. Under this Act, mimosa is declared as a Class A noxious weed (to be eradicated) south of 14° S latitude, a Class B noxious weed (spread to be controlled) north of 14° S latitude and a Class C noxious weed (not to be introduced to the Territory). Responsibility for weed control can be delegated to landowners, managers or occupiers, but landholders are not required to carry out control unless a notice is issued. Many deficiencies have become apparent with implementation of this Act and it is has been the subject of review since July 1995.

Deficiencies include:

- no provision for a formal consultative mechanism between land managers and government on the issue of weeds;
- poor definition of responsibilities of private landholders, leaseholders and government;
- no-one is legally bound to do anything unless a notice is issued. i.e. there is no general duty to control weeds;
- apart from hay and animal fodder, there is no reference to the prime distributors of weeds: livestock, vehicles, machinery, boats, seeds for sowing, soil and other materials, and no action can be taken against persons importing or moving such items when contaminated with weeds;
- there is no provision for quarantine areas;
- there is no mention of penalties for intentional propagation, distribution and sale of weeds;
- there is no provision for the legitimate use of a weed;

Because of these deficiencies and the presence of uncontrolled noxious weeds on Crown Land adjacent to other land, the *Noxious Weeds Act* has

been ineffective and it has not frequently been applied. At times it has been used for weeds such as salvinia, devil's claw and Noogoora burr, but it has only once been successfully applied to mimosa.

5.1.2 New weeds legislation

Landholder responsibility for weed management is a key element of the Northern Territory Weeds Management Strategy 1996-2005. An objective under the strategy is to provide appropriate legislation for weed management. The Committee was provided with a copy of the draft *Northern Territory Weeds Management Bill* which is expected to be tabled in the Legislative Assembly during 1997.

The Committee agrees that provisions in the draft Bill will provide for improved management of mimosa and other weeds in the Northern Territory and urges that the Bill be tabled as soon as possible. The draft Bill strengthens the principle of landholder responsibility for weed management and binds the Crown.

Some of its proposed provisions are as follows:

◊ The Minister may declare a plant to be a weed and classify it for the purpose of preventing its entry to the Territory or for its management within the Territory.

◊ It is proposed that land owners and occupiers will have a general duty to prevent their land being infested with weeds, and to prevent weeds spreading to other land.

◊ Unless a permit is issued, there will be penalties for any person bringing a weed into the Territory; for propagating, selling or hiring a weed, or anything that contains a weed; for storing, growing or using a weed; and for transporting a weed or anything that contains or carries a weed, unless it is in a sealed container and being carried for identification.

◊ It is proposed that Weeds Advisory Committees be established by the Minister for Primary Industry and Fisheries for regions, districts or catchments, or for specific purposes such as the management of mimosa.

◊ Weed Management Plans, to be approved by the Minister, can be developed by a Weed Advisory Committee or the Minister. The plan can be for the whole of the Territory or part of the Territory, for example in a particular catchment or region.

◊ Before approving a Weed Management Plan, the Minister will seek comment by publishing the proposal in a newspaper, specifying where the proposed plan can be inspected.

◊ Where a landholder fails to comply with a plan, the person may be directed to comply with the plan, or submit a remedial weed management plan for the property.

◊ In the case of non-compliance, penalties can be imposed or the work may be carried out by a weed management officer or an authorised person, the cost of which will be a debt payable by the landholder.

◊ Remedial weed management plans will be registered on the title records and be binding on a mortgagee in possession of the land and on successors in title to the land.

◊ There is provision for establishing quarantine areas to impose restrictions on the movement of persons, animals, vehicles and machines etc into, or out, of weed infestations. Cleaning areas can also be gazetted.

◊ Other proposed provisions are:

- emergency weed management plans;
- a requirement for owners or occupiers of land to notify the Minister in writing of a plant or weed;
- permits to use weeds which may require lodgement of a bond as security against cost and expenses that may be incurred to prevent the spread of a weed;
- prohibition of cutting of weeds in certain areas; and
- high penalties for moving animals, vehicles and other items containing or carrying a weed.

5.1.3 Mimosa Advisory Committee

There are currently two committees for mimosa: The Mimosa Steering Committee and the Interim Mimosa Planning Group. The Mimosa Steering Committee, with Territory and Commonwealth representation, was established in 1991 to oversee a Commonwealth funded program on control of mimosa on Aboriginal land and, more recently, for overseeing investigations into biological control. Representatives include the Northern Territory and Commonwealth Governments, the Northern Land Council and a human ecologist.

The Interim Mimosa Planning Group was established by the Minister for Primary Industry and Fisheries in 1996 as a precursor to a committee that could be established under proposed new NT weeds management legislation. Current membership of this group is the Chief Executive Officer of the

Department of Primary Industry and Fisheries, the Chair of the National Landcare Advisory Committee and a Northern Territory Land Management Consultant. This group aims to identify and recommend a plan of action to protect Territory industries and the environment from the adverse impacts of mimosa.

For maximum effectiveness, there must be coordination of the management of mimosa throughout its range and within catchments. Given the recognition of mimosa as a weed of national significance under the National Weeds Strategy and its importance to NT industries and the environment, it is appropriate that a specific purpose Mimosa Advisory Committee be established under the new NT weeds legislation to oversee the management of mimosa throughout the Territory.

The Committee sees the functions of the Mimosa Advisory Committee as:

- being responsible for implementing recommendations from this inquiry;
- developing a mimosa management strategy in consultation with all stakeholders;
- taking prime responsibility for implementation of the mimosa management strategy;
- advising the Minister for Primary Industry and Fisheries on matters relating to the management of mimosa;
- advising Commonwealth agencies on matters relating to the management of mimosa and taking responsibility for Commonwealth funded projects.

It has already been anticipated by the Department of Primary Industry and Fisheries (DPIF) and the Mimosa Steering Committee that, at some stage in the future, there will be one committee with broad representation to manage mimosa. However, as mentioned in Section 7.2, catchment management groups are recommended for coordinating a plan within a catchment.

The Committee recommends:

1. **That the draft *Northern Territory Weeds Management Bill* be tabled in the Legislative Assembly and enacted as soon as possible.**

2. **That a single Mimosa Advisory Committee be established on 1 July 1997 consisting of appropriately experienced or qualified persons, including landholder representatives.**

   (Explanatory note: This committee will incorporate the existing Mimosa Steering Committee and the Interim Mimosa Planning Group, but will not be limited to representatives of those committees).

3. **That the above Committee be approved by the Minister for Primary Industry and Fisheries as a Weed Advisory Committee under the proposed *Northern Territory Weeds Management Act*, as soon as it is enacted.**

5.2 Program management

5.2.1 Basic principles of management

The Committee was informed that the mimosa infestation is one of the most serious environmental issues facing the Northern Territory and that the Territory Government must become serious about its control. It is a community problem affecting industries and the environment across the Top End.

However, most witnesses agreed that the eradication of mimosa, in terms of zero population throughout its range in the Territory, is an unattainable goal and it is not economically feasible.

Views on the management of mimosa expressed to the Committee varied from two extremes: from spending large sums now, in a BTEC type program costing more than $100 million to control existing stands; to doing basic research to understand the problem before dealing with it.

The Buffalo Industry Council proposed an integrated program based on the Oenpelli experience, using chemicals, fire and mechanical control to knock down the existing problem, followed by grazing, re-establishment of native or introduced pastures, and biological control agents to maintain control. A similar principle of using biological control in this way was proposed by biological control scientists.

While mimosa occurs on treeless floodplains that are accessible to aerial application of herbicides, there are many other areas across mimosa's range where access is very difficult from the air and from the ground, and from where mimosa would certainly never be eradicated. For example, access through mimosa in the large stands of paper bark on the Finniss River is extremely difficult for ground teams, and aerial treatment of the area with herbicides would have unacceptable impacts on the surrounding vegetation.

Similarly, eradication of mimosa in the woodland areas of upper catchments of most rivers could only be carried out from the ground and would be unsuccessful except at the local level. The end result would be on-going control - this being different from eradication. Such a program across the range of mimosa would eventually cost more than BTEC.

On the other hand, the Committee realises that the alternative of doing nothing or very little, while basic research is carried out, is also not a feasible option when, right now, mimosa is still spreading and it is impacting on people's lives, their income, industries and the environment.

In assessing the basic principle of past program management, the Committee has relied on historical references (Sections 5.3.1 and 5.5.1). In retrospect, there seems to have been a sorry tale of neglect of the mimosa problem in the 1960s and 70s, despite warnings and requests to government for resources going back to at least 1966.

Fortunately, it was recognised at least 19 years ago that biological control of mimosa offered the best long-term and cost-effective method for managing the situation that existed, and its predicted expansion. Already there has been integration of herbicides with mechanical control, fire and revegetation, and the release of biological control agents.

In terms of an overall program, the time is opportune to test the long-standing recommendation of integration of biological control with these other methods in order to attain long-term, cost-effective management of the problem.

In summary:

- *While most witnesses agreed that the outcome of the Oenpelli program was successful, and the methodology used was appropriate at the time (Section 5.3.4), the Committee believes that a large scale chemical/ mechanical/ fire type operation, similar to that carried out on about 7,000 hectares of mimosa at Oenpelli, is not appropriate throughout the range of mimosa, nor is it sustainable on cost grounds. Nevertheless, these same methods are still appropriate for controlling mimosa in specific cases, eg for preventing spread to conservation areas or in areas used for grazing.*

- *The Committee commends the decision made by DPIF and the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in 1978 to cooperate in biological control research from 1979/80, and to then aim for a strategy based on integrated control with control of satellite infestations to slow down its spread. This is the basis of the program and has laid the foundation for an effective long-term solution to the problem.*

- *As a result of this early initiative, the Committee believes that there is no need for a major change to the basic principles of the existing program.*

- *However, with the release of the NT Weeds Management Strategy 1996-2005, and developments in research, funding arrangements, land use, economics of the live cattle export trade and the number of agencies involved with mimosa, there needs to be a change of emphasis in the program as outlined in recommendations below. The program needs to be continued and expanded.*

◊ *At the same time, we must look towards alternatives to the traditional methods of controlling mimosa such as the commercial harvesting of mimosa and its integration into the control program (Section 5.5.2.7).*

5.2.2 Mimosa Management Strategy

Throughout the 1980s and 90s, strategies developed for the overall management of mimosa have had the common theme of integration of biological control with other control methods.

Action Plans have dealt with managing the problem at a local level and have been more specific in the methods used. For example, in 1991 a Public Environment Report was developed for mimosa control on Aboriginal Land. In 1993 an Action Plan was first prepared under the draft National Weeds Strategy, relating to the containment of mimosa within the Territory and removing it from important conservation areas.

In view of the changing knowledge and opinions on the management of mimosa, and the pending introduction of a new *Weeds Management Act* for the Territory, the Committee agrees that it is appropriate to review previous strategies and plans to meet today's needs.

The Committee was informed that a national mimosa management strategy is currently being developed by the Mimosa Steering Committee in context of the approved National Weeds Strategy. This draft strategy will be put to the Interim Mimosa Planning Group for comment, and finally to the National Weeds Strategy Coordinating Committee for funding considerations.

Witnesses from the two existing mimosa committees agreed that a single mimosa strategy that has the approval of all stakeholders is needed.

The strategy should adopt and build on the basic principles of the existing program.

In some areas, pastoral land borders onto Aboriginal land and National Parks. Therefore, the strategy must have be a balance between the needs of pastoralists who rely on the land to produce income, the need to conserve biodiversity and the needs of the general community who utilise floodplains for recreation and tourism.

This balance may seem difficult to achieve when some of the tools used in an integrated control program may be incompatible with certain land uses. However, if the persons developing mimosa strategies and management plans are given maximum exposure to alternative points of view, this will go a long way to resolution of problems that may arise.

It is therefore essential that the national mimosa strategy is derived from the Territory and that all stakeholders, especially those that are personally affected by mimosa, have an input.

Mimosa management plans for specific catchments or areas will underlie the strategy (Section 7.2).

It is envisaged that the strategy would be used as a basis for determining funding by the Commonwealth, the Territory Government and landholders.

The Committee recommends:

4. **That the proposed Mimosa Advisory Committee (Recommendation 2) prepare a 10 year mimosa management strategy for all lands in the NT which is consistent with the NT Weeds Management Strategy 1996-2005, the National Weeds Strategy and the proposed *NT Weeds Management Act*.**

5. **That the basic principle of integration of biological, chemical, mechanical, fire and ecological management of mimosa be adopted for all lands, where appropriate.**

   (Explanatory note: Within catchments, targeting of satellite infestations and the most appropriate form of integrated control for large infestations will be determined in the mimosa management plans to be developed by catchment groups - Section 7.2).

5.2.3 Program funding

The Lower Mary River Landcare Group made strong representation to the Committee for Commonwealth funds to be made available for mimosa management across all areas of land, regardless of ownership, due to the weed's potential to be a national problem.

At present, the Territory and Commonwealth Governments and landholders all contribute funds to the management of mimosa.

The Commonwealth Government provides funds for control on Aboriginal Land, in Kakadu National Park, for research into biological control and ecology, and for environmental monitoring of control programs on Aboriginal land. The Territory Government contributes to control on all lands, to the Mimosa Control Assistance Scheme, education, training and to research.

Landholders fund their own programs with government assistance.

The Committee was informed that the Commonwealth Government has introduced Natural Heritage Trust legislation. The trust represents an investment in natural resource management activities covering conservation, repair and replenishment of Australia's natural resources. Assistance will be

delivered through four components: community groups, regional strategies, national partnerships and the Commonwealth.

The Committee was informed that a large proportion of the Natural Heritage Trust will be delivered through Partnership Agreements negotiated between the Commonwealth and each State/Territory. The guidelines for such agreements are still being determined, but indications are that government and non-government organisations and industry will be eligible to apply.

Applicants will be expected to contribute one dollar in cash or in kind for every one dollar provided by the Natural Heritage Trust. Projects should work towards developing support systems that assist integrated regional approaches; be consistent with strategies for the area concerned; and be consistent with State/Territory and national objectives. Projects may include development of strategic weed control plans and their implementation, and for training and education aimed at increasing general community awareness.

Apparently funding will not be available for research because it is considered to be available from other sources. Research is essential and the Natural Heritage Trust should consider supporting this aspect in the overall management of mimosa.

Given the national significance of mimosa (Section 8), there appears to be scope for Territory agencies and industry to foster partnerships with the Commonwealth Government on the mimosa problem through the Natural Heritage Trust. A partnership agreement would be suitable for funding some of the recommendations from this inquiry which pertain to development of catchment plans, their implementation, education and training.

In addition to the partnership agreements, there will be a Commonwealth component where there are Commonwealth or national priorities to be addressed. It is logical that part of the work necessary to fulfil a mimosa strategy would fit under a Commonwealth component. For example, in preventing the spread of mimosa to other parts of Australia, and protecting areas of national and international significance (Section 8).

All involved in mimosa control are well aware of the long-term nature of the task, the personal and financial commitment that is necessary for on-going control, and that short term programs are useless and a waste of resources. The need for a long-term funding commitment must be conveyed to those people who administer the funds for weed management, whether they be in private enterprise or government.

The Committee recommends:

6. **That in developing a new mimosa management strategy, the Territory and Commonwealth Governments consult all stakeholders and make recommendations for funding of research, strategic management and educational aspects from**

Commonwealth and Northern Territory Government sources, landholders and industry.

7. **That administrators of funds for weed control in both the public and private sectors are made aware of the long-term nature of weed management and the need for long-term program funding.**

5.3 Control operations

5.3.1 Historical perspective

The earliest record of control action on mimosa was in the Darwin Botanic Gardens in 1913 when it was being controlled along with other noxious weeds.

Outside of Darwin, control by the Commonwealth Government first commenced in 1965 on the upper Adelaide River. It was a typical catchment management approach and was highly successful within the area where sufficient resources were applied, but the project failed due to spread from below the control area.

The plan was to eradicate mimosa 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 prevented plants seeding within the 35 km control area, but plants continually reappeared from previously deposited seed further downstream. Hence, the infestation spread from seeding plants below the control area. There was no landholder input at that time.

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 with the available resources. However, a reduced program continued, being aimed at slowing the spread of mimosa. Again, the resources applied were not sufficient for the program to be fully effective and, in 1974, a further proposal was put to the Commonwealth Government for a full-scale eradication program costing $647,500 over 12 years. It was not approved and mimosa continued to spread.

Since 1972, the program has been based on eradicating new satellite infestations to slow down the spread of mimosa to new areas and roadside control for the same purpose. This program was inherited and continued by the NT Government after self-government in 1978.

It was at that time that a greater interest was shown in political circles about doing something about the escalating mimosa problem. It was realised by that stage that the opportunity for complete eradication of mimosa from the

Northern Territory had been lost and was not feasible, but that much could be achieved to control and contain the weed. It was from then that the plan of using biological control agents, integrated with other control methods, was born.

The policy adopted was that satellite infestations away from the Adelaide River would be controlled, as well as roadside infestations and no attempt would be made to control large infestations such as on the Adelaide River floodplain. It was planned to leave this for biological control.

That circumstances have prevailed, over the past 19 years, where this policy has been varied to control some large infestations away from the Adelaide River, was due to the wishes of landholders to control the weed, the need to prevent spread from the infestation at Oenpelli to Kakadu National Park and to the rest of Arnhem Land, and the need to prevent its south-west spread within and from the Daly River/Port Keats Land Trust.

After initiation in 1985 of what is now called the Mimosa Control Assistance Scheme, some larger infestations were treated in conjunction with private landholders.

The Territory and Commonwealth Governments now carry the major burden of cost for mimosa control on lands other than private land, eg in National Parks, reserves and Aboriginal Land. But, for a long time, going back to 1965, the Commonwealth and Territory Governments carried out control on pastoral land with no input by landholders.

The Parks and Wildlife Commission of the NT has partly controlled mimosa in its reserves, and the NT Land Corporation funded control at specific sites, as has the Power and Water Authority at Darwin River Dam. Commonwealth funds and staff have managed mimosa in Kakadu National Park. Other Commonwealth instrumentalities such as the RAAF and Navy have funded mimosa control on their land.

5.3.2 Difficulties with control

The Committee was informed of the difficulties associated with control of mimosa which have affected the outcome of control operations. It is important to consider these in developing future strategies and control options. Many difficulties can be overcome by financial resources and technology.

◊ Characteristics of the plant make it difficult to control, especially when using chemical, mechanical and ecological methods:

- It grows up to six metres in height.
- Its prickly nature and choking growth make access into infestations extremely difficult.

- The plant grows rapidly, flowers quickly and seeds all year round under favourable moisture conditions.
- It produces large quantities of seed, many of which remain viable for long periods.
- There is uncontrollable spread on floodwaters, and by native and feral animals.
- Mimosa prefers wet habitats, but it is also drought tolerant. In wet areas, specialised equipment is necessary for access.
- The fact that mimosa shades out understorey vegetation, means that competitive plants are of little use for control unless the dense growth is firstly controlled by other means.
- Some infestations can be several kilometres across. Because of its height and density, the application of herbicides from the ground is prevented. The only practical way of applying herbicides to large infestations is from aircraft.
- Mechanical control of green mimosa by way of chaining is not very useful because plants are pushed over, but many are not killed.
- The dense growth and lack of understorey vegetation means that, in many cases, fires stop soon after passing into dense infestations. Prior chemical or mechanical treatment will improve the burn. Green mimosa that has been burnt generally re-grows rapidly from the base and stems after fire.

◊ Socio-economic factors have not been conducive to control:

- Lack of intensive agricultural or pastoral development in the region, and low returns per unit area of land, mean that landholders are loath to control the plant without assistance. Under more intensive land use, weed control would be carried out as an integral part of land preparation for crops and pastures.

- Infrastructure. Lack of roads and tracks near to rivers results in access problems to isolated plants and larger infestations on river banks in upper catchments, especially in the wet season.

5.3.3 Satellite infestations

Over the past 25 years, large numbers of satellite outbreaks have been controlled by chemical and physical means. Roadside control has also undoubtedly reduced the spread of mimosa to clean areas. However, due to the long dormancy of seed it is not possible to declare that mimosa has been eradicated from an area, except in areas of small, immature infestations where this has been achieved.

It was put to the Committee that while mimosa may seem to be out of control, had the Government control program not been carried out over the past 25

years, it is almost certain that mimosa would now occur over a much wider area than it does, and would have a far greater impact.

The value of roadside weed control is often underestimated. For example, many do not know that mimosa has been found along the Stuart Highway in the area from near Hayes Creek to Darwin since the early 1970s, and beside the Arnhem Highway since 1975. In a similar situation in Thailand, before control was initiated around Chiang Mai, there was a hedge of dense mimosa beside most roads within the infested area. This has not occurred in the NT because mimosa on roadsides has been controlled since the 1970s in order to prevent its spread by carriage on vehicles.

A witness from DPIF stated that there are areas at the tops of catchments where they have been working strategically for a number of years. One of these is the Mary River system where control commenced in 1980. Control of satellite infestations has been undertaken for many years, protecting large areas of plain. Unfortunately, large infestations of mimosa developed downstream, independent of the smaller infestations upstream.

It is fortunate that no large infestations of mimosa developed in Kakadu National Park before it was declared as a park. Control of satellite infestations in the park has proven to be highly effective in keeping the floodplains clear by using dedicated weed teams.

A submission by the Lower Mary River Landcare Group stated that government programs have managed to hold infestations in most areas, but there is no real visible effect of winning except at Oenpelli where millions of dollars were spent. It is the visibility of large scale control programs that attract attention, while the value and result of protecting large uninfested areas by controlling satellite infestations goes unnoticed and is not easily documented.

In Arnhem Land, the control of outlying infestations is helping to prevent the further spread of mimosa.

Statements were made that there seems to be a lack of government commitment to the problem. Concern was expressed that there has been a downgrading of the NT Government work-force involved in the location and treatment of scattered plants due to servicing of operations on large infestations and lack of replacement personnel. For example the Commonwealth funded program on mimosa at Oenpelli took staff resources away from control of isolated infestations in the Mary and Reynolds Rivers and in the Daly River/ Port Keats Land Trust. This must be addressed in project proposals so that control of satellite infestations is maintained.

The Committee concluded that:

- *The basic approach being recommended by witnesses, in terms of the necessity of control of satellite infestations, is the same as that proposed 25 years ago and must be continued.*

- *Any lack of effectiveness of control of satellite infestations in some areas in past years is a cumulation of the magnitude of the task, insufficient funding at key times during the history of mimosa's spread and lack of continuity of programs.*

- *Recognition must be given to the fact that the overall government control program has been a factor in effectively slowing the spread of mimosa and has been instrumental in preventing its spread to Queensland and Western Australia.*

- *The Committee therefore believes that the government program in control of satellite infestations has, and is continuing to have an impact, but that the program can be improved.*

5.3.4 Large infestations

The Committee heard of "large-scale chemical control programs" on core infestations. These "core" areas occur and have been controlled on pastoral leases, Aboriginal land and conservation reserves.

A problem with using herbicides, mechanical control and fire for control of core infestations is the high cost and the risk of environmental damage.

There was criticism of these large-scale programs in that they are hard to justify in terms of economics, but may be justified on social or political grounds. It was also asserted that this work came at the expense of control of satellite infestations.

Despite claims of large-scale chemical control programs on mimosa the Committee estimated that at any one time, and at its maximum during the height of the Oenpelli program, chemical control is carried out on no more than about 10% of the total infestation in the Northern Territory. This leaves a far greater area available for control by other methods.

In November 1996, the Committee inspected two large mimosa infestations to which control had been applied. The Committee made an aerial inspection of the Oenpelli project and compared it with photographs of the area that were taken before control occurred. A ground and aerial inspection was made of a project at Sampan Creek in the Mary River system. Similar control methods were used at each site.

The Oenpelli infestation was the largest east of the Mary River. The control program was the largest of its kind ever undertaken on mimosa and was funded by government. Therefore it is essential that the outcome of the project be considered by this Committee in assessing the appropriateness and effectiveness of government programs.

The Commonwealth Government approved funding for a chemical and mechanical control program to commence near Oenpelli in 1991. It included chemical and mechanical control with some burning of the main infestation, and chemical control of satellite infestations. A Mimosa Steering Committee was responsible for overseeing the program.

The proposal was for a five year program with a review after the initial three years. The aim was to prevent the spread of mimosa westwards into Kakadu National Park and eastwards into Arnhem land. Justification for the program was that in these areas mimosa was having, or had the potential to have, an impact on biodiversity, the traditional Aboriginal way of life, tourism, recreation and commercial enterprises based on wetlands which would assist Aboriginal people to achieve greater economic independence.

During its inspections, the Committee was impressed with the control obtained and the amount of revegetation. However, evidence was given during the public hearings that the vegetation that had returned was not what it seemed. It was from primary colonisation and much desirable vegetation had not returned.

Witnesses, including a representative of the Northern Land Council agreed that the Oenpelli program achieved its objective. It was effective in terms of clearing mimosa from the floodplain and reducing expansion of the weed. It was stated that the floodplains are once more a resource for the Oenpelli community.

An independent consultant's review of the Mimosa Steering Committee's activities, carried out in 1995, determined that the activities at Oenpelli have almost certainly provided net benefits to the community at large, subject to important caveats such as lack of quantitative indications of costs and benefits, and the need to maintain control. It was reported that no known alternatives other than any which might be identifiable in hindsight were reasonably available to the Mimosa Steering Committee, and there was no responsible option but to tackle the Oenpelli infestation using aggressive and large scale, heavy duty action.

CSIRO Division of Wildlife and Ecology was responsible for environmental monitoring of the program at Oenpelli. In 1996, it was reported that the Oenpelli program was beneficial in preventing the spread of mimosa in Arnhem Land, that it reduced the main infestation to isolated mature plants and scattered stands of regrowth and seedlings, that herbaceous vegetation had returned and that native fauna had re-established. Options for Aboriginal land use in the area were restored.

However, application of herbicides at Oenpelli resulted in some deleterious environmental impacts. These included the death of *Melaleuca* trees in 4 km^2 of forest, but it appears that these will return unaided, given particular conditions. In addition, some small areas of scalded soils occurred in the floodplain margins which were considered to be within the limits of acceptable deleterious consequences.

Despite achievements of the program, the CSIRO report was highly critical of the program management. In addition statements were made to the Committee about the high cost of the program and its economic worth, the problems that arose in its implementation, the need for on-going chemical control and the lack of integration of biological control into the program.

Documents available to the Committee show:

- that the program was developed cooperatively by Commonwealth and Northern Territory agencies. The high cost of the program was known at the time it was developed and at the time of its approval by the Commonwealth;

- that justification for the program was based on ecological and socio-economic reasons rather than purely economic;

- that the 1991 Public Environment Report, which preceded the program's approval, did not state that there will be no requirement for control beyond five years;

- that the need for several applications of herbicides, and a need for the on-going use of herbicides until biological control is effective, was stated in the Public Environment Report;

- that damage of some native vegetation was foreseen in the Public Environment Report, but the damage was expected to be in the order of tens of hectares rather than hundreds;

- that a five year program was proposed because it was unlikely that biological control would be effective in less than five years;

- that the nature of the approved program at Oenpelli was not conducive to releases of biological control agents being successful.

- that biological control agents were released at Oenpelli prior to the program, while others spread there of their own accord and are still present;

- that the program management problems included the lack of integration of biological control into the program and inadequate review of the control

operations by the Mimosa Steering Committee which lead to continuation of several inefficient practices.

Witnesses to this inquiry spoke of a steep learning curve for those involved in the Oenpelli project. Therefore, in hindsight, the project may have been handled differently if it had commenced in 1997.

The Committee concluded::

- *The methodology employed at Oenpelli was appropriate at the time that the project was developed in 1990 and 1991.*

- *To date, the Oenpelli project has been successful in controlling a large infestation of mimosa and outlying satellite infestations, resulting in a reduction of spread of the weed in Arnhem Land.*

- *Importantly, the program showed benefits of a willing and committed Aboriginal community to become involved in mimosa control, and their appreciation of the result.*

- *Additional major benefits of the Oenpelli program are that much has been learnt in terms of program management, coordination between different agencies, and the technical practicalities of carrying out a large-scale chemical and mechanical weed control program in an isolated wetland environment.*

- *Problems with program management could be addressed in future large scale programs by employment of a program manager to address the areas of logistics, supervision of operations and timely reporting.*

- *The lessons learned at Oenpelli will be valuable in planning and implementing large-scale control programs on mimosa in the future.*

- *It was the first time that environmental monitoring had been carried out at this scale for a weed control program in the Northern Territory. It will set a bench-mark for future environmental monitoring of weed management.*

- *On-going control will be necessary to maintain this achievement at Oenpelli.*

- *The fact that biological control is now showing promise (Section 5.5.1) will be of benefit in maintaining the achievement at Oenpelli.*

5.3.5 Overall assessment of control operations

Assessing the appropriateness and effectiveness of government control operations goes beyond the land it specifically manages. The actions of

governments have marked effects on the success of programs on private land, Aboriginal land and on the protection of areas under threat. For example, the value of control of satellite infestations and roadside weed control in slowing the spread of mimosa and in protecting larger areas is not easily understood by many and it is difficult to quantify or value in dollar terms.

There are varying views on the success of mimosa control programs. It was put to the Committee that 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". Hence, to the casual observer, success in weed management is often invisible.

To know the result of mimosa control and protection in a particular area, one must be personally familiar with the area both before and after control was implemented in order to know the changes that have occurred or, in the case of large infestations, have access to satellite images or photographs dated before and after control measures have been effected.

In other words, just because mimosa is not at a particular site today, or is in small amounts, it does not mean it was not there before. Moreover, protection activities elsewhere prevent spread of mimosa to clean areas - the result of which is not measurable.

The Committee noted that:

- *Mimosa is still retained within a relatively small area of the Northern Territory (0.06%) and, so far, it occurs nowhere else in Australia.*

- *Although a large part of the Territory is not suitable to mimosa, many areas from the coast, inland to the 800 mm rainfall zone provide suitable habitats. It is clear that large areas have not become infested either because the seed has not been transported there, because of increased competition from pasture growth after removal of the feral buffalo, and due to the control and education program.*

- *In retrospect, any lack of success of control in certain areas has resulted from lack of resources to deal with the problem rather than to flaws in the approach to the problem.*

- *The methodology of integrating herbicides, mechanical control and fire for control of large infestations of mimosa is effective, but in any future projects close attention must be paid to improved program management, including the integration of biological control.*

- *Development of methods by which the outcome of mimosa control programs can be quantified is an important part of management.*

5.3.6 Future control

Preventing introduction and spread of weeds is a key objective of the Northern Territory Weeds Management Strategy 1996-2005. Control of satellite infestations has been confirmed by many witnesses to this inquiry as being the most appropriate way of controlling the spread of mimosa particularly at the extremities of its range.

Early detection of the plant, followed by swift action, regular follow-up and a long-term commitment to the task will effectively slow the spread and prevent the establishment of mimosa in new areas.

All satellite infestations have a source. Control of satellite infestations is most effective in areas where core infestations do not exist in the same catchment.

When satellite infestations occur in the same catchment as core infestations, and downstream from them, the establishment of new satellite infestations, or even quite large infestations, will continue. During every wet season there is a risk of massive seed movements by floods which, if conditions are suitable, will result in establishment of new infestations. Therefore, to reduce spread within a catchment, there is a need to strategically control core infestations using an integrated management regime that is most appropriate for the land use.

Surveillance for, and control of satellite outbreaks of mimosa, must continue indefinitely in all areas at risk of invasion. The program must be complemented with improved public education on the need to prevent spread of mimosa seed between catchments on vehicles, equipment, livestock and in other material. This will reduce the occurrence of satellite infestations.

It was suggested that keeping uninfested areas clear of mimosa should be a government function. On the other hand, within government, it is often stated that government should move away from carrying out weed control on private and leasehold land.

The Committee believes that for mimosa and other weeds of national significance, there needs to be cooperation between government and landholders for control of satellite infestations in high priority areas.

Due to the generally agreed importance of controlling satellite infestations, this function must be resourced above its former level. Specialist weed control contractors could be employed by both landholders and Government. Alternatively, the DPIF survey and control teams that have carried out this work on a part-time basis in recent years could be returned to this function in key areas to complement work by landholders and Parks and Wildlife staff.

The Committee recommends:

8. That the highest priority be given to control of satellite infestations of mimosa in regions and catchments which pose the greatest risk of further spread to important environmentally susceptible regions and to areas of pastoral land. For example, at mimosa's eastern extremity in the Arafura swamp, at its south-western extremity in the Daly River/Port Keats Land Trust, on Stray Creek at Jindare Station and all isolated occurrences along roadsides.

9. That the survey and control function within the DPIF Weeds Branch be enhanced so that control of satellite infestations of mimosa in high priority areas can be re-instated to the level prior to 1991.

10. That the weeds function within the Parks and Wildlife Commission be resourced at a level that allows it to effectively manage mimosa in its area of responsibility.

11. That survey and control teams in all government agencies coordinate with each other and landholders, and that the use of specialist weed control contractors be investigated for both private and public work.

12. That control of large infestations be carried out using integrated control methods that are appropriate to the specific situation.

13. That mimosa in areas that pose a high risk of spread by man and animals be quarantined under the proposed new NT weeds management legislation.

14. That the feasibility and practicality of establishing unstaffed, voluntary vehicle and equipment washdown stations in key areas be investigated by the Mimosa Advisory Committee.

15. That Commonwealth mimosa control programs be fully funded so that NT Government or other personnel are not removed from existing programs on mimosa or other weeds without being replaced.

5.4 Government Assistance

5.4.1 Mimosa Control Assistance Scheme

5.4.1.1 Background and assessment

The NT Government has provided a 50% subsidy for the chemical control of mimosa from the ground since 1982. Until November 1994, the subsidy was limited to $1,000 per property. However, some landholders were disadvantaged by the $1,000 limit because the success of aerial spraying reduced infestations to a size that could be treated from the ground. The subsidy for ground control of mimosa is now limited only by the availability of funds for the scheme and it includes herbicides, wetting agents, anti-evaporant oils and diesel used in the herbicide mix.

The Mimosa Aerial Spraying Assistance Scheme started in 1985 as a result of an approach by landholders to the then Minister for Primary Production. It provides a 50% subsidy on chemicals, the cost of aerial application and the cost of aircraft ferry. Since 1985, the upper limit available for claim by individual properties has been limited only by the budget allocation.

The ground and aerial spraying subsidies for mimosa are now combined into one scheme named the Mimosa Control Assistance Scheme. The scheme has been well supported, 20 properties using the scheme so far in 1996/97.

It is important to note that the Mimosa Control Assistance Scheme supports 50% of what a property can afford, not 50% of the mimosa that needs control on a property.

In providing subsidy funds, the aim has been an even handed approach across all landholders. The amount sought by landholders varies with their financial situation and their capacity and preparedness to deal with the problem as their work load permits.

In terms of value to landholders, one witness said that the main reason for giving evidence at the public hearings was to thank the government for the help he had received, and that he would not like to see discontinuation of assistance. He spoke of getting on top of the problem on his property for the first time. He stated that government has been more than fair with landholders with the subsidy, and he emphasised the need to follow-up with ground control after aerial spraying.

Other landholders stated that the subsidy has worked quite well. However, criticism came from scientists in terms of a lack of ability to force a long-term commitment by landholders, and lack of a plan in a strategic sense, such as ensuring coordination with surrounding properties and within a catchment.

Other criticisms related to problems with administration of the scheme. The Committee was informed that in 1996, final approval of government funds for

the scheme was delayed, leading to problems with effective timing of application of herbicides.

Funds were allocated initially, but the delay was caused by a number of factors: an August budget rather than a May budget; carrying out an initial survey of landholders to determine if the allocated funds were sufficient; seeking further funds from Cabinet; then going back to landholders seeking revision of their bids.

The delay meant that people were not prepared to commit their own funds. Subsequently, the threat of Cyclone Rachel, meant that it was getting too late to spray.

The Committee suggests that, providing there is an allocation for the scheme in the DPIF budget, landholders need to be reassured that the scheme will operate, but that the final amount available will depend on a survey of landholders. It is important that the survey take place as soon as possible in the financial year so that funds are in place by October in each year.

The Committee was informed that if financial assistance was not available, some may be forced to sell or abandon their properties. Others said that without an outside source of funds, the best they could do is prevent spread rather than reclaim areas for production.

The Committee concluded that:

- *The Mimosa Control Assistance Scheme has been beneficial. It must continue at least in the short term because there is uncertainty surrounding the final and quantifiable effectiveness of biological control.*

- *Without assistance, many landholders will be faced with the prospect of doing little or no control and the spread of mimosa on properties, within and between catchments will continue.*

- *The assistance scheme can be improved. The administration and conditions of the scheme should be reviewed to make it more relevant to today's situation, more accountable and more effective.*

5.4.1.2 Future of the Mimosa Control Assistance Scheme

Comments by witnesses indicated that the Mimosa Control Assistance Scheme needs review and that ways in which the subsidy could be made more accountable or outcome orientated should be investigated.

It was suggested that if government is serious about mimosa, government should pay all costs to eradicate it. Consideration could be given to subsidising the full cost of dealing with mimosa by whatever method a landholder choses to use - not just subsidising chemical control. Others

suggested that initial aerial spraying be fully funded by government with a 50% subsidy for follow-up work.

Some initial points to consider in carrying out a review are as follows:

◊ The assistance scheme must complement the overall mimosa strategy and catchment plans.

◊ Landholders must be consulted during the review.

◊ The control of satellite infestations must continue to be subsidised to the maximum extent.

◊ Integrated control must be pursued. The way to promote this is for government to subsidise methods other than chemical control. Therefore, the types of control that will be subsidised need to be reviewed (chemical, physical, biological, ecological, fire, uses etc.).

◊ If methods other than chemicals and their application are subsidised, a system that enables government to verify the authenticity of expenditure on mimosa is required, eg labour costs, fuel, machinery maintenance and other resources used in mimosa control.

◊ The level of the subsidy needs to be determined. It was suggested to the Committee that all chemicals should be supplied to landholders, as the landholder has an on-going responsibility for rehabilitating the country after the weed is initially brought under control.

◊ In providing assistance, government and landholders need a financial commitment for longer than the current one year funding cycle. The scheme must encourage landholders to make a long-term commitment to mimosa management.

◊ Assistance funds are limited. An issue that needs to be addressed is whether the assistance funds initially go into best management for the catchment (i.e to properties in the upper catchment), or whether funds should go to landholders who are willing to make their own financial commitment to the management of mimosa, irrespective of their location in a catchment.

◊ Methods to quantify the outcome of the assistance provided, and the provision of further assistance based on performance should be investigated.

◊ There may be a need for increased government and landholder resources to administer and manage the scheme, given the calls for strategic planning, increased accountability, an on-going commitment by government and landholders, and quantification of outcomes.

This review should be carried out in liaison with the proposed Mimosa Advisory Committee and catchment groups during development and revision of the overall strategy for mimosa and individual catchment plans.

The Committee recommends:

16. **That the Mimosa Control Assistance Scheme continue in its present form at no less than a 50% subsidy, pending a review.**

17. **That the Mimosa Control Assistance Scheme be reviewed by DPIF and consideration be given to monitoring outcomes of the assistance and the inclusion of other methods of control in the scheme, eg mechanical clearing of mimosa, fire, land preparation, pasture improvement, labour costs for ground control and biological control.**

18. **That a rolling five year management and funding program be developed by both government and landholders for the efficient management of the Mimosa Control Assistance Scheme.**

5.4.2 Other assistance

Other forms of assistance are provided by the Territory and Commonwealth Governments to landholders, in the form of financial assistance to Aboriginal communities, technical advice, training (See Section 5.6), release of biological control agents and in developing mimosa management plans on properties and in catchments.

Some control programs could be re-organised to include a greater local input and to create employment opportunities. For example, an Aboriginal Council expressed concern to the Committee of the lack of Aboriginal involvement in the mimosa control program in the Daly River/Port Keats Land Trust. The council requested a reduction in helicopter use and a greater emphasis on the training and development of ground control teams to be used where access is possible.

The use of the recently announced Commonwealth Government initiative, "Green Corps" (Young Australians for the Environment), should be investigated as a labour source for controlling satellite infestations. This environment program is worth $41.8 million, Australia wide, and is being provided through the Australian Trust for Conservation Volunteers.

The Committee recommends:

19. **That the Northern Territory and Commonwealth Governments improve the existing support for leasehold, private and Aboriginal landholders to control mimosa. This could take the form of:**

- **employment programs;**
- **use of the Natural Heritage Trust and "Green Corps" for control of mimosa on all lands;**
- **training in control techniques, including rearing and release of biological control agents;**
- **assistance with the preparation of mimosa management plans on properties and in catchment areas;**

20. **That where grant funds are provided for control of mimosa on Aboriginal Land, Aboriginal communities have improved access to long-term funding for labour, herbicides, vehicles and other equipment used in ground control.**

5.5 Research and development

5.5.1 Historical perspective and assessment

Research has been carried out on the control of mimosa in the Northern Territory since 1965 when 2,4,5-T and 2,4-D + picloram were tested. Research was greatly accelerated from 1979/80 financial year when the joint CSIRO/DPIF project on biological control commenced.

The biological control studies were part of the goal to achieve long-term, cost-effective control. Thickets of mimosa in its native range in tropical America are small in comparison with those in Australia and natural enemies of mimosa have been sought in Brazil, Venezuela, Mexico, Costa Rica and Honduras.

In 1981, further studies commenced on herbicides. Research was later initiated on the biology and ecology of the plant, mechanical control, fire and plant competition.

Justification for research into the biology and ecology of mimosa, and on methods other than biological control, was:

- to complement the biological control studies;
- to develop techniques suitable for preventing further spread of mimosa during the period that biological control research was progressing; and
- to enable the use of land for more intensive agricultural development than may be allowed by the level of control that is eventually attained by biological control agents;

In 1984, funds from the Australian Centre for International Research (ACIAR), supplemented those provided by DPIF and CSIRO for a collaborative program on the control of mimosa in Thailand. Expansion of the project benefited both countries and enabled cooperative research with the Thai National Biological Control Research Center and the Royal Irrigation Department. As was the case in Australia, the development of integrated control strategies was the aim in Thailand.

During this time, 19 herbicides were tested in the Northern Territory and Thailand using various methods of application. The herbicides tested form the basis of the herbicide treatment regimes that are used today.

The first biological control agents for mimosa were released in the Northern Territory during 1983. These were two species of seed feeding beetle, *Acanthoscelides* spp., from Mexico. To date, 10 biological control agents have been released in the Territory and a further six to eight are under study to be released over the next five years. Large-scale aerial release of pathogens is being tested.

The agents attack different parts of the plant and are causing visible signs of reduction in plant growth and reproduction.

Both the Territory and Commonwealth Governments continue to contribute funds for biological control. The Commonwealth component for biological control has been boosted over the past six years as a result of the Prime Ministers' Environment Statements.

A further research phase commenced in 1991 with the environmental monitoring program at Oenpelli, carried out by CSIRO Division of Wildlife and Ecology with assistance from the Northern Territory University.

Hence, it was through the 1980s and into the 1990s that major advances were made in understanding the biology and ecology of the plant, and in the development of various control methods that have already been put into practice.

Committee's assessment

It is not an easy task to assess the appropriateness and effectiveness of long-term research programs. The Committee therefore restricted itself to comments provided to it on the practical application of the research and to the appropriateness of the research concept, rather than to the manner in which the research was conducted.

◊ *Data provided by DPIF showed that the effectiveness of herbicides can vary greatly. For example the range of kills for mature plants measured in trials using the recommended rate of herbicide application can vary from 53% to 95% for fluroxypyr, and 95% to 100% for tebuthiuron.*

Environmental effects on the plant and the herbicide, and the method, time and season of application can influence the effectiveness of herbicides.

- *Evidence was given that landholders are happy with the effectiveness of herbicides providing they are applied under recommended rates, methods of application and weather conditions, and that use restraints are understood, eg soil type, rainfastness, and effects on off-target vegetation and the aquatic environment.*

- *In terms of the practical application of biological control agents, evidence was given that landholders have seen very limited results. Some landholders remain sceptical about the effectiveness of biological control. However, a witness from CSIRO stated that the program is at the exciting stage of starting to take effect.*

- *The different opinions between landholders and CSIRO on the effects observed from biological control agents may be due to differences in abilities to observe damage caused by agents, and differences in expectations of the program at this stage of its development. Moreover, sensational media reports on the biological control of mimosa have not helped to convey an accurate impression to the public.*

- *The Committee was informed that the first indications of a reduction in seed output, due to biological control agents, have been obtained in the past 12 months and there is a reduction in plant vigour in some areas. The damage inflicted by recent and new agents is forecast to increase and it is expected that mimosa can be reduced from being an aggressive weed to something les than that. It is now possible to go out in the field and physically see the damage that insects are causing.*

- *Exploration for biological control agents, and their subsequent testing, usually takes many years. Excellent progress has been made to date which is laying the foundation for cost-effective control.*

- *All involved with the mimosa program are hopeful that biological control will eventually provide a level of infestation which is tolerable. However, the Committee was informed that primary producers need a level of control which is greater than that which is currently being achieved by biological control agents. Hence, the urgent need for application of an integrated control program.*

- *Many aspects of the research program have been adopted by landholders over the past 16 years. The research concept is sound. The Committee is convinced that the early decision to commence research into biological control and other control methods for different land use situations was appropriate at the time and is still relevant today.*

5.5.2 Future research and development

5.5.2.1 Research coordination

Much useful research has been undertaken on the management of mimosa but there are gaps in our knowledge. A submission from the Environment Research Institute of the Supervising Scientist (ERISS) stated that many of these gaps could be elicited through the concept of Ecological Risk Assessment. This includes identification of a hazard, the likelihood of an event, its consequences, acceptability of the risk and its management.

Risk assessment can be applied to plant introductions to determine their weed potential, to the impacts of established weeds on ecosystems, and to control programs. Such an approach would result in more information being available on which to make decisions on weed management.

Research and development of mimosa management requires the expertise of various agencies. Coordination between agencies is essential at the technical level. The proposed Mimosa Advisory Committee (Recommendation 2) would be responsible for development and implementation of a mimosa strategy. It may make suggestions for future research, but this Committee is not the appropriate forum for research coordination. Mimosa is such an important and complex issue that it warrants formation of a Technical Working Group made up of CSIRO, DPIF, Parks and Wildlife, Environment Australia and ERISS.

Landholders and others who are personally affected by mimosa want action now, as it is affecting their livelihood. Therefore, the future research program must be relevant for those that are presently affected by mimosa, but at the same time have a long-term objective.

The Technical Working Group would:

- ensure coordination between different research agencies; develop funding submissions and determine responsibilities for carrying out specific aspects of research;
- design research programs and monitor the quality of the research;
- incorporate results into an integrated control program.
- monitor options for the use of mimosa;
- make recommendations to the Mimosa Advisory Committee and catchment groups on appropriate management programs in different land use situations; and
- ensure that the research results are publicised.

The Committee recommends:

21. **That the Mimosa Advisory Committee appoint a Mimosa Technical Working Group consisting of persons with expertise in research and development of all mimosa control methodologies, and their integration for different land use situations.**

22. **That the Technical Working Group determine the need for incorporating ecological risk assessment into mimosa control programs and develop protocols for monitoring the environmental impact and effectiveness of control programs.**

23. **That the Technical Working Group design and implement a research program aimed at developing the integrated control of mimosa.**

5.5.2.2 Biology and ecology

It became clear to the Committee that the manner in which land is managed is a major factor in determining whether mimosa becomes a serious management problem.

The need to understand the mimosa problem from an ecological viewpoint was emphasised. This includes understanding the reasons for the weed invading particular areas, what is causing habitats to be invaded, the ecologioal impact and options for revegetation after clearance of the weed. It is apparent that overgrazing predisposed some areas to invasion. Evidence was also given that there has been less spread since removal of the feral buffalo.

Research is required into the ecological control of mimosa to determine how its spread within a catchment can be limited.

Some work has already been carried out into the impact of mimosa on fauna and flora but, ideally, long-term studies are required to determine changes in areas under different control regimes, and in areas recently colonised by mimosa.

Post-control options need to be investigated. Experimental and anecdotal evidence have shown that mimosa seedlings are susceptible to competition from pasture grasses. Observations at Oenpelli and on the Adelaide River floodplain suggest that the return of native vegetation and/or other introduced vegetation is faster than expected. The desirability of replacement vegetation must be determined and how it can be managed to reduce re-invasion by mimosa is important.

In the Mary River area, concern has been raised about the possible invasion of mimosa into areas that are currently salt affected. The possibility of this occurring when salt levels are reduced by construction of barrages needs to be assessed and plans put into place for management of mimosa in such areas.

The Committee recommends:

24. **That ecological studies be conducted to determine susceptibility of areas to invasion of mimosa and the potential impacts on flora, fauna and industries.**

25. **That studies be conducted to determine all factors influencing the revegetation of areas after control of mimosa, including the ability of native and introduced flora to compete with regenerating stands, and the desirability of the replacement flora.**

26. **That mimosa establishment in salt affected areas of the Mary River system be investigated and monitored, especially when barrages constructed to reduce salt water intrusion take effect.**

27. **That research be carried out into the revegetation of salt affected areas with salt tolerant plants which may prevent establishment of mimosa.**

5.5.2.3 Biological control

The Committee was told that research into biological control does have an endpoint and that there will be a stage in the program when every agent that can be safely used in Australia has been processed. This will take about another four to five years, then a further five years may be required for implementation in the field.

The biological control program is at an important stage. The balance that will eventually be obtained with biological control is uncertain, but this balance will depend on the effectiveness of the suite of insects that are eventually released. The tolerance level of mimosa will vary with the land use aims of landholders. Where biological control achieves less than the desired level of control, it will be combined with other control options: chemical, mechanical, fire and ecological, as appropriate.

The Committee firmly believes that the Territory Government, having initiated and invested in the biological control program with CSIRO right from the beginning, has an obligation to see the biological control program through by retaining its funding base to at least the current level.

Improved marketing of the benefits of biological control will assist in overcoming the differences between landholders and scientists in their expectations of the final outcome of the program (Section 5.6).

The Committee recommends:

28. **That the collaborative biological control program between CSIRO and DPIF continues to be funded by the Territory and the Commonwealth so that introduction and establishment of all potential agents can be completed.**

29. **That support by the Northern Territory Government for the mimosa biological control program be given beyond the introduction, release and establishment stage so that the collective damage of agents can be monitored and assessed over the next 10 years.**

5.5.2.4 Herbicides

Little screening of new herbicides for mimosa has been carried out in the past six years. However, it is important that the mimosa research program includes studies on new herbicides and application techniques, and testing of different formulations of older herbicides. They may have advantages in terms of efficacy, cost, plant activity, safety and residual properties.

One submission suggested that large scale chemical usage should be avoided because of problems with the environment. Concern was also expressed on the lack of information on the methodology of herbicide application and the effects of herbicides used for mimosa control on the environment, especially their impact on aquatic and terrestrial habitats.

It is not usual for toxicology testing to be carried out by agricultural chemical companies in Australia but consideration is made of toxicology results from the United States or elsewhere in registering herbicides in Australia.

In the United States, the work is carried out under protocols developed by the United States Environmental Protection Agency, the Food and Drug Administration and Organisation for Economic Cooperation and Development. It is not possible to test all animal species. In the case of fish, the test species used are more sensitive than others to the effects of pesticides and are either ecologically or economically important. The tests are carried out on eggs and early fish stages which are more sensitive than adults.

Some environmental monitoring of the effects of herbicides was carried out by CSIRO and Northern Territory University during the Oenpelli project. This concentrated on the herbicide tebuthiuron, but there is little local information

on other herbicides. ERISS has also initiated investigations into the toxicity of tebuthiuron. This will increase our understanding of the impact of tebuthiuron in local wetland environments.

The Committee recognises that the application of herbicides to wetlands has risks. Therefore, to supplement the information that is already available, an up-to-date assessment of the ecological risks of using herbicides in wetlands should be made by government in association with chemical companies for the currently recommended herbicides for mimosa, and for any new herbicides proposed to be used. An assessment could be made of the action necessary to reduce any risk that is posed. Studies could take the form of literature reviews, followed by field and laboratory tests if required. Landholders must be informed of the outcome of this work.

As part of the national registration process, Environment Australia undertakes environmental hazard assessments of agricultural chemicals on behalf of the Australian and New Zealand Environment Council. Therefore, it is the appropriate body to undertake this review.

The Committee recommends:

30. **That the proposed Mimosa Technical Working Group, or its delegate, maintain a register of herbicides that are or may be suitable for control of mimosa and make recommendations on trials for their assessment.**

31. **That monitoring the effects of herbicides on Northern Territory flora and fauna be continued for mimosa control programs, with funds provided by government and agricultural chemical companies where appropriate.**

32. **That Environment Australia reassess the environmental data on herbicides used for mimosa control, in particular the effects on aquatic flora and fauna and, if necessary, recommend tests on local species and use restraints.**

5.5.2.5 Integrated control

The importance of integrating different control methods into an overall weed control program in grasslands has long been known. In the early 1970s it was stated that control by chemicals or biological control agents may be temporary or of little use if pasture improvement or other forms of revegetation are not carried out at the same time. Likewise, success with biological control agents is often due to interactions with the presence of competing pastures rather than to the effects of the agents alone.

In the case of mimosa, pasture improvement will be appropriate in some areas, but not in others where the regeneration of native species needs to be encouraged.

The Committee was informed by many witnesses that the integration of control methods is essential to achieve long-term control and reduce the costs of the currently used methods. It was pointed out that the collective damage of biological control agents is expected to increase and it is now realistic to start considering how biological control can be integrated with other methods of control.

It was suggested during the inquiry that control of large stands by chemicals, mechanical control or fire may be needed so that biological control agents can retain the stand density at low levels. Speeding up the rate at which mimosa goes through its generations, and having biological control agents working more and more on younger plants, may result in their having a greater impact on the weed.

Field trials are needed into all aspects of integrated control, for example:

- ◊ the planting of native or introduced pastures into areas that have been chemically and mechanically controlled and burnt, followed by release of biological control agents onto the regrowth;
- ◊ burning and biological control;
- ◊ biological and mechanical control;
- ◊ chemical and mechanical control;
- ◊ mechanical control, biological control and revegetation with native or introduced pastures;
- ◊ adjustments in grazing management in combination with all other methods; and
- ◊ the concept of "segregated integrated control" whereby different combinations of control methods are used in different parts of a property or catchment.

The Committee recommends:

33. **That the Territory Government and CSIRO collaborate in carrying out research into all aspects of the integrated control of mimosa, as determined by the Mimosa Technical Working Group.**

34. **That plans for re-vegetation of mimosa affected areas be developed, based on the results of research on ecological and integrated control.**

5.5.2.6 Economic analyses and impact

The costs of control provided to the Committee are not strictly comparable because of different methods of calculation and different types of infestation. However, the figures provided do illustrate that protecting clean areas from mimosa is cheaper than controlling large infestations.

The cost of chemical control of dense infestations on pastoral leases costs about $140 to $200 per hectare, per application.

In terms of overall cost of a program, the five year program to control 7,000 hectares of dense mimosa at Oenpelli, plus its outlying satellite infestations cost $6.5 million. If the larger area in the region that was protected by ground teams and aerial spraying is excluded from the calculation the cost was approximately $1,000 per hectare over five years ($200 per hectare per year). On-going costs will be incurred to maintain control at Oenpelli.

The cost of controlling isolated mimosa infestations to protect the uninfested floodplains in Kakadu National Park was given to the Committee as varying from $1.15 to $2.50 per hectare per year. This is based on the present allocation of about $500,000 per year for salaries, operational costs and equipment, divided by the total area of floodplain in the park protected, rather than by the actual area of mimosa.

On-going protection, such as at Kakadu, does have a high cost. However, allowing an area to become heavily infested such as at Oenpelli, followed by controlling it by chemical and mechanical means, followed by an on-going control program, has a far greater cost.

Statements were made that it is simply not economic sense for pastoralists to control mimosa using herbicides. Nevertheless, factors other than straight production economics are involved, even on pastoral land. A pastoralist told the Committee: "I've been there 35 years and I kind of like the place, you know. I don't like seeing mimosa taking over. So I will spend as long as I'm living and I will spend every penny I can get to try and whip it."

The Committee was informed that the economic impact of mimosa and the economic rationale for its control will vary with land use. It will be different for Aboriginal, pastoral and conservation land. Although, where Aboriginal enterprises exist, the situation could be similar to pastoral land.

Economic analyses will assist landholders and governments in making decisions on management programs and the levels of assistance that need to be provided.

Some preliminary economic analyses have been prepared for replacing mimosa with pasture grasses for intensive grazing. They show that a long-term commitment to control (more than 10-12 years) is required in order to achieve a net return. However, the budgets are very sensitive to factors like productivity per hectare and cattle prices. They show that pastoral operations would not be viable without an external subsidy.

Likewise, if standard principles of production economics were used in deciding whether to control mimosa on most Aboriginal land and conservation land, the weed would not be controlled. So, in many areas, natural resource economics will need to be applied to the value of conserving biodiversity, the value of this resource for the traditional Aboriginal way of life, and its value to tourism.

Economics raises the question of tolerance levels of mimosa in different land use situations, a topic raised by CSIRO in its submission. The level of tolerance may vary from zero to quite a large tolerance. The CSIRO proposal is to develop a strategy that addresses the tolerance level and the best management process that can be put in place.

The concept of tolerance levels begs the questions:

- Is mimosa just a nuisance that can be tolerated in most areas?
- Do areas need to be totally cleared for grazing or cropping?
- Must National Parks be totally free of the weed?

It was put to the Committee that even if biological control works effectively, it will probably not reduce mimosa to the level desired in Kakadu National Park. Therefore search and destroy missions will continue in the park indefinitely. This may also be the case for some Aboriginal and pastoral land.

The Committee concluded that:

- *When a landholder has little or no mimosa, but is in a high risk area, prevention of the establishment of the weed is more cost-effective than carrying out control after areas have become heavily infested. Prevention can be achieved by investing in on-going surveys and control of satellite infestations*

The Committee recommends:

35. **That further economic analyses be carried out to determine the economic impact of mimosa and its management in different land use situations. The concept of tolerance levels of mimosa in different land use situations needs to be incorporated into these analyses.**

5.5.2.7 The use of mimosa

A submission by a private company proposed that mimosa be harvested to extract vegetable tannins for the Australian and international leather tanning and wood product industries. It is proposed to replace the $9 million worth of imported vegetable tannin on the domestic market. The company may also produce by-products for the industrial chemical and cellulose fibre markets.

A company witness could not see any engineering barrier to the proposal. There is no commercial production of tannin in Australia and the company sees mimosa as the world's single largest resource of vegetable tannin.

It is planned to harvest the wild mimosa resource. It is obvious that not all areas could be harvested, but it is possible that harvesting of accessible dense stands could be integrated into the control program, with the landholder continuing control at a lower cost than would be incurred on a large dense infestation. Cropping of mimosa is not contemplated at this stage, nor should it be encouraged.

The company is aware of control strategies for weed management and the need to prevent further spread of the weed. It is proposed to operate a mobile tannin extraction facility on site. This would reduce the likelihood of spread of seed compared with transporting mimosa over long distances to the processing facility.

This proposal may lead to an export and manufacturing industry for the Northern Territory and it may provide returns from mimosa which could be used for control elsewhere. The Committee supports any use that can be made of mimosa, providing that safeguards are instituted to prevent its spread.

The draft *NT Weeds Management Bill* has a section which provides for the use of weeds under a permit which may include lodging of a bond for costs that may be incurred to prevent spread of a weed as a result of an action under the permit.

For its part, the company would want exclusive access to the commercial exploitation of mimosa, and support from landholders and government for access to mimosa, finance and for creation of required infrastructure. It was

stated that they would like to see the project stand on its own two feet without subsidies as there is no guarantee that subsidies will continue.

The Committee recommends:

36. **That the Northern Territory Government and landholders cooperate in research into the harvest of wild mimosa for extracting tannins.**

37. **That, if the commercial harvesting of mimosa proves to be a viable proposition, the Northern Territory Government, on advice from the Mimosa Advisory Committee, make recommendations for its controlled use under permit, as proposed in the new NT weeds management legislation.**

5.5.2.8 Mapping

Literature available to the Committee shows that the estimated area of mimosa was 4,000 hectares in 1980, 30,000 ha in 1984, 45,000 ha in 1987 and 80,000 ha in 1989/90. This latter estimate was made jointly by CSIRO and DPIF. It is not known if there has been a significant change since that time and there was some criticism of this during the inquiry. A map of known locations exists (Figure 2). This provides a good general indication of its distribution, but it does not provide a measurement of area and other useful parameters.

There have been long-standing proposals to develop a data base which would be used for measuring the extent of the problem; for identifying areas susceptible to invasion by mimosa; whether mimosa is spreading or diminishing; for development of management programs at the property, catchment and regional level; and in assessing the effectiveness of programs. It will be particularly useful for monitoring the long-term effectiveness of the Mimosa Control Assistance Scheme, biological control and integrated control.

A current proposal seeks to build on data available within the Department 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. Geographic Information Systems in the departments can be used to integrate these data with the known distribution of mimosa.

However, doubt was cast by one witness on whether producing a detailed map would be an effective use of resources. This is perhaps why it has not been done in the past. Nevertheless, the Committee suggests that development of a data base would be invaluable not only for mimosa management but also for other weeds.

The Committee recommends:

38. **That high priority be given to development of a system which allows for accurate mapping of mimosa and other weeds (locations and areas), including the storage of data on management practices adopted and the effectiveness of programs.**

5.6 Education and training

Mimosa has been the subject of significant media publicity in the Territory through the 1980s and 1990s in newspapers, radio and on television. Publicity on a national and international basis goes back to 1982 through conferences and the print media. Mimosa has also featured on national and international television.

In addition to the media, DPIF and CSIRO have produced extension literature on the weed, held field days and conducted training in control methods. Staff from Kakadu National Park have also been involved in training and supervising Aboriginal teams.

A report of mimosa in Arnhem land was directly attributable to a poster developed for Aboriginal communities. During the inquiry, an Aboriginal witness stated he was getting sufficient information and resources through DPIF.

The Committee believes that education of the public about the mimosa program and the dangers of spreading the weed is of the highest priority. The existing program must be continued, as does the training of persons carrying out field operations and release of biological control agents. In particular, the expectations of biological control need to be better understood by the community.

In Section 5.3.6, mention was made of a need to investigate the feasibility and practicality of establishing unstaffed quarantine washdown stations for vehicles and equipment. These would be used on a voluntary basis, hence there is a need for a vigorous community education program on the way in which mimosa is spread, the potential problems that will arise from moving mimosa to clean areas and the need to clean vehicles, equipment and animals after being in mimosa infestations.

Appropriately placed signs may assist in restricting entry into quarantine areas and in notifying the public of control being undertaken.

All persons that travel in areas at risk of mimosa invasion must be trained to identify the plant. Landholders must be encouraged to carry a small pack of dry herbicide in vehicles for immediate treatment of isolated plants.

The Committee recommends:

39. **That the existing mimosa education program be continued, targeting students, remote communities, recreational fishermen, hunters, four wheel drive enthusiasts, tourists, road contractors, miners and all landholders.**

40. **That the education program aim at:**

- **the dangers of spreading mimosa to clean areas, and the need to be ever-vigilant for the plant;**
- **instilling an ethic of abstaining from driving through mimosa, and the use of vehicle washdown stations after unavoidably passing through mimosa,**
- **appropriate action to take if isolated plants are found;**
- **expectations of the biological control program; and**
- **the value of integrated control.**

6. Responsibilities of Land Owners and Managers

6.1 Pastoral land

The responsibility of land owners and managers under the *Noxious Weeds Act 1962* is defined in Section 5.1.1.

In the past, government carried out most of the control work on both leasehold and Crown Land. With the introduction of the aerial spraying subsidy for mimosa in 1985, private landholders now carry the major cost of programs involving herbicides, mechanical control and revegetation on leasehold land.

The attitude to the problem varies between landholders. Most landholders recognise the responsibility of controlling mimosa on their land and the value of catchment management. However, due to individual circumstances in finance and time, and the level of control in other parts of a catchment, the ability of landholders to successfully implement control varies.

Nevertheless, some landholders have been very effective in their control programs and costs are decreasing. Others are faced with enormous problems.

Landholders generally recognise the need to integrate control methods for on-going control and in many cases are carrying it out in one form or another. However, it was emphasised that the area treated in the first year must not be more than what the property can maintain in the following year.

The Committee was told that using the currently best available techniques, landholders are contributing about 80% of the total cost of control. Their costs include not only herbicides and their aerial application, for which they are subsidised, but clearing and planting pastures, and the application cost for ground control. Some landholders are less able to carry the burden of mimosa control than others and there is variation in skills and knowledge of weed control.

Landholders find it extremely difficult to control mimosa without both financial and technical assistance. Although chemical and mechanical control are not cost-effective in the short-term, most landholders are willing to persist until biological control proves effective.

Some properties have staff employed specifically for control of satellite infestations in order to protect clean areas from becoming infested. Evidence from the Mary River Landcare Group emphasised that all members of the Group were out there doing something about mimosa

6.2 Aboriginal land

The Committee was informed that owners of Aboriginal land recognise the need to control mimosa. They are charged under their law with the responsibility of maintaining their land.

Aboriginal people are very concerned about the intrinsic value of their land, especially in wetland areas on which they depend for food resources. In areas of Arnhem Land, where there are only satellite outbreaks, they are already controlling mimosa. Larger areas of mimosa on Aboriginal land are being dealt with near Oenpelli, in parts of the Wagait and in the Daly River/Port Keats Land Trust.

Aboriginal land has a unique economic base with both traditional and European type cultures. Indigenous land management systems, in general, do not generate the finance to be able to participate in the 50/50 Mimosa Control Assistance Scheme. An exception is at Wagait where one group has its own control program, much of the funding being self generated. This group has made a financial commitment to managing mimosa on its land.

Most control on Aboriginal land is funded by the Commonwealth. Funds have been administered through the Mimosa Steering Committee (via the Australian Nature Conservation Agency/Environment Australia), the Aboriginal and Torres Strait Islander Commission (ATSIC), the Bureau of Rural Sciences, Environment Australia and the National Landcare Program. From this financial year, ATSIC's role will be taken over by the Indigenous Land Corporation.

The NT Government also commits funds and personnel for weed control on key areas of Aboriginal land.

Aboriginal communities are requesting a greater share of the work in treating satellite infestations in both the east and west of mimosa's range. This should be encouraged.

6.3 Future management responsibilities

The NT Weeds Management Strategy emphasises landholder responsibility for weed management, as does the draft *NT Weeds Management Bill* (Section 5.1.2). While it is necessary for landholders to retain this responsibility, government assistance is equally important in the form of training, financial assistance and coordination of activities within and between catchments.

Adoption of appropriate land management practices by landholders will assist in the management of existing infestations of mimosa and in minimising the risk of spread to clean areas.

The Northern Land Council (NLC) recognises the need to plan and prioritise weed management on Aboriginal lands. It has been proposed that ERISS develop an overview paper on weed management for the NLC. It is aimed at developing a strategy for Aboriginal Lands that integrates with the Northern Territory Weeds Management Strategy and the National Weeds Strategy. It will cover a range of weeds including mimosa.

It was put to the Committee that the effective management of weeds on Aboriginal Land using public monies is in the long-term interest of Australia in order to prevent degradation of some of the most biologically intact habitats in the nation.

As well as managing infestations, pastoral and Aboriginal landholders will have a responsibility to manage movements of seed within and from their properties. Control of satellite infestations and self regulation in the washdown of vehicles and equipment are therefore seen as priorities for landholders.

The improved market for live export of cattle has placed landholders in a better position to manage their properties and has created a greater demand for land on which to put cattle. Land that is under mimosa is now being rehabilitated because the floodplain country can support stock at times of the year when the upland country has dried off. Hence, the control of mimosa in certain areas is not strictly on a catchment management basis, but on the basis of needs for individual properties.

However, a warning was given during the public hearings that increased grazing pressure could increase the rate of expansion of mimosa. This would be minimised by fencing and subjecting herds to appropriate grazing management. Close monitoring of stocking rates will be required.

The Committee recommends:

41. That pastoral, Aboriginal and government landholders continue to be responsible for management of mimosa on their land.

42. That landholders actively participate in development of the overall Mimosa Management Strategy (Recommendations 4 & 6), and catchment management processes (Recommendation 47).

(Explanatory note: Mimosa management plans will be developed by landholders, in conjunction with government, using the Weed Advisory Committee system, proposed under the new NT Weeds Management legislation).

43. That all landholders prepare property weed management plans, in accordance with the proposed weeds management legislation. These will include a responsibility to survey for, report and control satellite infestations of mimosa, to control traffic and other movements through mimosa infested areas on their property, and to wash down vehicles and equipment.

44. That all landholders adopt biological control, increase the integration of weed management into all land management, and adopt appropriate vegetation management to prevent initial invasion or reinfestation by mimosa.

45. That, when it is proposed to control large, dense infestations of mimosa, only as much area be controlled as can be financially maintained and revegetated.

46. That landholders actively participate in relevant education and training programs.

7. REGIONAL AND CATCHMENT ISSUES

7.1 Regional and catchment differences

Mimosa occurs through five biogeographic regions: the Victoria-Bonaparte, Daly River, Darwin Coastal, Pine Creek and Arnhem Coast. Catchments where mimosa occurs vary in land ownership, land uses, soil types, vegetation and depths of flooding.

When mimosa is out of control on the floodplains, its overall impact is similar in all catchments, but there would be differences in the fauna and flora affected which can only be determined by further study. The specific impact depends on land use.

There are differences in the extent of mimosa between catchments which warrant differences in approach to its management. This is best determined by stakeholder groups in each catchment.

Within catchments, there are significant differences in land systems between the upper and lower catchments which affect the type of infestation encountered and the method in which they can be treated, especially when using chemical and mechanical control. Therefore, the approach may also vary within a catchment.

For example, in the Finniss River catchment, large areas occur in the lower river, but isolated infestations occur upstream in the Batchelor area which would warrant a different approach. The Finniss River floodplain is not totally infested with mimosa, contrary to popular belief. There are large areas of open floodplain and waterholes that are clear of the weed. To protect the floodplain from further degradation, there must be coordination between landholders to ensure that the best possible program can be developed for the catchment.

Certain catchments have special issues that affect mimosa control strategies. Parts of the lower Mary River have a problem with salt water intrusion where little mimosa grows. Barrages have been constructed, or are planned, which hold back fresh water and prevent entry of salt water. This may lead to the explosion of mimosa in previously clean areas (Section 5.5.2.2).

Parts of the Adelaide River floodplain that are infested with mimosa are subject to twice daily tidal inundation. This makes for difficult access to carry out integrated control.

7.2 Catchment management

All persons involved in managing weeds know that control on a catchment basis is logical and is the ideal. It is practiced on some individual properties by commencing control upstream, but total catchment management is more difficult to achieve.

During this inquiry, evidence was given criticising the lack of a total catchment approach by both landholders and government. So why is it not happening in certain catchments?

When dealing with a weed that spreads rapidly within a catchment that has a sparse human population and, when using labour-intensive and expensive non-biological methods, practical experience has shown that catchment management is difficult to attain. This is due to the varying financial circumstances, motivations and work-loads of landholders.

Land tenure and land use within a catchment may vary from pastoral, to park, Aboriginal, and to small unproductive subdivisions. Hence, while the ideal may be to declare a mimosa management program over a complete catchment, the reality may be that it will be done in a piece-meal fashion.

For example, in the Adelaide River catchment, where the infestation extends from the wooded upper river, to the dense monocultures of mimosa on the floodplain, "catchment management" is a massive task. It is unlikely to be effective using only chemical and mechanical means. It was attempted from 1965 to 1971 when the infestation was relatively small but was thwarted by the level of resources applied to the problem (Section 5.3.1).

Effective catchment management requires the cooperation of all landholders. Mimosa along river banks in upstream areas of the heavily vegetated part of the catchment is the most difficult area to control without a large labour force. It was suggested to the Committee that having a locally acceptable person to motivate and coordinate landholders in a catchment would be of benefit.

The live cattle trade has boosted the areas that landholders wish to control. These may be downstream of infestations on other properties where little or no control is carried out. This is an issue that needs resolving amongst the Mimosa Advisory Committee and the catchment groups in development of catchment plans for mimosa.

Further developments in the effectiveness of cheaper control methods, such as biological control and integrated control, will improve the situation. Effective biological control, where little personal expense or effort is required, is so necessary for the success of a total catchment management approach for mimosa.

The Committee concluded:

- *that catchment management is obviously desirable, but it is an ideal which will not always be successful due to the varying circumstances of individuals when methods other than biological or integrated control are employed.*

- *Landholders on floodplains in lower catchments are not always willing to wait for action by other landholders in the upper catchment before commencing control.*

- *Improved coordination of mimosa control within catchments is required.*

The Committee recommends:

47. **That a mimosa management group be established in each catchment to develop mimosa management plans under the proposed weeds management legislation and to coordinate operational programs.**

    (Explanatory note: These will not need to be new groups or committees. They could be part of Landcare Groups, or other relevant committees. These groups would seek advice from and advise the Mimosa Advisory Committee.

48. **That, in each catchment, a locally acceptable person be identified to motivate landholders and to coordinate control.**

8. THE NATIONAL SIGNIFICANCE OF MIMOSA

Mimosa is recognised as having national and international significance because of its serious environmental and economic impacts in the Northern Territory and Asia. In Australia, the impacts of mimosa on primary industry, conservation, tourism and the traditional Aboriginal way of life are becoming widely recognised through the media, government extension programs and through national and international conferences.

While the favoured habitat of mimosa is the wetlands, observations of its behaviour in the Northern Territory and in other countries confirm that it will grow in irrigation areas and in habitats other than wetlands.

In comparison with other tropical weeds such as prickly acacia, rubber vine and parthenium weed in Queensland, which cover millions of hectares, mimosa infests only a relatively small area of the Northern Territory and an even smaller area of the Australian continent. It is far from reaching its geographical limits of spread.

The Committee was informed that in its American 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 mimosa grows in a similar climatic zone in Australia, large areas of river systems and associated floodplains from Broome in Western Australia to approximately Rockhampton in Queensland are under threat of being colonised by mimosa. CLIMEX predictions (a computer program for climatic data) confirm this, and also predict that it may grow into northern New South Wales (Figure 3).

The potential impact of mimosa on conservation is of prime importance for Australia and the international community. Evidence was given to the Committee that a number of nationally and internationally important wetland areas in the Northern Territory are at risk of degradation through invasion by mimosa. Kakadu National Park 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. Approximately $500,000 is spent there annually in controlling mimosa.

Many other wetlands in the Territory are on the register of the National Estate or on the interim list, while others are listed in the Directory of Important Wetlands in Australia. Although these wetlands exist in the Northern Territory, their invasion by mimosa will result in losses to the Australian nation and to the international community in general, as will the loss of similarly important wetlands elsewhere in tropical Australia.

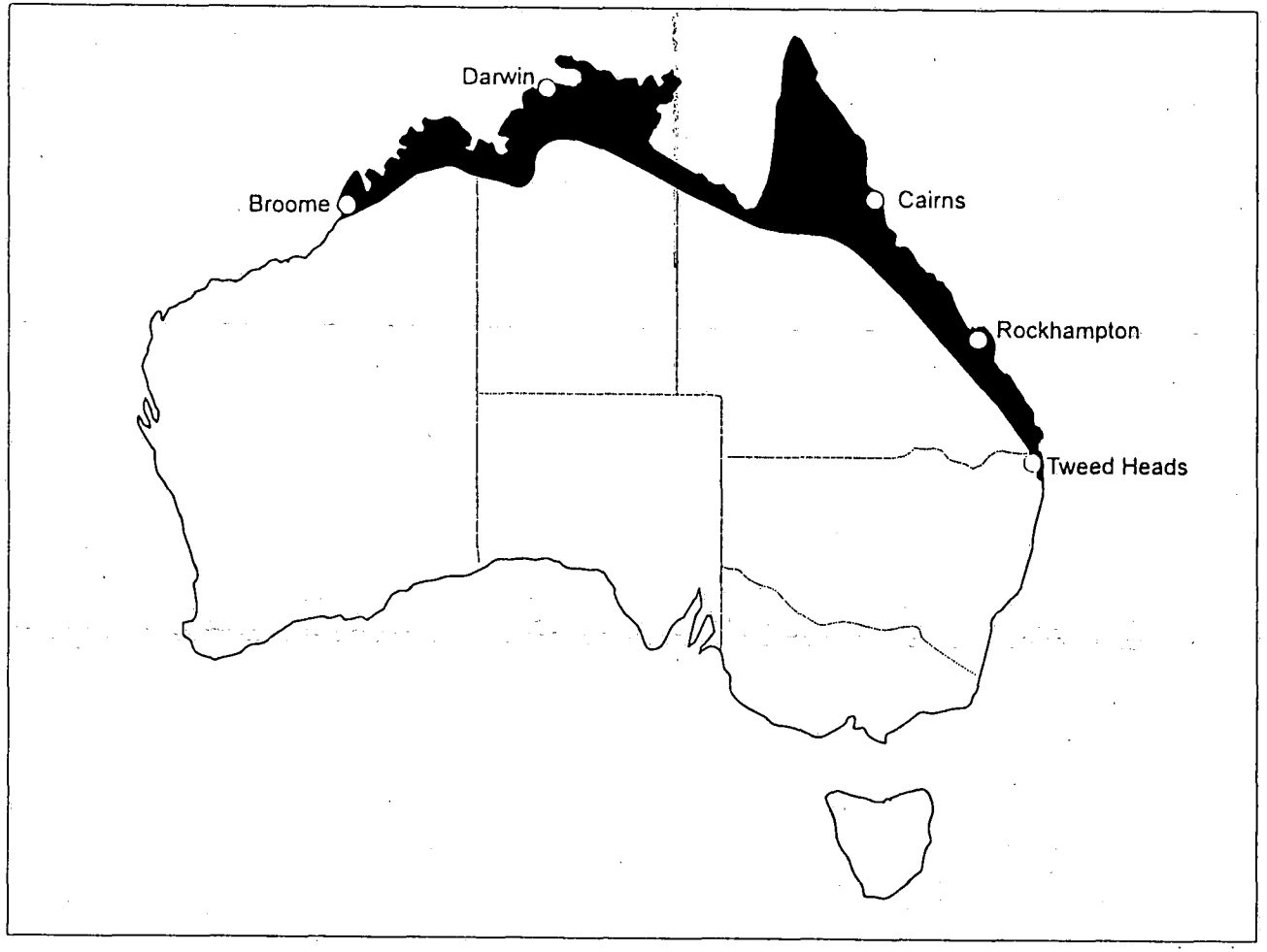

Figure 3. ■ The potential distribution of *Mimosa pigra* in Australia
(Adapted from Heard and Forno 1996)

Western Australia and Queensland have declared mimosa as a weed under their weeds legislation in an endeavour to prevent its entry and establishment. Both States have produced brochures on the weed. Mimosa is not declared as a noxious weed in New South Wales, but NSW Agriculture is aware of the threat and, if reported, it would be declared immediately.

In considering the national significance of mimosa, the Committee adopted a long-term view. At this point in time, we are not in a position to predict the outcome of biological control with any certainty, but it has been predicted that the damage to mimosa caused by biological control agents will increase over the next 5-10 years. Therefore, without active containment, the inevitable outcome over the next 50 to 200 years, may well be a low-level population of mimosa throughout Australia's tropical wetlands.

Such an outcome may be tolerated and be accepted by many, but there may be areas with a requirement for zero tolerance with a consequent cost for control, eg in the more densely populated agricultural areas.

Therefore, containment of mimosa to its present range in the Northern Territory, if not reduction, must still be the aim.

Mimosa was one of the first weeds to be recognised as having national significance in early drafts of the National Weeds Strategy. A draft Action Plan proposed to contain mimosa within the Northern Territory, and to remove it from key areas. This significance must be maintained until the plant is effectively managed.

Containment and reduction of mimosa can be achieved if resources are provided. The eastern and western extremities of mimosa are on Aboriginal Land and it is obvious that eradication needs to be the aim at these extremities.

However, the source of seed that starts satellite infestations further afield in the Territory or interstate can come from anywhere within mimosa's range. Spread to Queensland and Western Australia may well occur due to movement of seed on persons, vehicles, animals or other material from heavily infested areas, rather than through spread from the extremities of its range. The mimosa infestations closest to centres of population and arterial roads are on leasehold land, freehold land, Aboriginal Land, Conservation Reserves and other Crown Land.

Areas of mimosa that are easily accessible by the public must be kept free of mimosa or quarantined.

With 66 species and genera of plants on the Noxious Weeds List, Northern Territory landholders and government have weeds other than mimosa to manage, including weeds that pose significant environmental and economic problems or have the potential to do so. The Territory is sparsely populated

and under-resourced on an area basis. Therefore, increased funding by the Territory Government for preventing the spread of mimosa to other parts of Australia must not come at the expense of its other weed management programs.

Due to the national significance of mimosa, there is a case for increased Commonwealth assistance for its management in order to contain it within its current area and to prevent spread interstate. Therefore, the new strategy being developed by the Mimosa Steering Committee, in conjunction with the Interim Mimosa Planning Group (Section 5.2.2) must emphasise the national responsibility for management of the weed as well as the responsibilities of the Territory landholders and government.

The Committee concluded that:

- *to preserve the natural Australian wetland resource for future generations and to protect Australian industries based on wetlands and irrigation, the Territory and Australian community, and its governments, have an obligation to cooperate in preventing the further spread of mimosa within the Territory, and to prevent its spread to other parts of Australia.*

The Committee recommends:

49. That the Territory and Commonwealth Governments ensure that mimosa management remains a significant part of any strategy or plan under the National Weeds Strategy.

50. That access to Commonwealth funds for control of mimosa be given for all areas of land, regardless of ownership.

51. That, if isolated infestations are found outside of the current area of distribution, on any land, funding assistance for eradication be given to the Territory or State where it occurs, with contributions by the Commonwealth and Territory or States as appropriate.

9. CONCLUSION

Mimosa is nationally and internationally recognised as having serious environmental and economic impacts. As a result, the Australian and Territory communities have a duty to protect the nation's natural wetland environment, and those industries based on wetlands or irrigation, from these impacts.

Most witnesses agreed that mimosa will never be completely eradicated from the Northern Territory. However, it is being, and can continue to be, controlled and contained.

The inquiry revealed that much has been learnt about mimosa management over the past 32 years through research and practical application. This experience will be invaluable in planning and implementing any new strategy or plans.

The Committee is firmly convinced that future success in the control of mimosa requires an agreed approach to the problem. Establishment of a single Mimosa Advisory Committee to take prime responsibility for developing and implementing a mimosa management strategy, covering both Territory and national interests, will go a long way to achieving this.

In doing so, the proposed Mimosa Advisory Committee would consider and develop the recommendations from this inquiry.

The Committee agrees that the decision in 1978 to commence a biological control program on mimosa, and to eventually integrate it with other control methods, was the correct one. Therefore, the continuation of an integrated approach is recommended as it is still the best long-term option for the management of mimosa in different land use situations.

The formation of catchment management groups, with an identified coordinator, is essential for development of catchment and property management plans which will support the overall strategy at the local level. Landholders will require assistance to develop and implement these plans.

Economic analyses and adopting the concept of tolerance levels of mimosa will assist landholders and administrators in making decisions on future management plans for different land use situations.

High priority must be given to the control of satellite infestations to prevent the further spread of mimosa. For strategic reasons, and to preserve biodiversity, large infestations may need to be controlled using an integrated management regime that is most appropriate for the land use. Control of large infestations is also appropriate to rehabilitate land required for livestock production or other industry use.

A strong research and development effort, particularly into the integration of control methods, is essential to the mimosa management strategy and its associated management plans. As different agencies are involved, the research program is best coordinated through a Technical Working Group which consults landholders in developing its program.

A function of the Technical Working Group would be to monitor options for possible uses of mimosa.

Of utmost importance for the management of mimosa is education and training. The public must be informed of the dangers of spreading mimosa and appropriate action to take when infestations are found.

The Committee is confident that mimosa will effectively be managed by combining the ideas, skills and resources of landholders and government.

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APPENDIX 1

WITNESSES INTERVIEWED

Darwin
Wednesday 9 October 1996

Name	*Position/Organisation*
Mr Peter Blake	Secretary, Department of Primary Industry & Fisheries, Berrimah
Dr Wayne Mollah	Director, Land Resource Management, Department of Primary Industry & Fisheries, Berrimah
Mr Ian Miller	Principal Agronomist, Weeds, Department of Primary Industry & Fisheries, Berrimah

Darwin
Tuesday 4 February 1997

Name	*Position/Organisation*	
Mr Bob Townsend	Well Tree Station	
Mr Graham Schultz	Private citizen	
Dr John Fielke	APLEX Pty Ltd, Adelaide)	*(Partly in camera)*
Ms Corine Turner	APLEX Pty Ltd, Adelaide)	
Dr Gary Cook	CSIRO Division of Wildlife and Ecology, Darwin	
Dr Wendy Forno	CSIRO Division of Entomology, Brisbane	
Mr Robert Wesley-Smith	Agronomist	

Darwin
Wednesday 5 February 1997

Dr Wayne Mollah	Director, Policy Coordination, Department of Primary Industry and Fisheries, Berrimah
Mr Grant Flanagan	Senior Weed Scientist, Department of Primary Industry and Fisheries, Berrimah
Mr Jim Forwood	Member, Interim Mimosa Planning Group
Mr Colin Wilson	Senior Weed Management Officer, Parks and Wildlife Commission of the NT, Palmerston

WITNESSES INTERVIEWED (Cont.)

Wednesday 5 February 1997

Name	*Position/Organisation*	
Mr Dean Yibarbuk	Chairman Bawinanga Aboriginal Corp, Maningrida	
Mr Andy Kenyon	Northern Land Council	
Mr Michael Storrs	Environment Research Institute of the Supervising Scientist, Jabiru	
Mr Rick Van Dam	Environment Research Institute of the Supervising Scientist, Jabiru	
Mr John Hicks	Chairman, Mimosa Steering Committee	
Mr Andrew McNee	Acting Assistant Secretary, Wildlife Australia, Canberra	
Mr Don Milford	General Manager, Paspaley Pearls)	*(In camera)*
Mr Tony Searle	Manager, Melaleuca Station)	
Mr Ian Baker	NT Buffalo Industry Council	
Mrs Clair O'Brien	Lower Mary River Landcare Group	
Mr Kelvin Bugg	Lower Mary River Landcare Group	
Dr Naomi Rea	Plant ecologist	

APPENDIX 2

WRITTEN SUBMISSIONS RECEIVED

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
4	Dr Arthur Johnston, Director ERISS	***Joint Submission:*** Northern Land Council & Environmental Research Institute of the Supervising Scientist
5	Mr Tony Metcalf (CEO), Mr John Fielke, Mr Yuri Obst, Ms Corine Turner, Mr Barry Wright	APLEX Pty Ltd
6	Mr Graham Schultz	Personal
7	Mr Ned McCord	Tipperary Group of Stations (Northern Division)
8	Dr Gary Cook & Dr Wendy Forno	CSIRO
9	Ms S Whitfield, NT Manager	Australian Trust for Conservation Volunteers
10	Mr Joe Wilson, Manager	Murwangi Station, Ramingining NT
11	Mr 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	***Joint submission:*** Department of Primary Industry and Fisheries & Interim Mimosa Planning Group
14	Mrs Clair 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 *(In camera submission)*
19	Dr Goff Letts	Chairman, Wetlands Task Force - Mary River
20	-	White Eagle Aboriginal Corporation - Submission No. 2
21	Dr Naomi Rea	Private citizen