



Northern  
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Territory

A Territory Government initiative

# Cabomba Eradication Program

December 2010



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**Cover photo:** Cabomba infestation in 2007

## Executive summary

Cabomba (*Cabomba caroliniana*) is a fully submerged aquatic plant native to the Americas. Cabomba was first recorded in Australia in 1967, probably as a result of being introduced through the aquarium trade.

Cabomba is identified as a Weed of National Significance (WoNS) due to its negative impacts on social, cultural and industrial uses of affected water and waterways. Cabomba negatively impacts water quality, by increasing turbidity and nutrient loading, reducing dissolved oxygen levels and decreasing flow, and can rapidly displace native plant species forming dense monocultures. These impacts can negatively affect fauna populations, including fish, mammals, monotremes (platypus) and reptiles.

Two major infestations have been recorded in Northern Territory (NT). The first at Marlow's Lagoon, Palmerston, was successfully eradicated in 2002. The second, and persisting, infestation is limited to an isolated section of Darwin River.

The Territory Government manages the Darwin River infestation, with a view to eradication, in accordance with this plan and the Cabomba Eradication Program developed in 2004.

The Cabomba Eradication Program, as described in this document, now forms part of the Strategic Weed Management Program funded by the Territory Government aimed at reducing the impact and spread of priority weed species in the NT.

This document should be read in conjunction with the NT Cabomba Eradication Program Technical Reports and the statutory Weed Management Plan for Cabomba (*Cabomba caroliniana*).

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# 1. Introduction

## 1.1 Background

Cabomba (*Cabomba caroliniana*) is a declared Weed of National Significance and is recognised as an eradication target in the Territory 2030 Strategic Plan. It is a submerged aquatic plant which can rapidly out-compete and displace native plant species, disrupting the ecological structure and function of aquatic habitats. Cabomba can negatively impact water quality, by increasing turbidity, increasing nutrient loading, reducing dissolved oxygen levels and decreasing flow. Cabomba is often problematic in irrigation drains, channels and dams where low flow rates facilitate rapid development and spread. Interstate examples have shown that cabomba can significantly reduce water storage capacity and taint drinking water supplies

## 1.2 Infestations in the NT

Cabomba was first recorded in the Northern Territory (NT) in 1996 at Marlow Lagoon, Palmerston. This infestation was eventually eradicated in 2002 using the herbicide AF Rubbervine Spray (active ingredient 2,4 – D n butyl ester) following repeated unsuccessful attempts at physical removal.

In 2004 cabomba was detected in six locations along an 11 km stretch of the Darwin River; some of these infestations were in isolated waterholes or billabongs located on privately owned land. The infestations at the time of discovery were estimated to be less than 2 ha in total area. Given the limited extent of infestation size, comparative to the potential range and associated risk of severe environmental, social and economic impacts, eradication was established as a priority.

Since 2006, cabomba has been limited to an isolated section of Darwin River called Lok Landji Billabong.

## 1.3 Legislation in the NT

All plants within the genus *Cabomba* are declared under section 7 of the *Weeds Management Act 2001* (the Act) and are classified as Class A (to be eradicated).

Cabomba is also a Class C weed (not to be introduced).

These classifications apply to the whole of the Territory.

In accordance with the Act land owners and land managers are responsible for the control of a declared weed on personal property, however given the level of risk posed by cabomba, it was determined in 2004 that a comprehensive eradication program, developed with the input of all major stakeholders and affected land holders, would be administered and delivered by the Weed Management Branch of the Department of Natural Resources, Environment the Arts and Sport (NRETAS).

## 1.4 Strategic Weed Management Program

The Cabomba Eradication Program forms part of the broader Territory Government Strategic Weed Management Program. The principles underlying that program are:

1. To ensure strategic weed management within catchments and across land tenures by:

- a. ensuring government controlled lands are not a source of weeds by undertaking weed control on those lands;
  - b. supporting control of government land by developing partnerships and sharing resources (such as helicopter hire); and
  - c. supporting the establishment of replacement species (where appropriate) to ensure the full benefits of weed control are realised.
2. To support the Australian Government's *Closing the Gap* initiative and build Indigenous capacity by:
- a. educating local Indigenous ranger groups in a range of weed control methods;
  - b. providing local Indigenous ranger groups with opportunities to undertake weed control activities by engaging them to undertake control works on Government controlled land; and
  - c. facilitating the development of Indigenous enterprises associated with land management.
3. To build community capacity by:
- a. supporting community applications for funding of strategic weed management programs through the *Caring for our Country* and similar schemes by
    - i. providing cash support to those applications;
    - ii. providing additional in-kind operational support (for example helicopter hire or herbicide);
  - b. supporting strategic community weed management programs by providing in-kind operational support.

## 2. The problem

### 2.1 Habitat alterations

Cabomba is both persistent and competitive. It rapidly infests waterways, forming dense monocultures which can exclude native plant and animal species. In 2004 cabomba was found to be established in several reaches of Darwin River and in associated billabongs. One of these infestations, extended unbroken for more than two kilometres. It was estimated that this infestation was made up of hundreds of thousands of individual plants. Another infestation covered approximately 75% of a separate water body, monopolising the water column from the riverbed to the water surface.

Cabomba populations can rapidly die back as a result of seasonal temperature variations. The decomposing vegetation can result in dramatic oxygen reductions, which is likely to adversely affect aquatic plants and animals. Cabomba can also increase siltation resulting in changes to bottom habitats which may have flow-on affects to benthic communities.

## **2.2 Changes to hydrology and nutrient cycling**

The decomposition process described can also influence nutrient availability and has been hypothesised to result in the release of large amounts of iron, manganese and other metals, thereby reducing water quality.

Significant cabomba populations may restrict flow and contribute to the stagnation of affected water bodies.

## **2.3 Potential costs associated with water supply and distribution**

Cabomba is often problematic in irrigation drains, channels and dams where low flow rates facilitate rapid development and spread. Interstate examples have shown that cabomba can significantly reduce water storage capacity and taint drinking water supplies. Water treatment costs can be increased by up to \$50 a mega-litre.

Potential impacts on dam capacity and water quality are of particular concern, as Darwin River Dam, which supplies 90% of Darwin's potable water, is located just 6 km upstream from the original cabomba infestation at Darwin River. In the event that cabomba spreads to Darwin River Dam, an alternate water source for Darwin may need to be investigated, as there is no herbicide registered for cabomba control in potable water.

There has already been significant cost involved in controlling the existing cabomba infestation at Darwin River. Costs incurred have resulted from control, public education and awareness expenditure and the establishment of a number of alternate water sources. Affected land holders can not continue to use Darwin River water (for horticulture, industry, fishing or drinking) as long as the herbicide 2,4-D n-butyl ester is being used to treat the infestations.

## **2.4 Cultural/social impacts**

### **2.4.1 Impacts on Indigenous owned and managed lands**

The Kungarakany people are the Traditional Owners of the Darwin River area currently affected by cabomba. Representatives on the Cabomba Task Force voiced concerns regarding water quality and ecosystem functioning.

### **2.4.2 Impacts on recreational land use**

Cabomba infestations can displace native plant and animal species, reduce flow and ultimately stagnant affected water bodies. Situations worsen when massive volumes of cabomba vegetation decompose due to control methods or natural die-back. As a result the aesthetic appeal of affected water bodies and wetlands may be severely degraded, potentially reducing opportunities for tourism and recreational use.

In interstate situations, boating, sailing, canoeing and fishing have been physically restricted by cabomba infestations. Dense stands of cabomba make it unsafe for swimming activities of any kind and have direct implications for associated water sports. Please note that none of these activities are allowed in areas affected by cabomba in Darwin River, as the quarantine order, enforced under section 21 of the Act, prohibits all access to affected areas of the river and to the 5 metres of land either side of the river.

### **2.4.3 Human health implications**

Currently populations in the NT are not at levels where cabomba infestations are likely to have implications on human health. If infestations were to reach levels where control and



eradication was not achievable, then they could potentially create a work place health and safety issue for staff including water engineers, weed and park managers and field staff.

The use of the herbicide, 2,4-D n butyl ester to control cabomba must be closely monitored to ensure that no risk is posed to human health, either directly (e.g. by ingestion) or indirectly (i.e. by supplying water to horticulture/aquaculture ventures). The 1996 Australian Drinking Water Guidelines state that 2,4-D n butyl ester should not exceed a concentration of 0.03 mg/L. Regular water monitoring of the affected area has shown, where detectable, concentrations are well below the stipulated level.

Programs have also been implemented to determine the effects of herbicide application on aquatic macro-invertebrates (as biological indicators of water health) riparian fauna and riparian vegetation. These programs have not detected any significant impacts resulting from management activities.

Results from the risk assessment and monitoring programs are available in the NT Cabomba Eradication Program Technical Reports, which are available at [www.nt.gov.au/cabomba](http://www.nt.gov.au/cabomba).

## 3. The program

### 3.1 Objectives

The aim of the Cabomba Eradication Program is to eradicate cabomba from Darwin River (and hence the NT) and prevent any further introduction and establishment, thereby avoiding extensive impacts to aquatic ecosystems, drinking water supply, industry and recreational and cultural values.

In 2004, seven specific objectives to guide the program and provide an avenue for monitoring and evaluation were identified. These are:

1. Prevent all future introductions of plants within the genus *Cabomba* to the NT.
2. Eradicate all known infestations of the aquatic weed cabomba from the NT.
3. Prevent re-establishment of plants within the genus *Cabomba* at all sites where it has previously been recorded and subsequently been treated and/or removed.
4. Prevent the production of seed from all sites where cabomba is currently found.
5. Educate and enable the NT community to identify plants within the genus *Cabomba* and their potential negative impacts.
6. Determine the viability and longevity of cabomba seed in the NT.
7. Monitor the impacts of all management activities and provide an 'early warning' mechanism in order to avoid potential off-target impacts to the environment, community and industries of the NT.

### 3.2 The Management Committee

Oversight of the Cabomba Eradication Program is provided by the Cabomba Management Committee. The members of the Committee at July 2009 are specified in Appendix 2.

## 4. Program development and implementation

### 4.1 General



Effective weed management involves minimising the risk of new introductions and reducing the impact of current weed problems. Given this, the program aims to prevent any further introduction of cabomba into the NT and prevent any spread of existing cabomba into clean areas.

Cabomba spreads and establishes through the production and dispersal of large quantities of seed and through vegetative reproduction. As such on-ground efforts are directed at preventing any seed production and directing management towards complete control of any emerging infestations upon detection.

#### **4.2 Catchment management approach**

Cabomba is only currently found in the Darwin river catchment in the NT and management efforts focus on continued survey and control of all previously affected sites within the catchment.

This program involves weekly survey and control of Loklanji billabong during the dry season when water flow rates and turbidity levels are suitable for cabomba growth and germination.

All other previously affected sites are surveyed on a monthly basis during the dry season when water flow rates and turbidity levels are suitable for cabomba growth and germination.

Darwin River dam will be aerially surveyed on an annual basis.

#### **4.3 Chemical control using herbicide**

Currently there are no herbicides registered in Australia available for the treatment of cabomba and as a result of this NRETAS has applied to the Australian Pesticides and Veterinary Medicines Authority (APVMA) for a permit to use 2,4-D n butyl ester for this purpose. This permit was granted and will remain current until December 2011.

All chemical control of cabomba infestations in the NT will be undertaken using 2,4 – D n butyl ester in accordance with APVMA permit 11145.

#### **4.4 Research**

NRETAS will make a contribution toward the Aquatic WoNS herbicide research/registration program which is aiming to register alternative products in Australia for cabomba management, and provide a broader range of management options.

In addition to this the NRETAS cabomba program may become involved in supporting research at the national level regarding potential underwater seed production and further seed viability trials.

#### **4.5 Preventing seed production**

Cabomba infestations in the NT are unique in that they represent the only record of the production of viable seed in Australia. As a result of this, on-ground efforts will be directed at preventing any seed production and directing management towards complete control of any emerging infestations upon detection prior to flowering and subsequent seed production.

#### **4.6 Hygiene procedures**

The prevention of cabomba spread from known sites into clean areas remains an important objective of the NT Cabomba eradication program.

This will be achieved through the continued declaration of cabomba as a Class A weed (to be eradicated) and Class C weed (not to be introduced to the NT) and the extension of the Quarantine declaration at Darwin River until at least four years from the finding of the last plant.

## 5. Extension and education

The Territory Government will provide an extension and education program focussing on:

- cabomba management activities; and
- identification and awareness materials.

## 6. Ongoing monitoring and control

As previously stated there is an on-going requirement for monitoring and control at all previously affected sites within the Darwin River catchment during the dry season when conditions favour the establishment and growth of cabomba.

It is expected that this work will commence annually in approximately April and will be complete by the end of December with the on-set of the wet season. All active sites, currently restricted to Loklanji billabong will be surveyed and controlled on a weekly basis during this time of the year. All previously active sites found upstream of this area will be subjected to monthly survey on the basis that plants have not been recorded at these sites since 2005/06.

## 7. Reporting

NRETAS will undertake annual reporting of the efficacy and efficiency of the management program. Reports will be made available from the Weed Management Branch website: [www.nt.gov.au/weeds](http://www.nt.gov.au/weeds).

## Appendix 1

<b>Activity schedule</b>	<b>Activity description</b>
July 2009 – Dec 2009	Weekly survey and control Loklanji billabong
July 2009 – Dec 2009	Monthly survey and control all upstream sites
April 2010 – June 2010	Weekly survey and control Loklanji billabong
April 2010 – June 2010	Monthly survey and control all upstream sites
July 2010 – Dec 2010	Weekly survey and control Loklanji billabong
July 2010 – Dec 2010	Monthly survey and control all upstream sites
April 2011 – June 2011	Weekly survey and control Loklanji billabong
April 2011 – June 2011	Monthly survey and control all upstream sites
July 2011– Dec 2011	Weekly survey and control Loklanji billabong
July 2011 – Dec 2011	Monthly survey and control all upstream sites
April 2012 – June 2012	Weekly survey and control Loklanji billabong
April 2012 – June 2012	Monthly survey and control all upstream sites

## Appendix 2

<b>Agency</b>	<b>Area of Expertise/Association</b>	<b>Role</b>
Department of Natural Resources, Environment, The Arts and Sport	Biodiversity Conservation Unit	Monitoring riparian zone and aquatic fauna and flora
	Weed Management Branch	Survey, control, monitoring, landholder liaison
	Advisory and Regulatory Services	Water quality monitoring
	Communications and Media	Media management/contact/public awareness
	Environment and Heritage	Environmental monitoring and advice
Department of Health and Community Services	Environmental Health	Drinking water quality monitoring
Department of Resources	Horticulture	Industry liaison
	Pastoral Management	Industry liaison

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**Weed Management Branch contacts**

For more information or advice in relation the identification, management or monitoring of weeds please contact the Weed Management Branch:

Phone: (08) 8999 4567  
Email: [weedinfo.nretas@nt.gov.au](mailto:weedinfo.nretas@nt.gov.au)  
Website: <http://www.nt.gov.au/weeds>

The NT Herbarium can also provide plant identification advice

Phone: (08) 8999 4516