Mistflower Bio-control Project

Lake Baroon Catchment Care Group

2009-10

A co-operative project between Lake Baroon Catchment Care Group, Sunshine Coast Regional Council and CSIRO

LAKE BAROON CATCHMENT CARE GROUP

Project No. 0910-011
(0607-012)

This Project proposal has been prepared by:

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PROJECT APPROVALS

Date	Description	Result
31/3/2010	Project Proposal completed	n/a
8/4/2010	Project presented to LBCCG Committee	Approved (Minutes 36.5.7)
16/6/2010	Project Proposal forwarded to Seqwater for approval (email)	Approval Not Required (Not Seqwater funding)

Cover photo: *Mistflower (Ageratina riparia)*

LAKE BAROON CATCHMENT CARE GROUP INC.
Project Proposal

PROJECT TITLE: **Mistflower Bio-control Project 2009-10**

PROJECT NUMBER: **0910-016** (0607-012) **DATE:** **March 2010**

PROJECT SUMMARY

The sum requested will cover the cost of operating CSIRO facilities and of the staff required to prepare the documentation, test for host specificity in quarantine, complete the field activities required to test the pathogen and to undertake preliminary impact studies. Mistflower is an environmental weed so that a request to Federal Agencies to fund such a programme is unlikely to succeed.

The proposed mistflower project's anticipated cost is $200 000 over 2 years, and the documented evidence from overseas points to a high probability of success.

PROJECT PARTNERS/STAKEHOLDERS & ROLES

Lake Baroon Catchment Care Group (funded from 2006-07 project 0607-012 Mistflower Bio-control)	Accounting & financial support; funding contributor	$1,000 (cash) $1,000 (in-kind)
CSIRO Entomology	Test the host specificity of mistflower fungus; if successful release fungus; liaise with stakeholders & source contributors	
Sunshine Coast Regional Council	Funding contributor	$5,000 (cash)
	Total Project Value (seed cash)	**$7,000**

PROJECT OUTPUTS

Project Start Date	April 2010	**Project Completion Date**	June 2016
Seed funding for CSIRO Mistflower bio-control testing	1		

BACKGROUND

Mistflower is a garden escapee that has invaded riparian areas, bush margins and pasture in the Sunshine Coast (with outliers in northern Queensland) in the North, extending South to southern NSW. Unlike many other invasive plants, mistflower has the ability to spread along riparian corridors into pristine catchment headwaters and negatively impact diversity in ecologically important areas such as the Blackall Range, Lamington NP, Springbrook NP, and Barrington Tops NP.

Queensland Herbarium records indicate that mistflower has been collected from Norfolk Island, Sri Lanka and Indonesia. The implication is that this species has the potential to spread well beyond the existing known range in Australia. Additional notes on the distribution of mistflower are appended.

Current management operations are restricted to hand pulling and the application of herbicides. The latter may not be appropriate in riparian areas. 'Collateral damage' caused by herbicide application can and often challenges the floral diversity we might wish to conserve.

Biological control programmes in Hawaii and New Zealand have controlled this weed successfully with subsequent recoveries in the biodiversity of native vegetation.

Figure 1; Mistflower (Ageratina riparia) invades riparian areas and is shade tolerant allowing the weed to invade remnant vegetation unimpeded. Mistflower is a major weed on the Maleny plateau.

PROJECT OBJECTIVES

The Biological Control of Mistflower project proposal attached outlines the background, proposed aims, methodologies and outcomes for the project. The agreed objectives for the project are summarised as follows:

- Import and test the host specificity of the fungus, *Entyloma ageratinae*, for potential biological control of the introduced noxious weed, mistflower (*Ageratina riparia*)
- If host specific, then apply for permission to release and release the agent if approved.
- Prior to releasing the agent, select release sites and monitor baseline data for use in determining effectiveness.

Mistflower is an environmental weed so that a request to Federal Agencies to fund such a programme is unlikely to succeed.

PROJECT OUTCOMES

Expected outcomes from the project are summarised as follows:

- a report on the host specificity of the mistflower fungus;
- a proposal to release the fungus in Australia;
- a report on potential release sites and baseline data; and
- successful control of mistflower in Australia

DESCRIPTION OF WORKS

Appropriate tests will be undertaken in Australia before release to ensure that the smut pathogen does not infect species that are part of the native flora or are of commercial significance. Tests overseas indicate the disease is highly specific. The only non-target species which may be infected is the closely related Ageratina adenophora (Crofton Weed or Mexican Devil Weed): it has a similar distribution and weed status to mist flower in eastern Australia. White smut created lesions on the leaves of Crofton Weed in host specificity tests carried out in New Zealand, but there was no evidence of sporulation[1]

The sum requested will cover the cost of operating CSIRO facilities and of the staff required to prepare the documentation, test for host specificity in quarantine, complete the field activities required to test the pathogen and to undertake preliminary impact studies.

The proposal to finance this project is directed to a consortium of public and private sector natural resource management and wild life conservation groups, and local authorities located in the areas where infestations occur. If a notional five such organizations join the consortium their contribution could be $20 000 pa over a two year period.

FUTURE ACTIVITIES

If the host specific testing of the Mistflower fungus is successful release sites will be selected within the Obi Obi Creek catchment. The Memorandum of Understanding clearly states that Lake Baroon Catchment Care Group has input to the selection of these sites.

[1] Fröhlich, J. et al. 2000. Biological control of mistflower (*Ageratina riparia*, Asteraceae): Transferring a successful program from Hawai'i to New Zealand. In: *Proceedings of the X International Symposium on Biological Control of Weeds* (ed. Spencer, N.R.), pp.51-57. Montana State University, Bozeman.

PROJECT BUDGET

The table below reflects current 'seed' funding contributions for the project. Approximately $200,000 is required to complete the two year project, although the project will not commence until $100,000 has been deposited into the LBCCG designated project account.

All figures are GST exclusive.

Organisation	Contribution $	(in-kind) $	Total $
Lake Baroon Catchment Care Group	1,000	1,000	**2,000**
CSIRO	-	-	**-**
Sunshine Coast Regional Council	5,000	-	**5,000**
Totals	**6,000**	**1,000**	**7,000**

PROJECT ACTION PLAN

The funds stipulated here represent a fraction of the funding needed to carry out this project. The project will not begin until enough funding for the first year of the project ($100,000) is obtained. The funds will reside in the account of LBCCG until the first year's funding is achieved and then this will be used to complete the host specificity testing and begin the selection and monitoring of release sites. If alternate sources of funding are obtained by CEnt, remaining funds at LBCCG will be used either; 1) as matching funds to leverage additional funds, 2) to fund components of the second year of the project or 3) to fund monitoring of mistflower biological control effectiveness.

PROJECT REPORTING

Reporting on the progress of the project is an essential component of delivering successful on-ground outcomes. Therefore the following reporting schedule will be implemented to ensure all stakeholders are informed in a comprehensive and timely way.

Report	Recipients of Report	When
Progress Reports (presentation & brief summary).	LBCCG	Quarterly
Progress Reports (written report) – completed by CSIRO	LBCCG Seqwater Stakeholders	Annually
Final Report (includes evaluation & further recommendations for project)	LBCCG Seqwater Stakeholders	Completion of project

Objectives

The Biological Control of Mistflower project outlines below the background, proposed aims, methodologies and outcomes for the project. The agreed objectives for the project are summarised as follows:

- Import and test the host specificity of the fungus, *Entyloma ageratinae*, for potential biological control of the introduced noxious weed, mistflower (*Ageratina riparia*)
- If host specific, then apply for permission to release and release the agent if approved.
- Prior to releasing the agent, select release sites and monitor baseline data for use in determining effectiveness.

Outcomes

Expected outcomes from the Project are summarised as follows:

- a report on the host specificity of the mistflower fungus
- a proposal to release the fungus in Australia
- a report on potential release sites and baseline data
- successful control of mistflower in Australia

CSIRO Activities on Project

- test the host specificity of the mistflower fungus
- if host specific, submit a proposal to release the fungus in Australia
- select potential release sites and take baseline data
- make releases if the agent is approved (Obi Creek Catchment will be given high priority for initial releases)
- maintain stakeholder list and provide updates and yearly reports
- reports will commence one year after funds are accessed and continue at yearly intervals until the project is completed
- liaise with potential stakeholders and inform them about the project and how they can contribute

Scope of Project

This project consists of five components;
1) obtain permission to import the fungus into quarantine in Australia,
2) test the host specificity of the fungus on native and economically important plant species,
3) select release sites and conduct baseline monitoring (to measure effectiveness),
4) submit a proposal to release the fungus in Australia (if sufficiently host specific), and
5) mass rear the fungus and make the releases (if approved).

Components one through four would be conducted during the first year with the releases being made during the second year. The parties will need to obtain the funding for at least the first year ($100,000) to begin the project. This would ensure that we would have the resources to complete the host specificity testing.

Summary

The goal of this project is to reduce the environmental impact of mistflower through the testing and release of a biological control agent. Prior experience in Hawaii and New Zealand has already proven the agent to be extremely safe (host specific) and effective (reduces mistflower abundance with resulting increases in biodiversity). Unlike many introduced weeds, mistflower has the ability to spread into relatively undisturbed National Parks and ecologically important World Heritage Areas where it is likely negatively affecting populations of threatened plant and animal species.

Although mistflower is an invasive weed with demonstrated environmental impacts, it is not listed as a Weed of National Significance (WoNS), which limits federal funding opportunities. However, a group of interested stakeholders could provide the funding needed to complete the project within a two-year timeframe. The host specificity testing would be completed within the first year, with releases planned for the second year. We estimate the total cost for the two-year project would be $200k.

Mistflower Profile

Mistflower (*Ageratina riparia* (Regel) K. & R. = *Eupatorium riparium* Regel: Asteraceae), native to the Caribbean, is a perennial herbaceous plant that invades wet habitats, particularly riparian areas and moist cliff faces. In subtropical habitats it grows through most of the year, setting abundant white composite flowers in late-winter. Each seed has a pappus, which, along with its small seed size, allows the plant to colonize upstream and upslope habitats on the prevailing winds. In late-spring, the flowering stalks die back to the stolon, particularly during dry periods, and new shoots begin to grow in early-summer.

Mistflower was introduced to Australia (NSW) in 1875 as an ornamental garden plant and was first recorded in Queensland in the 1930s. It is currently present in eastern Australia from Wollongong to Cairns and in western Australia south of Perth. It is primarily a problem in mid-high elevation rainforest areas where it creates a canopy over headwater streams and displaces native riparian plant species (Barton *et al.* 2007). It is also a problem in wet meadows where it reduces forage quality for livestock (Trujillo 2005).

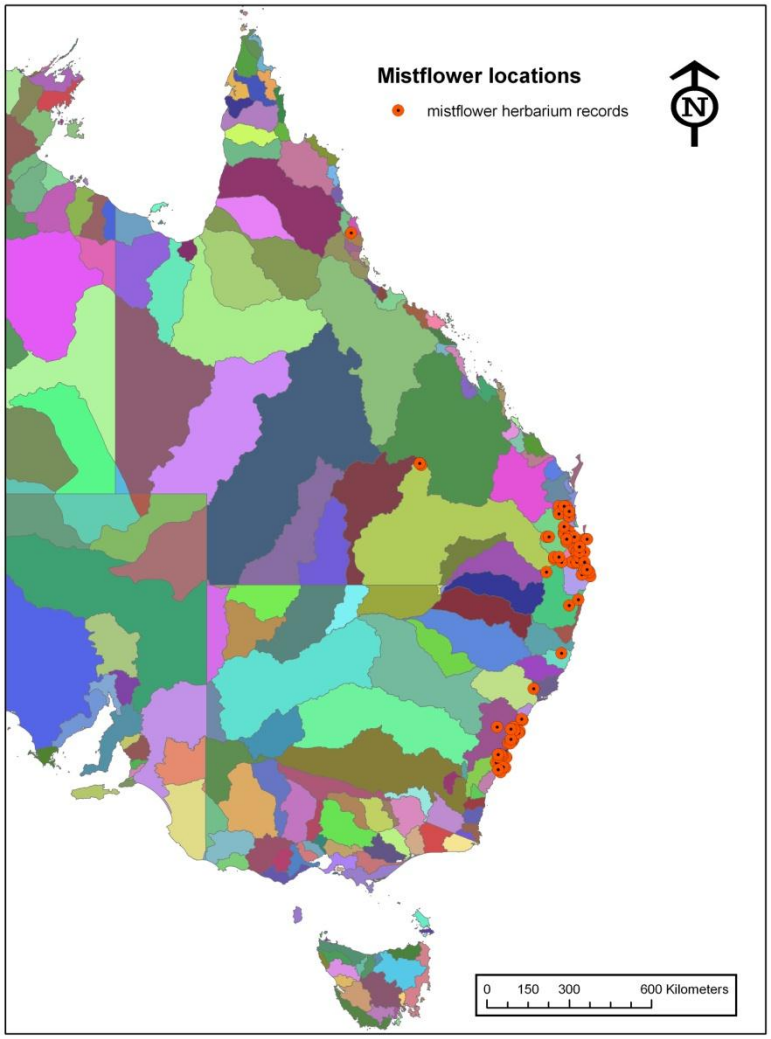
Unlike many other invasive plants, mistflower has the ability to spread along riparian corridors into pristine catchment headwaters and negatively impact biotic diversity in ecologically important areas such as the World Heritage listed Lamington NP, Border Ranges NP, Mt. Barney NP, the Murray Scrub (Toonumbar NP), and Main Range NP and other environmentally sensitive areas such as Brisbane Forest Park, Barrington Tops NP, Blue Mountains NP, and Carnarvon Gorge NP. Mistflower negatively affects the populations of a number of threatened and endangered plants in NSW including plants; *Brachyscome ascendens Daphnandra* sp. C Illawarra, *Doryanthes palmeri, Euphrasia bella, Irenepharsus trypherus, Rapanea* sp., *Sarcochilus hartmannii* and a native bird species, *Dasyornis brachypterus* (Coutts-Smith and Downey 2006). Several threatened native plants in Queensland are also thought to be negatively affected by mistflower including; *Gaultheria* sp. Merino, *Cyperus semifertilis, Isoglossa eranthemoides, Ozothamnus vagans, Plectranthus nitidus,*

Sarcochilus fitzgeraldii, and *Wahlenbergia scopulicola* (B. Macdonald, Queensland Herbarium, personal communication, 2009).

Current management operations are restricted to hand pulling and the application of herbicides. Physical removal is labour intensive and the weed often infests areas that are difficult to access (headwater riparian corridors and cliff faces). Herbicide application is increasingly expensive, often destroys desirable vegetation along with the weed (creating disturbed habitat for weed seed germination), and is known to harm fish and amphibian populations.

Current Distribution of Mistflower in Australia

Australian herbaria records for mistflower consist of 122 accessions. Most records are from Queensland and New South Wales. In Queensland, mistflower is found throughout the coastal and hinterland tract of the Sunshine Coast extending south from Gympie to the NSW border (Map 1). This distribution covers numerous national parks, including the World Heritage listed Lamington NP, Mt. Barney NP, and Main Range NP. There are many records from the Greater Brisbane area, dating back to 1921, encompassing riparian strips, forested areas, coastal wetlands, and from further inland (Gatton and Boonah). In addition, there are outlying records from north and central QLD, near the estuary of the Russell River (which drains the Atherton Tablelands), Mount Baldy and the Carnarvon Gorge. In NSW, mistflower extends from the QLD border (including the World Heritage listed Border Ranges NP and Mt Warning NP) south along the coast to Ulladulla. There are many records throughout the Greater Sydney area, including the Blue Mountains NP. However, although these records provide a good overview of the distribution of mistflower, absence of a record does not mean that mistflower is not present. For example, there are no records for mistflower in Barrington Tops NP, although mistflower is present in high abundance throughout the park (G. Prichard, pers. observation). Similarly, there are no records for Toonumbar NP and the World Heritage listed Murray Scrub, but mistflower is present throughout these areas as well (S. Schooler, pers observation).



Map 1. Mistflower distribution for Australia based on herbarium records. Background image is a map of Australian catchments. Data complied from the Australia Virtual Herbarium (www.anbg.gov.au/avh) on Aug. 5, 2008.

Queensland Herbarium records also include specimens from the Norfolk Island, Hawaii, Indonesia and Sri Lanka. NZ records indicate populations throughout the North Island (primarily around Auckland) and Nelson (South Island). Herbarium annotations confirm the conventional wisdom that this species prefers moist, shady sites but also indicate its ability to colonize open areas throughout its range in Asia and the Pacific (Australia, Sri Lanka and Norfolk Island), including plantations and grassy areas.

The biological control agent and its prior success

Extensive mistflower outbreaks in Hawaii were controlled by a fungal pathogen, (the white smut fungus *Entyloma ageratina),* imported from Mexico in the 1970s. More recently, in 1998, the same fungus was introduced to New Zealand. A field study

demonstrated control of the weed by the smut fungus and the subsequent increase in plant diversity (Barton et al. 2007).

Appropriate tests will be undertaken in Australia before release to ensure that the pathogen does not infect species that are part of the native flora or are of commercial significance. Tests overseas indicate the disease is highly host specific. The only non-target species which may be infected is the closely related Crofton Weed (Ageratina adenophora): it has a similar distribution and weed status to mistflower in eastern Australia. The pathogen created lesions on the leaves of Crofton Weed in host specificity tests carried out in New Zealand, but there was no evidence of sporulation (Fröhlich et al. 2000).

Conclusion

Mistflower is an invasive weed with two unique aspects. First, mistflower can disperse into relatively undisturbed areas that are ecologically important. Second, we have access to a safe, self-sustaining, and proven effective tool to manage mistflower. There are many weed species that are frustratingly intractable in terms of finding a safe, effective, and sustainable long-term management strategy. The strategy presented for mistflower is the ideal scenario sought for many other species. This proposal presents an opportunity to invest in a low-cost project that has a high probability of success. A comparatively small investment now will restore and protect our unique flora and fauna in these world recognized areas of high ecological significance. CSIRO Entomology has the facilities, skills, and experience to complete this project within a two-year timeframe.

References cited

Barton, Jane, Simon V. Fowler, Alison F. Gianotti, Chris J. Winks, Maarten de Beurs, Greg C. Arnold, Guy Forrester (2007). Successful biological control of mist flower (*Ageratina riparia*) in New Zealand: Agent establishment, impact and benefits to the native flora. *Biological Control* **40**:370–385

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