

National Siam Weed Management Strategy

Prepared for the National Management Group for Weeds

March 2013



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Abbreviations

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
AG	Australian Government
DAFF (AG)	Department of Agriculture, Fisheries and Forestry (Australian Government)
DAFF (Qld)	Department of Agriculture, Fisheries and Forestry (Queensland)
LG	Local Government
NAQS	Northern Australia Quarantine Strategy
NRM	Natural Resource Management
NSWEP	National Siam Weed Eradication Program
NTWMC	National Tropical Weed Management Committee
SAP	Scientific Advisory Panel
SWMG	Siam Weed Management Group

Glossary

Assets	Specifically identified assets – either environmental, cultural, agricultural or other, at risk of losing value due to Siam weed infestation.
National Tropical Weeds Management Committee (NTWMC)	A committee of relevant stakeholders established to guide the management and implementation of the NSWEP
Siam weed	<p><i>Chromolaena odorata</i> – Two phenotypes of <i>C. odorata</i> have been identified in the Siam weed infestation in north Queensland. Phenotype 1 is the most common, with type 2 phenotype having a much smaller footprint, having only been detected in the upper reaches of the Tully River catchment.</p> <p>This strategy does not distinguish between the phenotypes of <i>Chromolaena odorata</i>.</p>
Statutory bodies	Includes local and State/Territory governments and State/Territory agencies from all jurisdictions
Tropical Weeds Operational Group	A committee established to improve partnerships and information exchange between operational partners of the NSWEP
Zone	Geographical area to aid in the prioritisation of effort to achieve defined objectives

Executive Summary

Siam weed (*Chromolaena odorata*) was first detected in north Queensland in 1994 and the cost-shared National Siam Weed Eradication Program (NSWEP) commenced that same year.

A Scientific Advisory Panel (SAP) was formed by the Australian Government in November 2011 to assess the technical aspects of the Siam weed program review which was completed in August 2011. The SAP concluded that it was not technically feasible to eradicate Siam weed on a national scale.

On the 10 August 2012, the Primary Industries Standing Committee endorsed a proposal to wind down the eradication program by the end of 2012 to allow for a period of stakeholder engagement to determine an appropriate management approach for Siam weed into the future.

This strategy, which has been developed with members of the National Siam Weed Management and Operational committees and previous partners in the cost sharing arrangements, recommends an approach for the ongoing management of Siam weed into the future. The recommended actions included in this document should not preclude additional activity from taking place.

The success of the National Siam Weed Management Strategy will be dependent on the allocation of additional resources and in kind contributions from key stakeholders including Queensland Department of Agriculture Fisheries and Forestry, resources acquired through successful competitive and other funding bids and the efforts and actions of landholders and land managers that align to the strategy.

1 Siam weed in Australia

1.1 Biology

Siam weed (*Chromolaena odorata*) is recognised as one of the world's worst weeds, being a major pest in over 50 sub-tropical and tropical countries. The shrub is an aggressive invader of a broad range of land types, including pastures, plantation crops and native vegetation, with overseas evidence indicating that it is toxic to livestock. It is a perennial weed that can out-compete other vegetation because of its phenomenal growth rate of up to 5 m per year.

Siam weed can produce large numbers of seeds when mature (over 80,000 per season) that are readily dispersed by wind, water, livestock and vehicles. Plants can live for over ten years, and seed can survive in the soil for up to seven years. The time it takes for a seedling to germinate and mature sufficiently to produce seed can be as little as six months (e.g. a seedling germinating in February could produce seed in August). The root system of Siam weed is adapted to enable the plant to regrow after fire or slashing.

Siam weed can be difficult to detect, especially to the untrained person, and can be confused with lantana (*Lantana* spp.), blue-top (*Ageratum* spp. *A. conyzoides* and *A. houstonianum*.) and praxelis (*Praxelis clematidea*). The most common type of Siam weed is most readily detected when it flowers in June-July, with aerial survey usually undertaken in late June to maximise detection. The second phenotype of Siam weed identified in the Tully River catchment flowers in February-March.

Siam weed has the ability to fill a broad range of habitats. It can grow on the high tide mark of coastal dunal systems and up to 1500 m elevation on all soil types. It has been recorded in areas with as little as 500 mm of rainfall per year, and has the ability to die back in the dry season and reshoot after rain. Siam weed prefers habitats with full sun or partial shade. In the rainforests of north Queensland, it is mainly restricted to tracks, waterways and canopy gaps such as those caused by cyclonic winds. The tropical woodlands, pastures and savannahs of northern Australia are ideal habitat for Siam weed as they overlap with its vast area of suitable climate and are considered areas at highest risk for potential establishment of Siam weed (Figure 1).

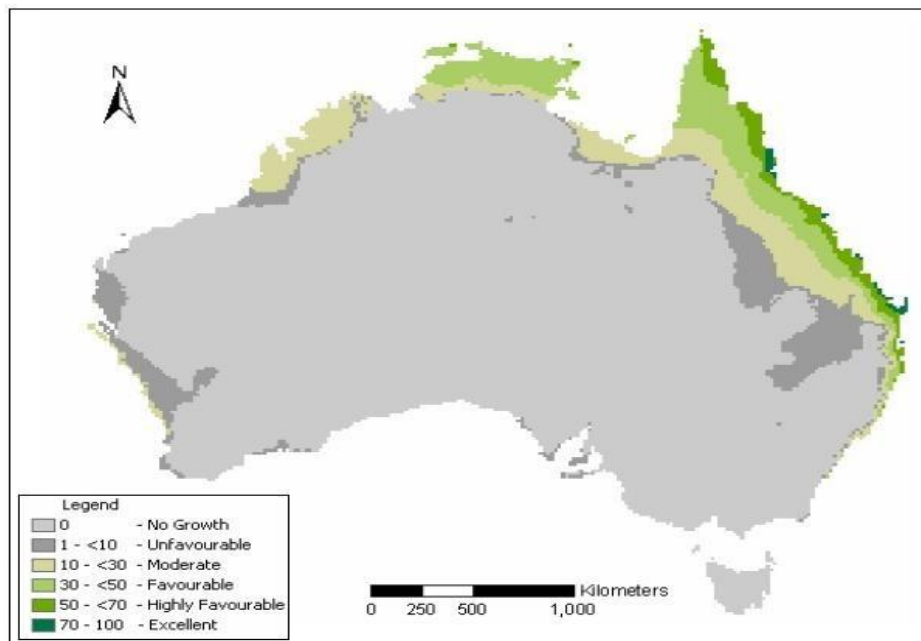


Figure 1. Potential distribution of Siam weed in Australia. Dark green areas indicate the most suitable climate (McCall 2004). The coloured area is considered a high-risk zone for potential establishment of Siam weed.

1.2 Impacts

Natural environment and ecosystems

Siam weed, due to its highly competitive nature, has the potential to significantly impact natural ecosystems across a large area of northern Australia. This species has proven to be one of the world's worst invasive weeds overseas (Lowe *et al.* 2000), with South Africa declaring it to be their worst weed alongside lantana (Mgobozi *et al.* 2008).

Dense Siam weed infestations often represent an increased fuel load compared with the native vegetation, resulting in fires of increased intensity. These cause considerable damage to the surrounding native vegetation and give the re-sprouting Siam weed plants a further competitive advantage. Once Siam weed dominates forest edges, fire is able to penetrate into native forest, causing progressive erosion of forest edges (Zacharades *et al.* 2009).

In South Africa, undisturbed coastal forest ecosystems have been progressively invaded by Siam weed leading to the degradation of these forests. Siam weed has established in natural canopy gaps formed by tree falls and then outcompeted native pioneer species. Ultimately the forest canopy has collapsed through invasion and resource monopolisation by this species (Goodall and Erasmus 1996).

Studies in Africa have also found that dense thickets of Siam weed along rivers have altered the shading and cooling of river banks, which in turn have affected the sex ratio of Nile crocodiles (Leslie and Spotila 2001). If thickets are allowed to develop along North Queensland rivers, there may be a potential impact on the local freshwater and estuarine crocodile populations.

There would also be an impact on invertebrate assemblages if Siam weed was allowed to become more widespread. In South Africa, spiders, which are a good indicator of ecological change affecting lower trophic levels, were found to be less species diverse in areas invaded by Siam weed (Mgobozi *et al.* 2008).

The palatability of Siam weed to native fauna and the impact of toxins are currently unknown, but should be recognised as a potential threat.

Siam weed is currently found within and adjacent to a number of National Parks and Conservation Areas in North Queensland, many of which are within the boundaries of the Wet Tropics World Heritage Area. The highly competitive characteristics of this invasive weed make it a significant threat to the biodiversity values of natural areas in northern Australia. The Wet Tropics bioregion is recognised as one of the world's centres of plant diversity and supports over 4660 plant species, of which 25% are endemic. The highly restricted nature of many of these endemic plants renders this regional flora particularly vulnerable to extinction due to threatening processes such as weed invasion (Werren 1995). A report to the Wet Tropics Management Authority (Werren 2001) listed Siam weed as the third highest ranked species when assessed on its potential environmental risk to the Wet Tropics. The Queensland Department of Environment and Resource Management has recognised this threat, and has been increasing funding for Siam weed control on their lands in recent years.

People, social amenity and human infrastructure

Siam weed affects human livelihood, both through its impacts on agriculture and, in areas with a distinct dry season, because it is a fire hazard. Siam weed may also cause skin complaints and asthma in allergy-prone people. If allowed to reach high densities, Siam weed will impact outdoor recreational activities (e.g. bushwalking) by impeding access and decreased aesthetic values of natural areas.

Business activity

Much of the information on the impact of Siam weed on agriculture is from overseas experience, where the impact of Siam weed is well documented. In South Africa it is ranked as the second worst invasive weed species after *Lantana camara*. Siam weed is an invasive weed of pasture and forest clearings, trails and roadsides where it can form dense thickets 2-5 metres high. Overseas it is a major weed of plantation crops such as oil palm, rubber, forestry plantations, coffee, cashews and other fruit trees (Crutwell-McFadyen 1989), as well as sugar cane, pineapples, tobacco and dryland rice (Parsons and Cuthbertson 2001).

Thickets of Siam weed impact the grazing industry in three main ways. Siam weed can:

- restrict the movement of livestock
- reduce the quantity and quality of available forage through shading and other competitive techniques; and
- have a toxic effect on livestock when consumed causing liver damage, abortions and death.

The plant is generally not eaten by livestock, however, the high nitrate levels in tender foliage and flowers have been recorded as causing livestock death through tissue anoxia (Fasuyi *et al.* 2005; Pancho *et al.* 1971). In the Philippines over 3000 livestock deaths per annum are attributed to

Siam weed (Parsons and Cuthertson 2001). In South Africa, Siam weed expansion into grazing lands has led to a reduction in stocking rates (Goodall and Erasmus 1996).

Allelopathic properties of the plant may also adversely affect germination and growth of certain agricultural crops (Goodall and Erasmus 1996).

In Timor, Indonesia, Siam weed is now the dominant plant species and in many villages up to 60% or more of arable land is now covered in this plant. Even when these Siam weed thickets are cleared before planting crops, it has been noted that the allelopathic chemicals of this plant have reduced the yield of maize and other crops (McWilliam 2000).

1.3 Legislation

Siam weed is considered a pest in many States of Australia (Table 1). In Queensland it is a Class 1 declared pest plant which requires landowners to take reasonable steps to keep their land free of the pest. Siam weed will remain a Class 1 until the new Queensland biosecurity legislation is enacted. It is Queensland’s intention that obligations relating to Siam weed will continue under the proposed new legislation.

Siam weed is a Class 1 noxious weed throughout New South Wales under the *Noxious Weeds Act 1993* (NSW), a Prohibited Species in Western Australia under the *Biosecurity and Agriculture Management Act 2007*, and has a Class C rating (not to be introduced) in the Northern Territory. Further to this, Siam weed remains a targeted species on the Northern Australia Quarantine Strategy weed list and regular survey of coastal areas between Cairns and Broome will be continued by DAFF (AG) as part of the Northern Australia Quarantine Strategy. There are restrictions on entry of Siam weed into Australia. Dried herb, leaf, flower is permitted entry for all uses other than as animal foods, fertilisers or for growing purposes.

Table 1. Declaration status of Siam weed in Australia.

Queensland	New South Wales	Victoria	Northern Territory	Western Australia	South Australia	Tasmania
Class 1	Class 1	--	Class C*	Prohibited**	--	--

* Northern Territory: Class C – not to be introduced into the Northern Territory ** Western Australia: Prohibited – species is prohibited from entering the state.

1.4 National Siam Weed Eradication Program

Siam weed was first detected in north Queensland in 1994, near Bingil Bay. It is now found in five local government areas in north Queensland: Townsville, Charters Towers, Cassowary Coast, Tablelands and Cairns, Mareeba, Hinchinbrook, Burdekin and Douglas – outlier at Shoalwater Bay (Figure 3).

A national cost-shared eradication program was initiated in 1994, managed by Biosecurity Queensland and over \$9 million has been spent up to 31 December 2012 by the Australian, Queensland, Northern Territory, Western Australian, New South Wales and Victorian governments. Additionally, a significant resource contribution in excess of \$5 million has been made by other government agency and industry stakeholders.

Over the past 18 years (1994 - 2012) the National Siam Weed Eradication Program (NSWEP) has reduced the spread, density and seed production of Siam weed infestations across a relatively small and contained area of north Queensland. The actual treatment area of Siam weed in 2011 was 619 hectares, which is less than 1% of the total area of Australia at risk.

The effectiveness of the program has significantly reduced the impact of Siam weed on agricultural production and environmental values in north Queensland. A benefit cost analysis (Goswami 2008) estimated that the Siam weed eradication program activities had provided \$4.5 billion worth of benefit to agriculture and the environment since 1994 through effective containment and suppression.

The program has also contributed increased knowledge to support the longer term management of Siam weed in Australia (refer to additional reference material – pg 22), including:

- A better understanding of the life cycle of Siam weed in Australia, including seed persistence in the soil and the time it takes for plants to start producing seeds;
- Improved survey and detection techniques, including aerial surveillance; and
- A broad range of improved and permitted control options including herbicides and application techniques, and the use of fire.

1.5 Economic and science-based assessment of policy options

In 2012 the National Biosecurity Committee commissioned ABARES to undertake an economic and science-based assessment of policy options of Siam weed in Australia (Hogan *et al.*, personal communication). In this study, the annual damage costs from maximum Siam weed spread in mainland Australia were estimated under three damage cost scenarios—low, medium and high damage.

The indicative damage costs inform jurisdictions of projected returns from a successful Siam weed containment or eradication policy. The annual damage costs from the maximum spread of Siam weed were projected to be substantial, particularly for the beef cattle industry and the environment in northern Australia. Indicative annual damage costs to agricultural and environmental areas in mainland

Australia were estimated as ranging from \$42 million (low damage cost scenario) to \$141 million (high damage cost scenario) in 2010-11 prices. Three jurisdictions incurred damage costs in the medium and high cost scenarios (Queensland, 70%; Northern Territory, 27%; and Western Australia, 3%) while only Queensland and the Northern Territory incurred damage costs in the low cost scenario.

The expected net present value of damage costs from Siam weed spread over a 150 year period were estimated to be \$1 billion (in 2010-11 prices). This estimate assumed a Siam weed growth rate of 10% per annum and that 99% of annual damage costs were incurred after 100 years under a discount rate set at the long term government bond rate of 2.5% in real terms.

1.6 Future Siam weed management

The future of Siam weed management beyond an eradication program was discussed at the Tropical Weeds Management Committee (TWMC) meetings of 19 September 2012 and 14

February 2013. There was general consensus from members present that a program for management of Siam weed should continue following the cessation of the NSWEP.

A zonal approach to management was discussed as one that could provide different management goals in each zone such as eradication in outlying catchments where infestations are few or absent, and asset protection in other catchments where local eradication is no longer feasible. This approach may also be able to align with local government area pest management planning processes.

It was generally agreed by the TWMC that a zonal approach to management should be adopted.

2 Strategic Goals and Objectives

2.1 Strategic Goal

The goal of this strategy is to assist all stakeholders in the prioritisation of management actions to limit the spread and impact of Siam weed infestations on agricultural production, cultural assets and the environment. Include list of specific assets

2.2 Strategic Objectives

- The impact of Siam weed on agricultural production, cultural assets and the environment is limited.
- A zonal approach to management of Siam weed is adopted. And is reflected in the legislation
- Siam weed control is implemented by landowners and land managers.
- Management advice for Siam weed is provided to landholders.
- On-going, coordinated management of Siam weed is provided.
- A mechanism to track spread and respond to new Siam weed detections in weed-free and prevention zones is in place.
- Key learnings from the eradication program are incorporated into future management.
- Partnerships are supported to source investment to continue on-ground works in strategic infestations.
- Include something about improved communications, including
 - o the presence of SW infestations (SDR's), and
 - o improved awareness at national and 'other states' level (WA/ NT)
 - o

2.3 Governance

In order to maintain a coordinated and collaborative approach to Siam weed management across its distribution, a Siam Weed Management Group (SWMG) will be established to follow on from the National Tropical Weed Management Committee (NTWMC).

The membership of the SWMG will be similar to the NTWMC and will provide updates to the Australian Weeds Committee via the Queensland Department of Agriculture Fisheries and Forestry member. The SWMG will include representatives from industry, local government, NRM groups, land managers and government departments/agencies and be chaired by industry or local government with Secretariat support provided by DAFF (Qld).

Actions for the SWMG will include:

- development of Terms of Reference for the new management group
- establish trigger points for a review of the strategy
- encourage and support response to new detections in the Siam Weed Free and Prevention and Removal Zones
- coordination of funding proposals in a timely manner
- review of zone boundaries

2.4 Review of zone boundaries

Reviews of the zone boundaries by the SWMG will incorporate scientific evidence based information and agreed policies. Suggested trigger points for a review of zone boundaries may include:

- Response to Siam weed detections/ incursions that threaten the integrity of the zone, for example:
 - The confirmed detection of Siam weed in the Siam Weed-Free Zone
 - The confirmed detection of a significant infestation of Siam weed in the Prevention and Removal Zone.

2.5 Review of the Strategy

Reviews of the strategy by the SWMG will incorporate scientific evidence-based information and agreed policies. Suggested trigger points for a review of this strategy may include:

- Scheduled review, for example:
 - Two years after the adoption of this strategy, and subsequently every three years.
- Other, for example:
 - Any change in the state or national arrangements or legislation used to support this strategy.

3 Zonal Arrangements

3.1 Introduction to Zones

The strategy identifies three zones (Figure 2) to help prioritise management actions needed to contain and limit the impact of current and future Siam weed infestations:

- i. Siam Weed-Free Zone
- ii. Prevention and Removal zone
- iii. Impact Reduction Zone

Within these three zones, the coloured areas identified on the map of Australia in Figure 1 are considered high-risk areas for potential establishment of Siam weed based on most suitable climate.

Siam weed infestations are spread across several local government areas, natural resource management regions and multiple river catchments (Figures 3 and 4).

Zonal boundary recommendations in this strategy are based on:

- the current level of infestation of Siam weed in any given area; and
- the achievability of the proposed objectives of each zone.

Consideration has also been given to the recognition of the existing resources available for the management of Siam weed.

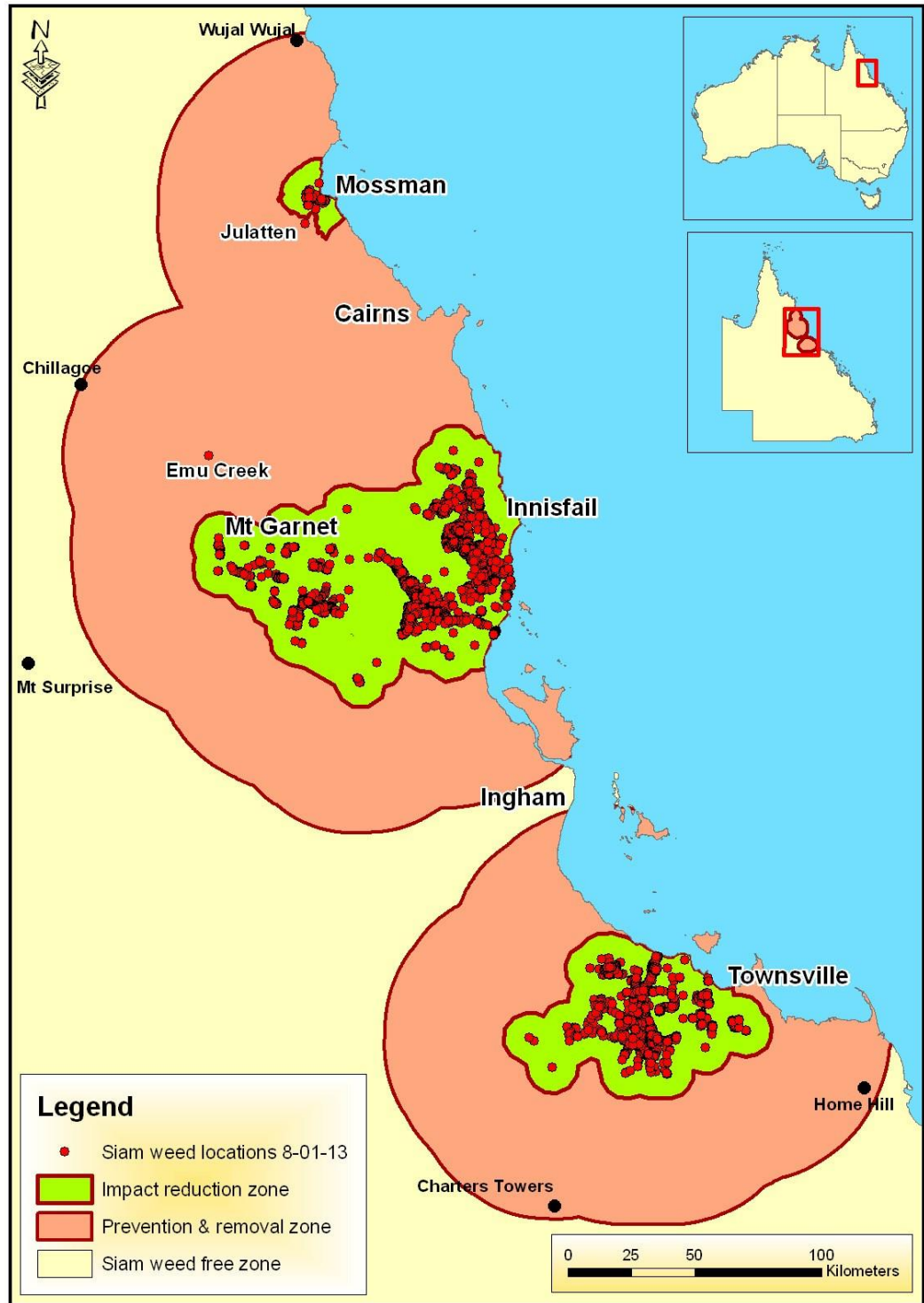


Figure 2. Recommended Siam weed management zones.

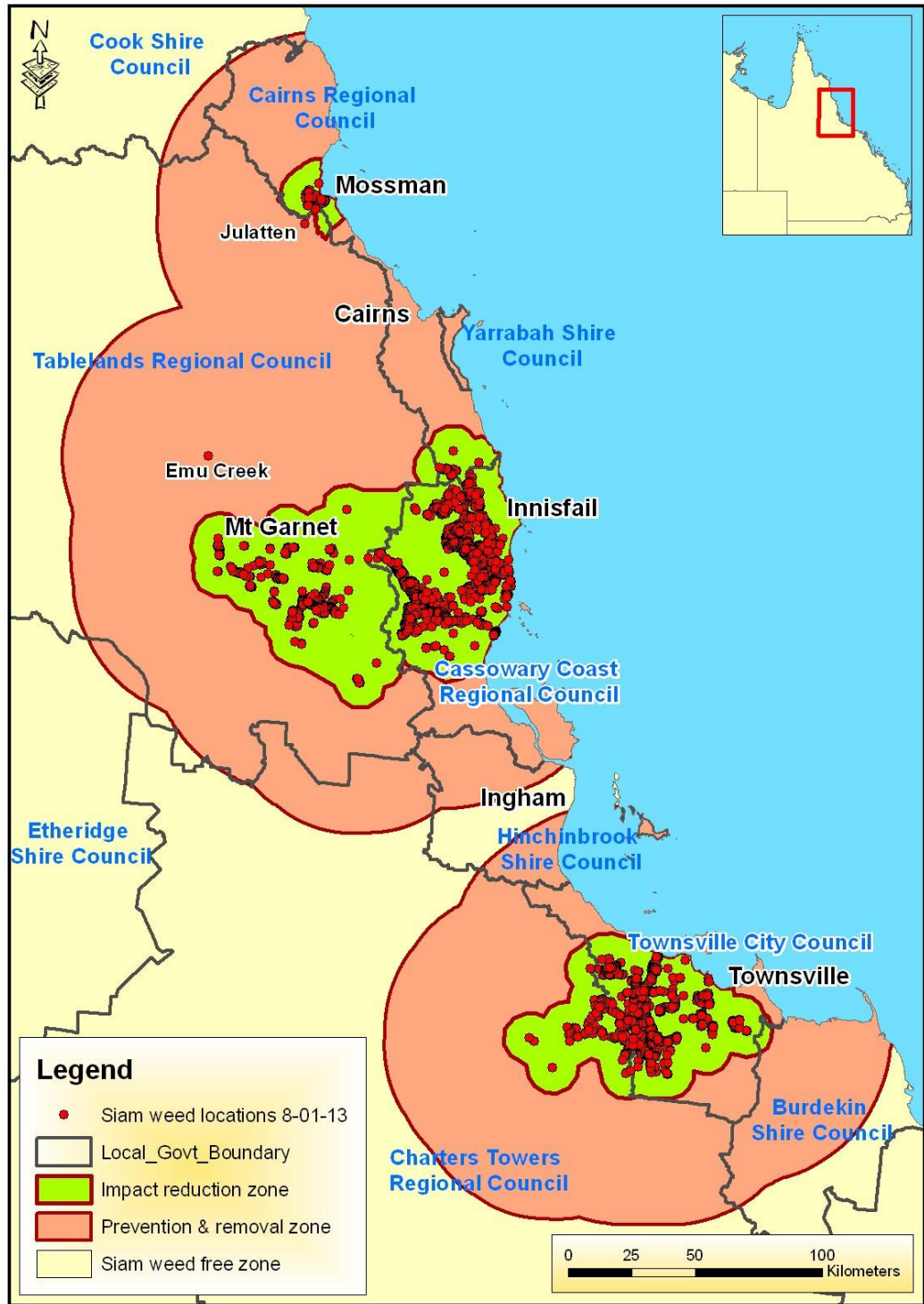


Figure 3. Recommended Siam weed management zones with local government areas.

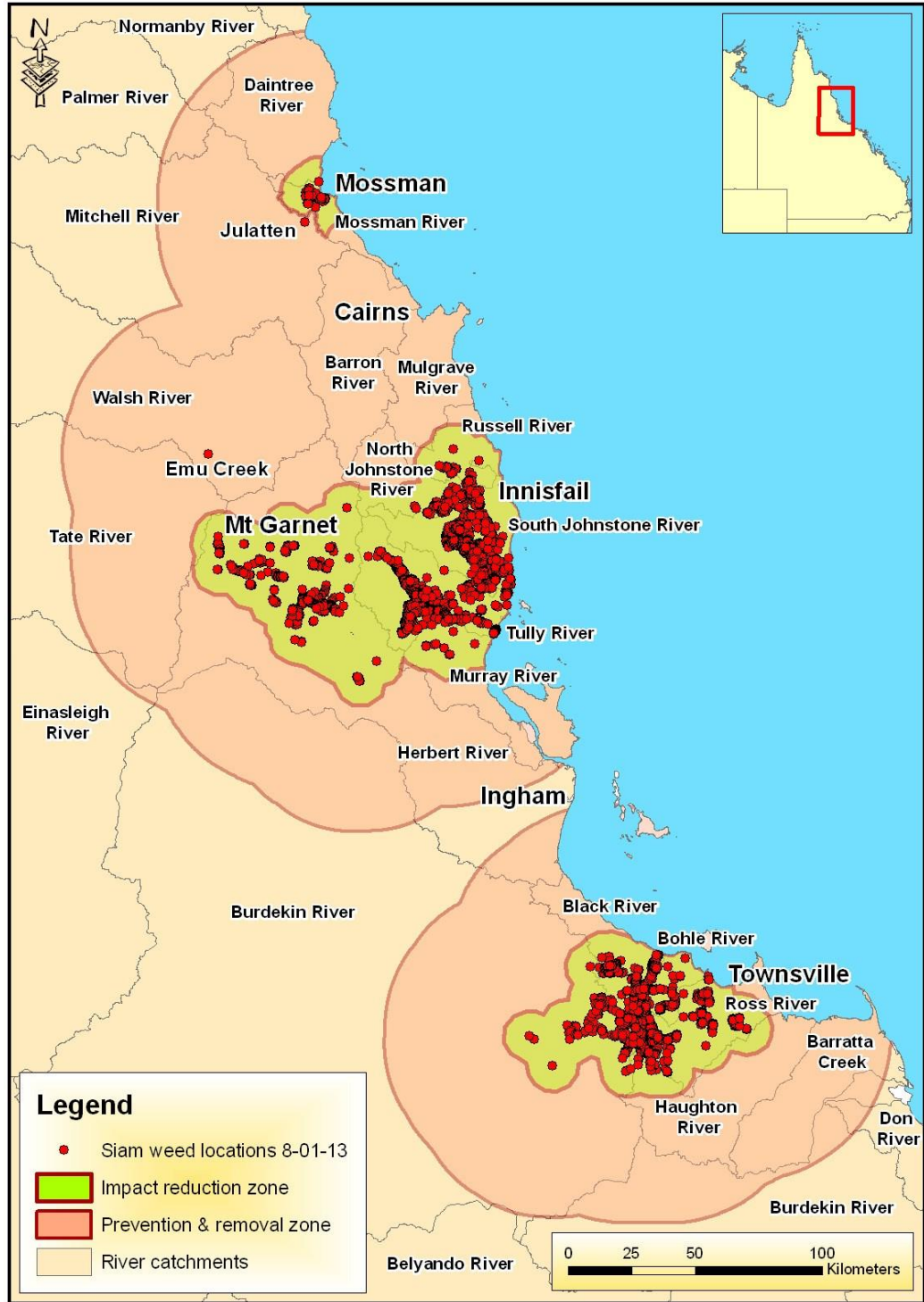


Figure 4. Recommended Siam weed management zones with river catchments.

3.2 Siam Weed-Free Zone

This zone begins 60 km from known Siam weed infestations and, by definition, extends to include the remainder of the Australian mainland. The recommended actions should be primarily

focussed in the local government areas in the immediate vicinity of existing infestations (Figure 3), however, they apply to all regions that are climatically suited to the establishment of Siam weed.

Spread prevention and infestation reduction actions recommended in other zones also supports the objective of maintaining these areas free of Siam weed.

A positive detection of Siam weed in this zone (as confirmed by the relevant State Herbarium) will trigger an immediate response.

Criteria used to determine the zone

- No Siam weed has been detected in this zone as at 31 December 2012.

Management Objectives

- Area maintained as Siam weed-free.
- Early detection of, and response to, Siam weed infestations.
- Ongoing awareness through extension and education.

Table 2. Recommended actions in the Siam Weed-Free Zone.

Action	Output/ performance indicator	Responsibility	Timing
Update of existing Siam weed extension material	New material developed and accessible	DAFF (Qld)	End March 2013
Relevant jurisdictions promote the objectives of Weed Free Zone into Siam weed communications	Objectives of Weed Free Zone are included in communications plans	Relevant jurisdictions, other interest groups and industry	End February 2013, ongoing
Early response to suspect detections	Suspect samples sent to relevant herbarium for identification and reported as per jurisdictional protocols	Landowners and land managers; relevant jurisdictions	Per jurisdictional requirements
Response to positive identification	Control and ongoing follow-up of infestation to maintain zone as weed-free Location of infestation recorded through relevant jurisdictional databases and reported to the SWMG	Landowners and land managers; relevant jurisdictions	As detected
Review of zone boundaries	Review of boundaries by the SWMG to ensure management actions are achievable	Siam weed management group (refer to section 2.3 of this strategy)	As required
Promote sound weed hygiene practices to minimise Siam weed entering the Weed Free Zone as a contaminant of other products, e.g. fodder, soil, grass seed	Awareness of risks associated with receiving material sourced from within the Impact Reduction Zone	LG/ DAFF (Qld)	Ongoing
Siam weed included as priority species in relevant pest and NRM plans	Siam weed identified in relevant plans consistent with objectives of this plan	Relevant NRM and statutory bodies DAFF (AG - NAQS)	Ongoing

3.3 Prevention and Removal Zone

This zone is located between 10 – 60 km from known Siam weed infestations, and is considered to have medium to high risk of being infested with Siam weed.

This strategy recommends Siam weed is included in regular pest survey programs, and that confirmed infestations in this zone are intensively controlled.

Extension activities targeting Siam weed identification are delivered to landholders and managers.

Criteria used to determine the zone

- A 50 km Siam weed-free* buffer adjacent to known infestations of Siam weed (recorded by the NSWEP as of 31 December 2012; * includes outlier infestations at Emu Creek and Julatten).

Management Objectives

- Area maintained as Siam weed-free.
- Early detection and response to Siam weed infestations.
- Emu Creek and Julatten infestations targeted for eradication
- Ensure detections in this zone are reported to IPAC and also relevant local stakeholders
- Active and passive surveillance is encouraged.
- Promotion of sound weed hygiene practices and the risk of spreading Siam weed as a contaminant in other material.

Table 3. Recommended actions in the Prevention and Removal Zone.

Action	Output/ performance indicator	Responsibility	Timing
Communications Plan developed	Communications Plan developed with relevant roles and responsibilities	DAFF (Qld)/ LG/ NRM and industry groups	End March 2013 - ongoing
Identify high-risk sites for targeted surveillance	Results of surveys at high-risk sites reported	LG/ DAFF (Qld)/ landowners and land managers	Ongoing
Early response to suspect detections	Suspect Siam weed samples sent to the Qld Herbarium for identification	Landowners and land managers/ Qld Herbarium/ Weedspotters networks/ LG/ other	As detected
Response to positive identification	Control and ongoing follow-up of infestation to maintain zone as weed-free; Location of infestation recorded through LG process and Pest Central and reported to the SWMG	Landowners and land managers/ DAFF (Qld)/ LG/ Industry	Update provided to relevant regional and local Pest Advisory Forum ASAP after detection confirmed
Promote sound weed hygiene practices to minimise Siam weed entering the Prevention and Removal Zone as a contaminant of other products, e.g. fodder, soil, grass seed	Awareness of risks associated with receiving material sourced from within the Impact Reduction Zone	LG/ DAFF (Qld) (if comment is agreed to – list industry)	Ongoing
Emu Creek and Julatten infestations targeted for eradication	Emu Creek and Julatten sites under Intensive management and monitoring	DAFF (Qld)/ LG/ landowners and land managers	Ongoing
Review of zone boundaries	Review of boundaries by the SWMG to ensure management actions are achievable	SWMG (refer to section 2.3 of this strategy)	As required

3.4 Impact Reduction Zone

The primary on-ground activities in these areas will be implemented by landowners and land managers.

This strategy recommends prioritising on-ground control actions in this zone towards:

- i. the protection of specifically identified assets – either environmental, agricultural or other.
- ii. limiting the risk of Siam weed spread into un-infested areas – particularly through strategic suppression along and adjacent to major spread pathways (e.g. waterways and roads).
- iii. targeted intensive control to achieve local eradication in strategic infestations (e.g. Mossman and Upper Herbert infestations).
- iv. promotion of sound weed hygiene practices and the risk of spreading Siam weed as a contaminant in other material.

Criteria used to determine the zone

- Siam weed present including large or core infestations, plus a 10 km buffer (from NSWEP data as at 31 December 2012; includes infestations at Mossman and Herbert River catchments that were making good progress towards local eradication during the NSWEP).

Management Objectives

- Limit spread of Siam weed into the surrounding Prevention and Removal zone.
- Assist LGA's in IRZ to improve landholder management and treatment of Siam weed.
- Targeted intensive control to achieve local eradication in strategic infestations (e.g. Mossman and Upper Herbert infestations).
- Assets in national, regional or local interest at risk of Siam weed infestation are identified.
- Suppression/ limit seeding and impact reduction on primary production and the environment/ other identified asset.
- Biological control development and release in this zone (contingent upon successful testing and approvals) to assist with reducing the impact of Siam weed.

Table 4. Recommended actions in the Impact Reduction Zone.

Action	Output/ performance indicator	Responsibility	Timing
Develop Communications Plan	Communication Plan developed with relevant roles and responsibilities	LG/ NRM bodies/ DAFF (Qld)	End March 2013
Assets identified and prioritised	Assets at most risk identified as part of Pest Management Planning process	Landowners and managers/ LG/ DAFF (Qld)	During 2013/ Ongoing
Existing mechanisms used to monitor and report locations of Siam weed	Current processes to record weed locations to include Siam weed	LG/ DAFF (Qld)/ relevant NRM group/ other statutory bodies	Ongoing
Pathways and sources identified and prioritised	Pathways and sources of high risk of spread identified as part of Pest Management Planning process	Landowners and land managers/ LG/ DAFF (Qld)	During 2013/ Ongoing
Targeted intensive control of identified areas (Mossman, Upper Herbert catchments)	Funding for intensive control programs sought and applied Engage with landholders to promote intensive control actions	Relevant NRM group/ LG/ DAFF (Qld)	Biodiversity fund – December 2012 Ongoing
Appropriate management actions developed and prioritised	Implementation of appropriate management techniques	Landowners and land managers	Ongoing
Siam weed management included in existing forums	Siam weed control on agenda at relevant regional Pest Advisory Forum	DAFF (Qld)	Twice yearly in Dry Tropics Three times per year in Wet Tropics
Continue development of biocontrol agent	Suitable biocontrol tested and applied for release	DAFF (Qld)	2-3 years
Appropriate chemical permits are in place	Appropriate permits remain current	DAFF (Qld)/ APVMA	Ongoing
Review of zone boundaries	Review of boundaries by the SWMG to ensure management actions are achievable	SWMG (refer to section 2.3 of this strategy)	As required

Reference Material

The following references have been developed through the National Siam Weed Eradication Program and that support the implementation of this strategy.

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Appendix 1. Stakeholders consulted

Table 5. National Tropical Weeds Management Committee membership.

Agency/Organisation	Member
DAFF (Qld) Biosecurity Queensland Control Centre	Neil O'Brien
DAFF (Qld) Invasive Plants and Animals	Gabrielle Vivian-Smith
DAFF (Qld) Invasive Plants and Animals Science	Shane Campbell
Department of National Parks, Recreation, Sport and Racing, Queensland Parks and Wildlife Service	Andrew Millerd/ Marty McLaughlin
Department of Natural Resources and Mines, State Land Management Unit	Russell Jack
Terrain Natural Resource Management	Bart Dryden
NSW Department of Primary Industries	Stephen Johnson
Townsville City Council	Cr Vern Veitch
Department of Agriculture, Fisheries and Forestry (AG)	Chris Adriaansen
Department of Defence (AG)	Alan McManus
Far North Queensland Regional Organisation of Councils	Travis Sydes
North Queensland Dry Tropics	Brett King
AgForce	Paul Burke
DAFF (Qld) Biosecurity Queensland Control Centre, Weed Eradication Programs	Mick Jeffery

Table 6. State and Territory agencies also consulted during the development of this strategy.

Agency	Individuals
Department of Agriculture and Food, Western Australia	Jon Dodd, Andrew Reeves
Department of Land Resource Management, Northern Territory	Piers Barrow, Geraldine Lee

Table 7. Tropical Weeds Operational Group members.

Agency/ Organisation	Member
DAFF (Qld) Biosecurity Qld Control Centre	Neil O'Brien, Mick Jeffery, Kim Erbacher
DAFF (Qld) Invasive Plants and Animals	Rob Cobon, Jodie Bocking, Michael Graham, Lauren O'Bryan
DAFF (Qld) invasive Plants and Animals Science	Simon Brooks, Stephen Setter
Queensland Parks and Wildlife Service	Alex Tessieri, Kylie Goodall, Jack Hargreaves, Mark Parsons, Col Adams, Rob Graham, Russell Best, Bridget Armstrong
State Land Management Unit, Department of Natural Resources and Mines	Russell Jack, Nicola Ambrose
Tablelands Regional Council	Sid Clayton
Cairns Regional Council	Russell Wild, Peter Logan, Matt Birch
Townsville City Council	Kent Worsley
Cassowary Coast Regional Council	Damon Sydes, Kelly Ashwood
Department of Defence (AG)	Alan McManus
Hinchinbrook Shire Council	Matt Buckman
Charters Towers Regional Council	Ted Vinson, Dick White
Centrogen (contractors to Dept of Defence)	Brendon Walters
Far North Queensland Regional Organisation of Councils	Travis Sydes
Wet Tropics Management Authority	Bruce Jennison
NQ Land Management Services (weed contractors)	Geoff Onus
Ergon Energy	Meredith Anderson, James Curtin, Peter Gorrie, Zero Crawford
Powerlink	John Peeters
Queensland Rail	Glenn Withers, Steven van Ballegooyen
Department of Transport and Main Roads	Paul Barnes

Table 8. Other agencies/ organisations invited to provide input to this document.

Agency/ Organisation
Meat & Livestock Australia
Cook Shire Council
Canegrowers Organisation
Australian Banana Growers Council
Growcom
HQPlantations Pty Ltd
Northern Gulf Natural Resource Management
Southern Gulf Natural Resource Management
Cairns and Far North Environment Centre
Northern Australia Quarantine Strategy – DAFF (AG)