WEEDS OF
NATIONAL SIGNIFICANCE

Water Hyacinth
(*Eichhornia crassipes*)

Strategic Plan
2012 to 2017

ISBN [To Be Advised]

Supporting information about the Australian Weeds Strategy, Weeds of National Significance and progress to date may be found at www.weeds.org.au**,** where links and downloads provide contact details for all species, their management committees and copies of the strategy.

This strategy was developed under the leadership of the Andrew Petroeschevsky [Department of Primary Industries], [New South Wales] with full cooperation of all the States, Territories and Commonwealth of Australia.

Comments and constructive criticism are welcomed as an aid to improving the process and future revisions of this strategy.

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For further information contact:
Secretariat
Australian Weeds Committee
[*Insert contact details of AWC*]

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EXECUTIVE SUMMARY

Water hyacinth (*Eichhornia crassipes*) causes severe impacts to freshwater ecosystems and water storage facilities across much of the east coast of Australia. It has been declared a Weed of National Significance because of its invasiveness, potential for spread and severe impacts.

Water hyacinth is a highly attractive ornamental plant that causes havoc wherever it naturalises. It was first detected in 1890s in localities in New South Wales and Queensland, and has since spread to many locations on Australia's east coast where it causes significant economic, ecological and social impacts. Its ecological impacts are many and varied but essentially it reduces aquatic biodiversity by removing light from the water body killing all submerged plants and eventually their associated fauna. Infestations can also adversely affect water storage and irrigation infrastructure, and recreation and amenity values. The annual economic cost of water hyacinth to Australia could be millions of dollars when control costs and flood damage caused by its floating rafts are included.

Water hyacinth is now considered naturalised along most of the east coast of Australia from Cairns to Jervis Bay. Outlier infestations are found in Victoria, the Murray Darling Basin and Far North Queensland. However, its potential for further spread is immense as water hyacinth only occupies a small percentage of its potential range. Despite its status as a declared weed in all states and territories it is still occasionally utilised as an ornamental pond or farm dam plant. It is from its ornamental use that water hyacinth poses the greatest risk of spreading to new waterways.

In 2012 water hyacinth was named one of the additional twelve Weeds of National Significance. This strategic plan was developed in response to its WoNS listing and aims to provide a framework to eventually protect Australia's waterways from the severe impacts of this weed.

The strategic plan complements the Australian Weeds Strategy by aspiring to deliver the following goals and objectives:

1. New water hyacinth infestations are prevented from establishing

    - Invasion vectors, sources and pathways for water hyacinth are identified and managed to prevent or reduce spread
    - Surveillance and response mechanisms established to ensure timely detection of new infestations.
    - Priority outlier infestations delimited and destroyed or contained
    - Risk of spread from outlier sites and core areas is reduced

2. Existing water hyacinth infestations under strategic management

    - Priority assets at risk are benefiting from long term strategic water hyacinth control programs
    - New biological agents explored and performance of existing agents optimised
    - Holistic weed and land/water management practices are improving waterway condition

3. Increase capacity and will to manage water hyacinth

    - Infestations are mapped to national standards and to a level sufficient to inform decision making
    - Effective integrated tools are available to manage water hyacinth
    - Capability and motivation to manage are enhanced by availability of best practice information, and education and awareness
    - Improved knowledge base of the impacts of both water hyacinth and its management
    - Local to national planning, policy and legislation incorporates and/or supports strategic plan objectives

- Stakeholders are committed to the implementation of the strategic plan
- The national strategic plan remains relevant and effective

The plan outlines measurable and targeted actions that allow progress towards these goals and objectives over the next five years.

Vision /Aspirational Goal

The vision of this strategy is: Australia's waterways will be protected from the negative impacts of water hyacinth.

1 THE CHALLENGE

Water hyacinth (*Eichhornia crassipes*) is regarded as one of the world's worst aquatic weeds due to its ability to form dense floating mats that can rapidly cover the entire surface of a water body. These mats devastate aquatic environments and cause significant damage to infrastructure (such as bridges and fences) during flood events. In addition, management costs can be considerable. Water hyacinth is Weed of National Significance because of its invasiveness, potential for much further spread throughout Australia and severe economic, social and environmental impacts to waterways.

The potential range of water hyacinth includes fresh waterways in all mainland States and Territories and, although well established in coastal Queensland and New South Wales, it still only occupies a small percentage of this potential range. The use of water hyacinth as an ornamental plant by water gardeners threatens to spread water hyacinth to regions that are currently free of the weed. In addition, despite a nationwide ban on its sale the illegal trade of water hyacinth continues through weekend markets and over the internet. Awareness programs with peri-urban and ethnic communities, inspection programs and enforcement of legislation are required to reduce its ornamental use and limit this critical invasion pathway.

Outlier water hyacinth infestations in some regions of Australia have potential to spread further downstream and create new infestations. These include those infestations within the Murray Darling Basin, including a severe infestation in the Gingham watercourse that also threatens the Ramsar-listed Gwydir wetlands. New incursions are often the result of deliberate plantings in outdoor fishponds and farm dams and can easily spread to nearby waterways during flood events. A key challenge will be to detect and respond to new incursions before they have the opportunity to spread further.

Existing infestations of water hyacinth currently impact on or threaten a range of assets and values, including ecologically important wetlands, river navigation, water storage facilities, aquatic based recreational activities and infrastructure in flood prone areas. Careful planning and long term commitment will be required to ensure control programs are effective.

It is vital that we improve our capacity and willingness to manage if we are to protect Australia's waterways from water hyacinth. It remains an extremely difficult and expensive plant to control due to its rapid growth rates and persistent seed banks so both the provision of best practice information and research on more cost effective control options, including biological control, are high priorities. Finally, it is important that all stakeholders recognise the threat posed by water hyacinth and work together to implement this strategic plan.

2 INTRODUCTION

The national water hyacinth strategic plan has been developed to provide a framework for the coordinated management of water hyacinth across Australia. The plan provides a five year time frame to achieve the priority actions necessary to prevent further spread, reduce impacts and increase capacity of stakeholders to manage water hyacinth. The plan seeks to complement and build on existing weeds and water management strategies and initiatives from a local to national level, including the Australian Weeds Strategy.

Water hyacinth shares many similar issues and management responses with other priority aquatic weeds in Australia. Aquatic weeds often have similar invasion pathways, impacts and research needs, and importantly are often managed by the same stakeholders. This plan recognises these similarities with some actions having either broader benefits for all aquatic weeds management or applicable for other aquatic weeds. Due to such similarities this plan will be jointly managed with sagittaria by the National Aquatic Weeds Management Group, as part of the existing Australia wide coordinated approach for aquatic Weeds of National Significance.

The plan was prepared by the national aquatic weeds coordinator, with input from many stakeholders across Australia. This input was through a strategic plan development workshop, consultation with key stakeholders and a public consultation period.

2.1 Principles underpinning the plan

This strategic plan is based on recognition and acceptance of seven principles outlined in the Australian Weeds Strategy (AWS) (NRMMC 2006):

1. Weed management is an essential and integral part of the sustainable management of natural resources for the benefit of the economy, the environment, human health and amenity.

2. Combating weed problems is a shared responsibility that requires all parties to have a clear understanding of their roles.

3. Good science underpins the effective development, monitoring and review of weed management strategies.

4. Prioritisation of and investment in weed management must be informed by a risk management approach.

5. Prevention and early intervention are the most cost-effective techniques for managing weeds.

6. Weed management requires coordination among all levels of government in partnership with industry, land and water managers and the community, regardless of tenure.

7. Building capacity across government, industry, land and water managers and the community is fundamental to effective weed management.

In addition to the AWS, WoNS strategic plans are also aligned to the 2012 Intergovernmental Agreement on Biosecurity (IGAB; COAG 2012), which outlines national invasive species management objectives. IGAB aims to enhance Australia's biosecurity system by fostering a collaborative approach to minimise the impact of pests across the biosecurity continuum, including 'a national management framework to ensure that nationally significant pests and diseases established in Australia are contained, suppressed or otherwise managed. WoNS can contribute to this aim by facilitating coordinated, strategic management of nationally significant weeds.

IGAB principles highlight the importance of managing invasive species across the biosecurity continuum. The 'One Biosecurity' report (Beale et al. 2008) also recognises that weeds and other invasive species are biosecurity threats that are most effectively managed in a collaborative manner across this continuum. This includes a 'spatial continuum' of pre-border, border and post-border, as well as a 'management continuum' that spans prevention, eradication, containment and asset protection, depending on the scale of weed invasion.

In most instances, complete control (i.e. eradication) of long-established weeds and other invasive species is unachievable. However, well researched, strategic and coordinated management approaches can reduce

current and potential impacts and provide a good return on investment. Effective weed management requires an approach that spans the biosecurity continuum (Figure 1).

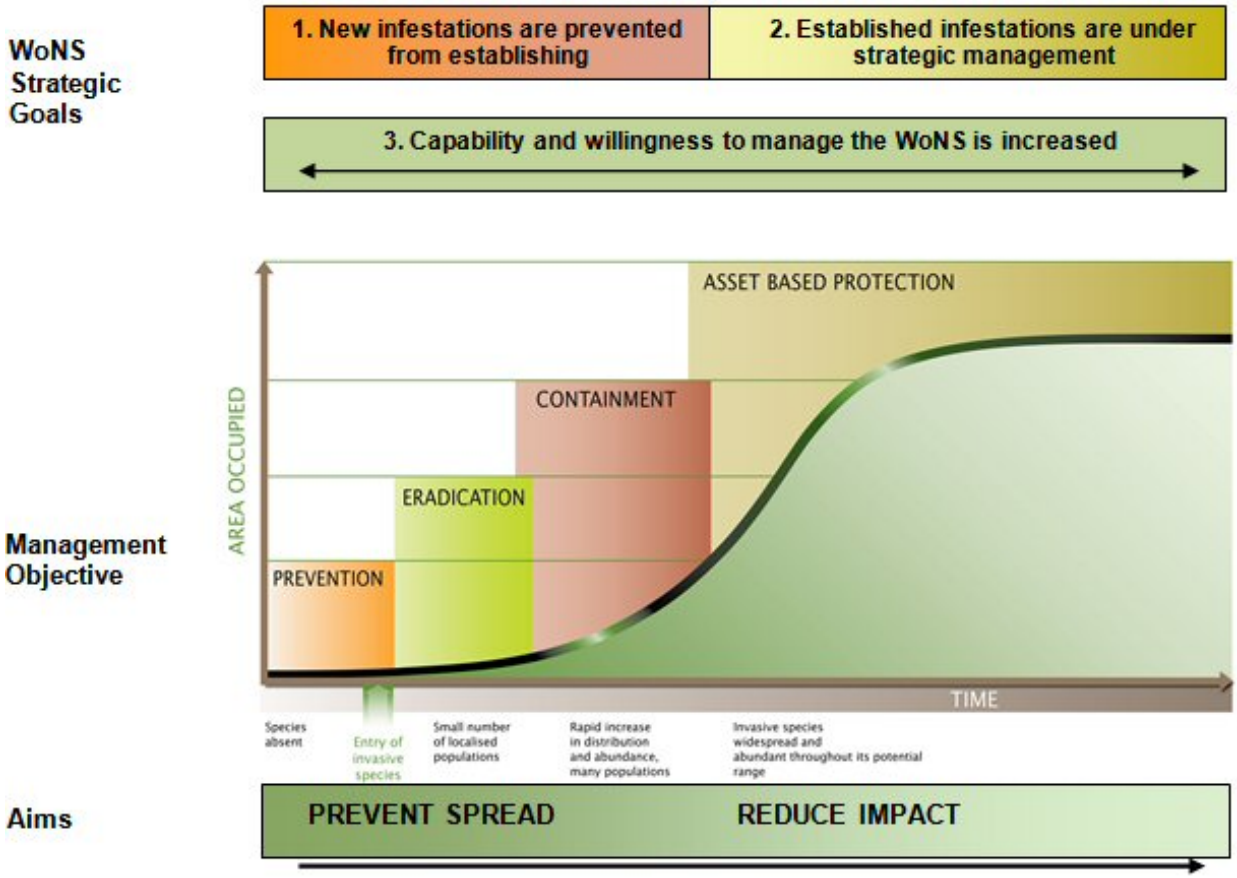

Figure 1. Biosecurity continuum - Stages of weed invasion with corresponding goals, management objectives and actions at each stage. Modified from DPI (2010).

This includes spread prevention practices and eradication of outlying infestations to protect environments where the water hyacinth has not yet taken hold, establishment of containment programs to halt or reduce the rate of spread; and the identification and protection of key environmental, social and economic assets in areas where the weeds are already widespread. Paired with these efforts is the need for strong education, research and capacity building programs, and support mechanisms to ensure on-ground outcomes are achieved.

2.2 The current situation

Water hyacinth infestations are found in New South Wales, Queensland and Victoria (see Figure 2). It is most prevalent along Australia's east coast where it infests many coastal rivers from southern Cape York Peninsula in Queensland to Kiama in New South Wales. Smaller outlier infestations are present in Victoria, the NSW south coast and in the Murray Darling Basin. Naturalised infestations have previously been detected in the Northern Territory, South Australia and Western Australia but have since been destroyed.

The potential range for water hyacinth includes all still or slow moving freshwater bodies in mainland Australia (see Figure 3). Currently it only occupies a small percentage of this potential range. If water hyacinth continues to spread it could threaten aquatic biodiversity and water storage assets throughout Australia. Ecological assets at immediate risk include the Ramsar listed Gwydir wetlands in North West NSW and other nationally significant wetlands on Australia's east coast and the Murray Darling Basin.

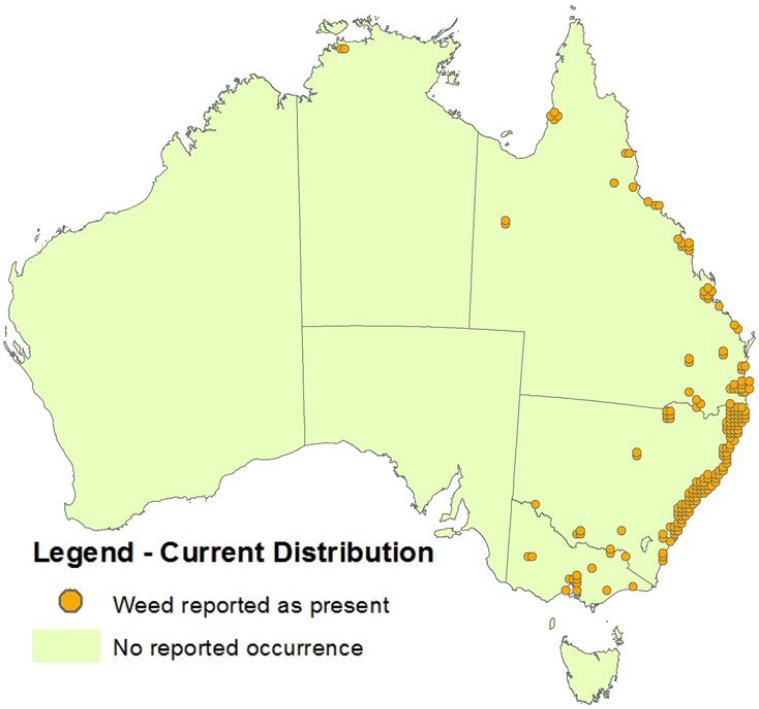

Figure 2. Current distribution of water hyacinth in Australia
(Source: Auricht & ABARES 2011).

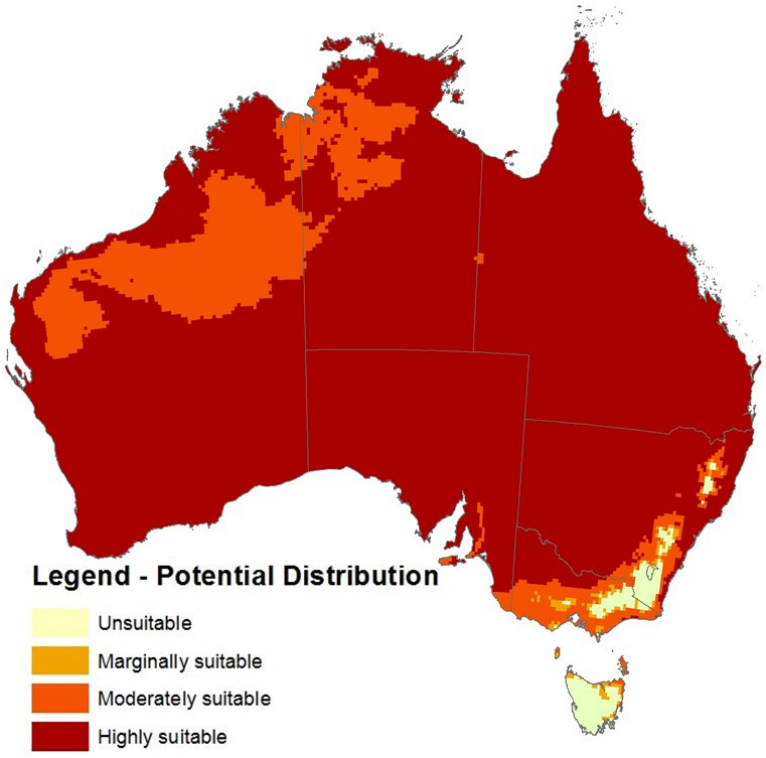

Figure 3. Potential distribution of water hyacinth in Australia
(Source: Auricht & ABARES 2011).
Note that only freshwater bodies within this range are at risk.

Water hyacinth is a declared weed in all Australian states and territories. It is illegal to posses, sell or distribute water hyacinth and infestations must be actively managed. In the Northern Territory, South Australia, Victoria, Tasmania and some parts of NSW plants or infestations must be or can be expected to be destroyed. Further details on legislation are found in 6.6 Quarantine and legislation.

Despite prohibition on sale and possession, water hyacinth is still utilised as an ornamental plant by pond plant enthusiasts and water gardeners. There are also occasional reports of water hyacinth illegally traded through weekend markets and over the internet. It is through this illegal use and trade that water hyacinth probably poses the greatest risk of spreading to regions or states that are currently free of the weed. Further efforts to increase awareness amongst potential traders and water gardeners about the impacts of water hyacinth are required to reduce this invasion pathway. Enforcement of legislation should also be considered.

Active control programs for water hyacinth are in place across its range. In Victoria water hyacinth is a state prohibited weed with several infestations around Melbourne and in the North East region targeted for eradication. In NSW infestations outside of the coastal strip between Wollongong and the Queensland border are an eradication target. In Queensland the guideline for the management of water hyacinth states the management objectives and actions required for the management of water hyacinth. Key objectives include reducing its ornamental use and eradicating infestations within the Murray Darling Basin.

Despite a range of chemical, physical and biological controls, water hyacinth remains a difficult and expensive plant to control. Although biological control agents are now well established across the east coast they cannot be relied upon solely as a control method. Chemical and physical controls can result in short term success but the plant's rapid growth rates and persistent seed bank means control programs often require long term or ongoing commitment. In addition, withholding periods and other restrictions can limit the availability of effective herbicides in some situations. Efforts to improve control options for water hyacinth should be pursued. This includes investigating the suitability to release in Australia the potential biological control agent *Megamelus scutellaris*. This leaf hopper was released in the USA in 2010. Other potential investigations include new herbicide and seed bank manipulation strategies.

2.3 Strategic plan development

The national water hyacinth strategic plan is the product of an extensive stakeholder consultation process. The first draft of the national water hyacinth strategic plan was developed after a water hyacinth stakeholder workshop and stakeholder consultation sessions. The stakeholder workshop, held on the 3 April 2012 in Brisbane, involved 16 representatives from NSW, Northern Territory, Queensland and Victoria representing community, local and state government, irrigation, Natural Resource Management regions and research interests. Stakeholder consultation sessions involved joint WoNS regional/state workshops and meetings held in NSW, Queensland and South Australia. The Plan was submitted to the Australian Weeds Committee for comment by all jurisdictions in June 2012. Further public comment and contribution was sought via a 30-day public consultation period with 14 responses received. Feedback was incorporated and the Plan was endorsed by the Australian Weeds Committee in 2012.

2.4 Relevance to other strategies

2.4.1.1.1.1.1 Scale	**Strategy/Plans**
National	Australian Weeds Strategy 2007, National Strategy for the Conservation of Australia's Biodiversity 2010, Draft Basin Plan – Murray Darling 2012
State	State/territory conservation, invasive species and biosecurity strategies. Queensland guideline for the management of water hyacinth (*Eichhornia crassipes*) 2004.
Regional	Natural Resource/Catchment management plans, wetland and water quality management plans, invasive species plans
Local	Weed control plans, creek/catchment plans, Local Government pest management plans

3 STRATEGIC GOALS AND OBJECTIVES

This strategic plan outlines aspirational actions for the period 2012-17 that will contribute to the long term vision of protecting Australia's waterways from the negative impacts of water hyacinth.

Three strategic goals are used, which are common to strategic plans for all Weeds of National Significance. These goals aim to prevent new infestations, reduce impacts of existing infestations and increase our capacity and willingness to manage water hyacinth. For each goal a number of objectives, each with prioritised actions, have been identified. These goals and objectives are listed below.

Strategic Goal	Objectives
1. New infestations are prevented from establishing	1.1 Invasion vectors, sources and pathways for water hyacinth identified and managed to prevent or reduce spread
	1.2 Surveillance and response mechanisms established to ensure timely detection of new infestations
	1.3 Priority outlier infestations delimited and destroyed or contained
	1.4 Risk of spread from outlier sties and core areas is reduced
2. Established infestations are under strategic management	2.1 Priority assets at risk are benefiting from long term strategic water hyacinth control programs
	2.2 New biological control agents explored and performance of existing agents optimised
	2.3 Holistic weed and land/water management practices are improving waterway condition
3. Capability and willingness to manage water hyacinth is increased	3.1 Infestations are mapped to national standards and to a level sufficient to inform decision making
	3.2 Effective tools are available to manage water hyacinth
	3.3 Capability and motivation to manage are enhanced by availability of best practice information, and education and awareness
	3.4 Improved knowledge base on both the impacts of water hyacinth and its management
	3.5 Local to national planning, policy and legislation incorporates and/or supports strategic plan objectives
	3.6 Stakeholders are committed to the implementation of the strategic plan
	3.7 The national strategic plan remains relevant and effective

3.1 GOAL 1: New infestations are prevented from establishing

Prevention is the most effective way to manage weed problems. Goal 1 aims to protect clean areas in Australia through both preventing the introduction of water hyacinth and rapidly responding to new incursions. Monitoring of waterways and invasion pathways helps ensure that new infestations are detected and destroyed early. A range of early detection tools are available to help build capabilities of weed managers, waterway managers and the community to monitor waterways for water hyacinth, including aquatic weed early detection survey guidelines and aquatic weed identification training. Targeted awareness activities along with inspection and enforcement activities should help reduce its ornamental use and thus remove a critical invasion pathway. Response to new water hyacinth incursions at outlier sites should be rapid as the weed has large capacity for population expansion and spread.

Table 1. Objectives and goals for goal 1

Objectives	Strategic Actions	Priority	Responsible Partners
1.1 Invasion vectors, sources and pathways for water hyacinth are identified and managed to prevent or reduce spread	1.1.1 Establish awareness programs that target high risk pathways and vectors of spread. Includes: ▪ peri urban landholders ▪ pond plant enthusiasts ▪ permaculture networks ▪ other priority pathways as identified	1	NAWMG, State/Territory Govt, NRM regions, WCAs, RWCs, Local Govt, Landcare and community groups
	1.1.2 Investigate mechanisms to enable or improve inspection and compliance activities for weekend markets and online trading sites	2	NAWMG, States and Territories, WCAs, Nursery / aquarium industry
	1.1.3 Continue weed risk assessments to identify and remove from sale other ornamental aquatic plants that pose similar weed risks to water hyacinth	2	State/Territory Govt
	1.1.4 Identify and prioritise additional water hyacinth pathways and vectors of spread	3	NAWMG, research organisations
	1.1.5 Scope potential for a voluntary plant labelling scheme for retail outlets who trade aquatic plants	3	Nursery / aquarium industry, NAWMG
1.2 Surveillance and response mechanisms are ensuring timely detection of new infestations.	1.2.1 Identify priority regions, water bodies and assets at invasion risk for water hyacinth monitoring and surveillance	1	NAWMG, RWCs, WCAs
	1.2.2 Incorporate water hyacinth into current aquatic weeds surveillance and identification initiatives (eg aquatic weeds identification workshops, weed spotters, aquatic weeds early detection guidelines)	1	NAWMG, State/Territory Govt, RWCs, WCAs, weeds experts, Local Govt, Landcare and community groups, asset managers
	1.2.3 Build capacity of stakeholders to undertake water hyacinth surveillance (both active and passive) and reporting in/near ▪ priority reconnaissance regions ▪ invasion pathways ▪ new infestations ▪ key ecological assets at risk of water hyacinth invasion	1	NAWMG, State/Territory Govt, WCAs, Landcare and community groups, asset managers

Objectives	Strategic Actions	Priority	Responsible Partners
	1.2.4 Develop and distribute water hyacinth identification and awareness resources (eg brochures, flyers)	1	NAWMG, State &Territory Govt, NRM regions, WCAs, RWCs, Landcare and community groups
	1.2.5 Develop and implement riverine water hyacinth early detection protocols for post-flood events	2	NMC (Develop only) WCAs, Landcare and community groups
	1.2.6 Investigate hydrological modelling as a tool to better predict post flood spread of water hyacinth and other aquatic weeds	3	Research organisations
	1.2.7 Investigate new technologies (eg digital aerial imagery, Satellite Hyper spectral mapping, GPS cameras) for their potential as water hyacinth / aquatic weeds detection and mapping tools	3	Research organisations
1.3 Priority outlier infestations delimited and destroyed or contained.	1.3.1 Delimit the extent of outlier infestations and prioritise based on risks of further spread, potential impacts and management feasibility	1	NAWMG, State/Territory Govt, WCAs
	1.3.2 Establish feasibility criteria (based on nationally recognised models) for eradicating and containing infestations. Incorporate results into decision making frameworks	1	NAWMG, State/Territory Govt, WCAs
	1.3.3 Develop and implement eradication or containment plans/programs for high priority outlier sites & ensure rapid response to new incursions	1	State/Territory Government, NRM regions, WCAs, asset managers
1.4 Risk of spread from outlier sites and core areas reduced	1.4.1 Ensure legislative compliance to manage activities and access to waterways, where infestations are at high risk of further spread	2	WCAs, asset managers
	1.4.2 Investigate use of quarantine zones or awareness programs where key vectors risk further spread (eg boating activities, plant collecting)	2	NAWMG, State/Territory Govt. WCAs

Priority

1 = critical to the success of the strategic plan

2 = highly beneficial and will contribute significantly to success of the strategy

3 = desirable, still beneficial, but not critical to success of the strategy

Responsible partners

NAWMG = National Aquatic Weeds Management Group (includes National Coordinator)

NRM regions = Natural Resource Management regions (inc Catchment Management Authorities)

RWC = Regional Weeds Committees

WCA = Weed Control Authorities (statutory agencies/groups responsible for weeds management, including local government, regional boards or state/territory agencies as per jurisdictional legislation).

3.2 GOAL 2: Existing infestations under strategic management

Goal 2 aims to reduce the impact of water hyacinth within its core infestation range. This includes an asset-based protection approach whereby control programs shift focus to protecting aquatic habitats of national, state or regional significance from water hyacinth. For an asset protection based approach to work it will require a better understanding of the impacts of current control technologies on aquatic ecosystems. Biological control will continue to provide a highly cost effective measure for reducing the impact of water hyacinth and there are new opportunities for exploring additional agents and/or increasing understanding of use of existing agents.

Table 2. Objectives and strategic actions for goal 2

Objectives	Strategic Actions	Priority	Responsible Partners
2.1. Priority assets at risk are benefitting from long term strategic water hyacinth control programs	2.1.1 Develop an assessment process (risk matrix) to identify priority areas/assets (ecological, economic and social) threatened by water hyacinth Compile database of high priority assets at risk	1	NAWMG, State/Territory Govt, NRM regions, WCAs, asset managers
	2.1.2 Utilise assessment results (2.1.1) and cost benefit analysis to guide water hyacinth management investment in core areas Utilise zoning based approaches where applicable	1	NAWMG, State/Territory Govt, NRM regions, WCAs, asset managers
	2.1.3 Develop and implement site specific water hyacinth management plans that protect priority assets	1	WCAs NRM regions, asset managers
	2.1.4 Mass rear and release existing biological control agents at new locations or where reintroductions are necessary	2	State/Territory Govt, WCAs
	2.1.5 Form key stakeholder groups to guide protection of priority assets	3	Asset managers, NRM regions
2.2. New biological agents explored and performance of existing agents optimised.	2.2.1 Conduct host specificity testing on the agent *Megamelus scutellaris* Mass rear, release and monitor *Megamelus* if host specific and approved for release	1	Research organisations, State/Territory Govt
	2.2.2 Investigate new biological control agents	2	Research organisations
	2.2.3 Investigate factors that may optimise impacts of existing agents, including the role of nutrients and climate Apply key findings in the field	2	Research organisations, State/Territory Govt
2.3. Holistic weed and land/water management practices are improving waterway condition	2.3.1 Promote benefits to water hyacinth management that can result from improved water quality and landscape/waterway management practices	3	NRM regions, Local Govt, Landcare and community groups

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agencies/groups responsible for weeds management, including local government, regional boards or state/territory agencies as per jurisdictional legislation).

3.3 GOAL 3: Capability and willingness to manage water hyacinth increased

Goal 3 aims to build the capacity and willingness to manage water hyacinth across Australia. National mapping will improve our understanding of water hyacinth distribution and will serve as an important decision support tool. The development and provision of best practice materials will be critical for building the skills base required for effective water hyacinth management. Research into improved control methods and other key areas will help develop more effective and affordable control options, as well as improving our knowledge base about water hyacinth. Finally, integration of this plan's key priorities with state/regional weeds and NRM plans will help build commitment to manage water hyacinth.

Table 3. Objectives and strategic actions for goal 3

Objectives	Strategic Actions	Priority	Responsible Partners
3.1. Infestations are mapped to national standards and to a level sufficient to inform decision making	3.1.1 Collate existing mapping data into a national water hyacinth mapping database	1	NAWMG, State/Territory Govt, WCAs
	3.1.2 Produce revised national distribution and management actions map	1	NAWMG
	3.1.3 Support the development and use of national information and mapping systems	2	All
	3.1.4 Improve stakeholder capacity to input mapping information into database	2	State/Territory Govt
3.2. Effective integrated tools are available to manage water hyacinth	3.2.1 Review current control options (including international research and control techniques) and identify key knowledge gaps	1	NAWMG, research organisations
	3.2.2 Develop effective integrated management options. Key focus areas include: ▪ enhancing biological control with herbicides ▪ strategies to destroy/eradicate outlier sites and deplete seed banks ▪ hydrological manipulation	1	NAWMG, research organisations
	3.2.3 Develop effective chemical control options and strategies that are applicable to a range of aquatic systems, weed densities and delivery systems. Includes: ▪ testing efficacy of new aquatic herbicides ▪ quantifying effects of timing, dosage and sub lethal doses	1	NAWMG, research organisations
	3.2.4 Develop guidelines for determining economic, environmental and social benefits of management intervention.	2	NAWMG, research organisations, NRM regions
	3.2.5 review and optimise mechanical harvesting techniques	3	WCAs, asset managers
3.3. Capability and motivation to manage are enhanced by availability of best practice information, and education and awareness	3.3.1 Develop and promote best practice decision support tool as a one stop shop for water hyacinth management information (digital and hard copy formats)	1	NAWMG (lead), State/Territory Govt
	3.3.2 Document case studies – success stories and failures and incorporate into best practice decision support tool	1	State/Territory Govt, WCAs, asset managers

Objectives	Strategic Actions	Priority	Responsible Partners
	3.3.3 Develop targeted community education programs for identification, impacts, spread and the need to manage water hyacinth	1	State/Territory Govt, Local Govt, NAWMG, RWCs, WCAs, Landcare and community groups
	3.3.4 Increase the wider community understanding of how biological control works and its limitations	3	State/Territory Govt
3.4. Improved knowledge base of the impacts of both water hyacinth and its management	3.4.1 Quantify the ecological impacts of aquatic herbicides and other control techniques	1	State/Territory Govt, research organisations
	3.4.2 Improve understanding of seed dynamics, including risks of spread, climatic limitations, viability and responses to management	2	Research organisations
	3.4.3 Quantify the ecological and economic impacts of water hyacinth and other high priority aquatic weeds	2	Research organisations, State/Territory Govt
3.5. Local to national planning, policy and legislation incorporates and/or supports strategic plan objectives	3.5.1 Integrate national strategic plan objectives throughout regional and state planning and policy processes	1	State/Territory Govt, Local Govt, RWCs, NRM regions, WCAs
	3.5.2 Investigate potential to nominate water hyacinth and other priority aquatic weeds as a Key Threatening Process Undertake literature review of invasive biology of water hyacinth to inform Threat Abatement Plan and triage process	3	NAWMG, research organisations
	3.5.3 Identify and promote to key stakeholders where weed legislation can and cannot deliver effective management of water hyacinth and aquatic weeds	3	NAWMG
	3.5.4 Investigate the effectiveness of incentive programs to influence effective management outcomes	3	All
3.6. Stakeholders are committed to the implementation of the strategic plan.	3.6.1 Maintain the National Aquatic Weeds Management Group to provide advice	1	NAWMG, State/Territory Govt
	3.6.2 Increase stakeholder cooperation and ownership through the inclusion of local stakeholders in regional strategic planning	1	NRM regions, State/Territory Govt, Local Govt, WCAs
	3.6.3 Develop and maintain water hyacinth management networks, from local to national level	2	All
3.7. The national strategic plan remains relevant and effective.	3.7.1 Coordinate, monitor and review implementation of the strategic plan	1	NAWMG
	3.7.2 Report implementation progress to Australian Weeds Committee and all key stakeholders	1	NAWMG, State/Territory Govt

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4 STAKEHOLDER ROLES AND RESPONSIBILITIES

While land owners and managers are ultimately responsible for the control of water hyacinth on their land/waterway, the effective implementation of this strategy requires the involvement of a range of stakeholders. It is also noted that stakeholders responsibilities may vary between jurisdictions and that some may be optional while others are prescribed by legislation.

The successful achievement of strategy objectives relies on the development and maintenance of partnerships between community, industry and government and recognition of the roles of each stakeholder. Suggested responsibilities to assist in achieving these are:

Australian Government

- Ensure quarantine controls to prevent importation (DAFF Biosecurity)
- Promote the status of water hyacinth as a WoNS, its impacts and the importance of management
- Promote collaborative research between CSIRO and key stakeholders to maximise expertise and co-investment
- Undertake strategic water hyacinth control on all Australian Government managed lands

State and territory agencies

- Maintain appropriate legislation and policies to achieve state and territory based objectives for managing water hyacinth
- Coordinate water hyacinth control and management at a jurisdictional level to complement the management and delivery of the National Water Hyacinth Strategic Plan
- Work closely with local governments, communities and other stakeholders to prevent and minimise water hyacinth impacts
- Identify strategic management areas and associated objectives
- Promote consistency with this strategy in jurisdictional pest management plans
- Facilitate the inclusion of strategic water hyacinth management in pest management planning processes with secondary stakeholders
- Contribute to priority research initiatives
- Source funding for strategic management programs and research
- Implement monitoring and reporting protocols in line with the MERI plan and provide relevant information to the national taskforce and/or Australian Weeds Committee
- Develop and implement communication and extension plans where appropriate
- Facilitate state and territory level mapping and contribute to national mapping initiatives
- Ensure, where appropriate, participation on the National Aquatic Weeds Management Group

Australian Weeds Committee

- Provide a mechanism for identifying and resolving weed issues at a national level
- Facilitate coordination between jurisdictions
- Provide advice to National Biosecurity Committee on weeds issues
- Provide planning, coordination and monitoring of the implementation of the Australian Weeds Strategy
- Provide governance process for the effective delivery of the WoNS initiative
- Oversee the implementation of the activities described in the WoNS strategic plans
- Promote the importance and benefits of the WoNS initiative to all levels of government

National Aquatic Weeds Management Group

- Ensure a diversity of community and agency views are represented for effective strategy implementation
- Provide guidance, direction and policy advice for the management of water hyacinth through the delivery of the strategic plan
- Monitor, evaluate, report and improve strategy implementation
- Assist in the development and implementation of programs and initiatives which support strategic actions
- Maintain and build partnerships with key stakeholders to improve strategic water hyacinth management
- Identify funding sources and provide independent advice for prospective applicants for projects consistent with the needs of the WoNS strategy.

Research organisations (including state government and industry)

- Applied research to address priority national strategic requirements
- Identify research gaps and seek innovative solutions for the management of water hyacinth
- Seek new and on-going funding and support for research requirements

Weed control authorities (includes local government, regional boards or state agencies depending on jurisdiction, regional boards or state agencies depending on jurisdiction)

- Incorporate water hyacinth objectives in relevant pest management plans and monitor implementation
- Administer and enforce legislation where applicable
- Undertake surveying and mapping particularly in relation to outlying water hyacinth infestations
- Establish local management policies to contribute to strategic control, containment and/or asset protection objectives
- Improve community awareness of impacts and identification; and promote early detection
- Control water hyacinth on local government managed or owned land
- Facilitate the removal of urban plantings of water hyacinth
- Source funding and/or contribute to strategic control programs

Natural resource management regions (including catchment management authorities)

- Contribute local and regional perspectives to water hyacinth management
- Contribute to the development, implementation and/or review of local and regional pest management plans
- Promote and contribute to local and regional containment and/or management programs in partnership with relevant stakeholders
- Support and/or develop water hyacinth funding submissions in line with national priorities
- Participate in local and regional mapping initiatives and contribute to state, territory and national map production
- Promote awareness and best practice management through event coordination and product distribution

Landcare, community (including Waterwatch), catchment management, conservation and other interest groups

- Contribute local and regional perspectives to water hyacinth management
- Contribute to the development, implementation and/or review of local pest management plans
- Support and/or develop water hyacinth funding submissions in line with national priorities

- Participate in local and regional mapping initiatives and contribute to state, territory and national map production
- Promote awareness, early detection and best practice management through event coordination and product distribution

Asset managers (includes irrigation companies, water authorities or protected area managers)

- Incorporate water hyacinth objectives in relevant pest management plans and monitor implementation
- Undertake surveying and mapping particularly in relation to outlying water hyacinth infestations
- Promote and adopt best practice management of the water hyacinth
- Control water hyacinth in channels/drains/reservoirs managed by the company
- Contribute to priority research initiatives
- Source funding for strategic management programs and research

Nursery / Aquarium industry

- Discourage the promotion and trade of water hyacinth and other declared aquatic weeds
- Create awareness amongst their members and customers of legislation on aquatic weeds

Private landholders

- Prevent the introduction of water hyacinth and other aquatic weeds onto their lands:
- Do not introduce water hyacinth into fishponds, farm dams or other water bodies
- Be aware of the potential of water hyacinth to be introduced from upstream sources
- Alert weed control authorities if suspected water hyacinth plants are found
- Eradicate infestations where feasible. Maintain control pressure on other infestations to reduce impact and potential for further spread
- Improve landscape management practices to reduce nutrient runoff

5 MONITORING EVALUATION REPORTING AND IMPROVEMENT

5.1 Targets and Measures

Strategic Plan Goals	Key Evaluation Questions	Data/Evidence Required	Consider
1. New infestations are prevented from establishing.	To what extent have new infestations been prevented from establishing?	1.1National distribution data • Has the national distribution map been reviewed and/or updated? • Has the Priority Management Action spreadsheet been updated?	• Are these documents publicly available? • Have stakeholders been advised of any changes? • Where is this data/info stored? • Do they capture national priorities?
		1.2 New infestations • Number of new outlier infestations[1] recorded. • Percentage of known infestations actively controlled. [1] New infestations should be an outlier, outside existing distribution of WoNS	• Are any new outlier infestations occurring in areas identified as a high priority in the national strategy? • How were infestations detected (passive or active surveillance, community reporting etc)? • Have high risk pathways been adequately identified? And threats minimised?
		1.3 Eradication & containment programs • Percentage of eradication and/or containment programs being maintained	• What percentage of programs identified in the national strategy are being actively managed? • Is there a plan in place for ongoing management? • How is progress being monitored and reported to stakeholders? • Can include examples using case studies.

Strategic Plan Goals	Key Evaluation Questions	Data/Evidence Required	Consider
		1.4 Legislation • Have there been any legislation or policy changes for this species? • Has a need for legislative change been identified by stakeholders?	• Are minimum requirements being maintained (e.g. ban on sale, trade, movement? • Is control required throughout or in part of jurisdiction? • Is compliance actively enforced?
		Overall progress rating	
2. Existing infestations are under strategic management.	To what extent is integrated weed management effectively managing core infestations?	2.1 Integrated Weed Management • How effective are IWM programs?	• Are management tools providing adequate control of water hyacinth? • Have new advances/technologies been developed and are they incorporated into BPM information? • Are there barriers to adoption of best practice management? • Are research programs addressing any observed gaps (e.g. herbicide trials, biocontrol and restoration requirements post control)?
	To what extent are assets being protected through strategic management?	2.2 Asset protection • Number of priority assets identified as 'at risk' from WoNS? • Percentage of priority assets being protected (eg assessed against relevant Threat Abatement Plans)? • Percentage of state/regional invasive species plans that identify priority assets at risk from WoNS?	• Response should include status report on progress towards asset protection programs. • Methods by which assets are being protected (e.g. targeted annual spray programs, high risk pathway surveillance, strategic plans). • Are long term monitoring programs in place to detect change? • To what extent is management leading to an improvement in asset condition?
		Overall progress rating	

Strategic Plan Goals	Key Evaluation Questions	Data/Evidence Required	Consider
3. Greater capability and commitment to manage Water hyacinth.	To what extent has the capability and commitment to manage water hyacinth increased?	<u>3.1 Community engagement & awareness</u> • What is the status of best practice information? • Are partnerships being maintained to ensure collaboration on WoNS? • Number and type of media activities.	• Is best practice information up to date and readily available? • Is this information and/or advice being targeted to priority regions. • Is training being delivered to meet the needs of weed managers (including the community)? • Are networks/groups being supported (e.g. through dissemination of research outcomes, funding opportunities, control options etc)? • Has awareness and engagement in water hyacinth management been raised effectively?
		<u>3.2 Resourcing</u> • From what sources are programs being funded?	• Number of projects funded by Commonwealth, jurisdictions, industry, etc
		<u>3.3 Policy & Planning</u> • Are the objectives of the strategy being integrated into commonwealth/state/regional plans, policies and programs? • Has cross border collaboration occurred?	• How are priorities reflected in planning and policy approaches? E.g. WRA, invasive species plans, asset protection plans, district plans, weed spread prevention activities, management programs, incentive programs, state working groups. • How are national priorities being maintained? E.g. containment lines, eradication targets, training & awareness raising, research projects.
		Overall progress rating	
Continuous improvement	Are there any unexpected outcomes that have been identified through implementation of strategy?	<u>4.1 Barriers</u> • Have any other management issues or impediments been identified?	

How to score progress rating

1- Insufficient evidence to score

2- No progress against goal

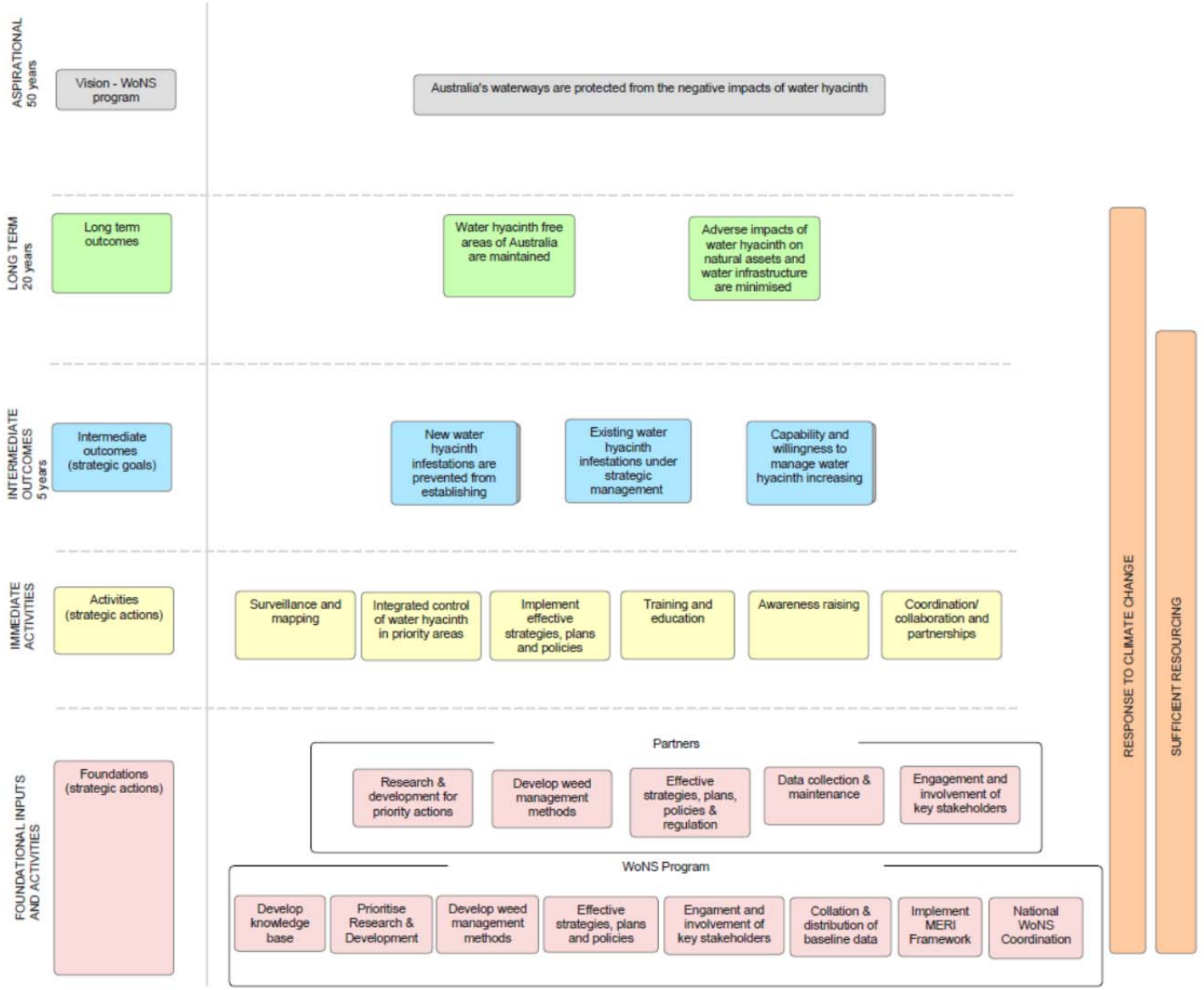
3- Limited progress is being made against this goal

4- Reasonable progress is being made against this goal

5- Excellent progress is being made against this goal

5.2 Program Logic

Program logic for the water hyacinth strategic plan



6 Technical Background

6.1 Water hyacinth identification

Water hyacinth is a free-floating aquatic plant that grows in ponded or slow moving waterways. It is a perennial monocot that belongs to the Pontederiaceae family and is native to the Amazon basin in Brazil and other nearby South American countries.

Water hyacinth has clusters of leaves with sometimes spongy or inflated petioles that arise from the plant's base. The heart-shaped leaves are thick, glossy and dark green in colour. There are two leaf types ranging from plants with swollen and bulbous petioles up to 25 cm long, to plants having slender and non-bulbous petioles up to 60 cm long. These petioles contain variable amounts of air, which provides the plant with the buoyancy it requires to float. The flowers are bluish purple with a yellow centre, each approximately five centimetres wide with six petals. Flowers are arranged on a single spike consisting of generally eight but ranging from three to 35 flowers. The seed capsules of water hyacinth are one to 1 to 1.5 mm long with each containing up to 300 seeds. The root systems are fibrous and feather like, and can grow to depths of up to one metre in the water column.

6.2 Water hyacinth biology and ecology

Water hyacinth is capable of growing and reproducing all year round in favourable conditions. New plants can flower within 3-4 weeks with seed production shortly afterwards. Seeds can germinate in just a few days under the right conditions or remain viable for up to 28 years. Germination is more linked to hydrological factors rather than temperature as it requires shallow water or mud, and high light intensity.

Water hyacinth best grows in ponded or slow moving water bodies, such as rivers, dams, lakes and wetlands, in tropical to temperate climates. It can survive frosting but requires temperatures above 10^{o}C for growth, with optimal growth occurring between 28^{o} - 30^{o}C, but not exceeding 35^{o}C. It tolerates a pH range from 4.0 to 8.0 and can survive in water with salinities up to 15% that of seawater. Although water hyacinth will grow in low nutrient conditions it requires abundant nitrogen, phosphorous and potassium for optimal growth. It favours water bodies with high nutrient levels, such as those found downstream of agricultural or urban areas.

Reproduction occurs through both seeds and vegetative means. Vegetative reproduction is the plant's most common mode for rapid population expansion and spread once it invades a waterway. It occurs through the production of daughter plants from horizontally growing stolons. The plant has rapid growth rates and in optimal growth conditions infestations can double in size in as little as eight days. Just one plant is all that is needed to start a new infestation.

6.3 Distribution and spread

Water hyacinth was introduced into Australia as an ornamental plant and was first recorded naturalised in Australia in 1894 from localities in New South Wales and Queensland. Naturalised infestations of water hyacinth are now present on Australia's east coast from Cape York Peninsula in Qld to Kiama in NSW. Smaller outlier infestations are found in Victoria and in the Murray Darling Basin. Infestations have also be found in the Northern Territory, South Australia and Western Australia but have since been destroyed. Of note is its successful eradication in the period 1937-41 from the lower reaches of the River Murray in South Australia.

Water hyacinth has the potential to invade and establish in all still or slow moving freshwater bodies in mainland Australia. Its potential distribution has been determined using Climex, a climate based model that assesses habitat suitability (see figure 3 pg 5). It predicts that nearly the entire mainland Australia has favourable climatic conditions for water hyacinth, providing freshwater is available. Observations have shown water hyacinth to survive extreme winter conditions in Japan, indicating its potential to establish in Tasmania and colder areas of Australia.

Water hyacinth spreads to new catchments through human activities and its use as an ornamental plant poses the greatest risk of creating new infestations. Despite a national ban on its sale it remains a popular ornamental plant for many water garden and pond plant enthusiasts. An emerging development is the detection of new incursions in dams on lifestyle blocks in semi-rural and peri-urban areas. Ornamental plantings in backyard ponds and farm dams can spread water hyacinth to new waterways when plant material is washed downstream during rain events. Once water hyacinth invades a catchment it is often

spread further through flood events. Other potential means of spread include boat trailers and fishing equipment spreading smaller plants and birds spreading seeds.

6.4 Summary of impacts

Water hyacinth is widely considered as one of the world's worst aquatic weeds due to its invasiveness, potential to spread and environmental impacts. It has the ability to form dense and impenetrable floating mats on the waters surface, which cause considerable biodiversity impacts by displacing native vegetation, decreasing light penetration and preventing birds and other fauna from accessing the water. Mats can also increase the quantity of decaying vegetation and prevent oxygen exchange in the water, resulting in unsuitable habitat for fish and other aquatic fauna.

The dense floating mats can significantly impact on water storage facilities and irrigation assets. Infestations can lead to water losses in water storage impoundments because the water loss due to evapo- transpiration through the plants can be up to three times higher than the natural evaporation of open water. Infestations can also clog important water delivery infrastructure including channels, pumps and intakes.

Severe infestations are capable of reaching up to 445 tonnes of wet weight per hectare. During flood events heavy floating mats of the weed can dislodge and cause significant damage to downstream infrastructure, such as bridges and fences, and to crops and pastures. Infestations also provide favourable breeding conditions for mosquitoes, reduce the aesthetics of waterways and interfere with recreational activities such as swimming, fishing and boating.

6.5 Control options

6.5.1 Prevention

The best method to control water hyacinth is to prevent it from entering a water body. Because it is introduced into new catchments by people, mostly through its ongoing and illegal use for ornamental purposes, preventing further spread will be best achieved through education programs. Gardeners, hobby farmers, lifestyle property owners and the general public should be made aware of the impacts of water hyacinth and discouraged from planting it in their ponds, farm dams or water gardens. People who have unknowingly cultivated water hyacinth should contact weed control authorities for information on how to correctly dispose of it. Burial in flood free areas is the quickest means of disposal.

Enforcing the nationwide ban on its sale is a useful tool for preventing further spread. Nurseries, weekend markets or internet auction sites that illegally display or sell the plant to customers should be reported to weed control authorities.

Early detection is critical for the management of water hyacinth as successful eradication or containment is normally only possible when infestations are small. Even in such cases its persistent seed bank means ongoing commitment will normally be needed to ensure that previously destroyed infestations do not re-establish and spread further.

Monitoring and early detection should be carried out in catchments at risk from water hyacinth invasion, especially after floods where there is a high risk of plants washing out of backyard ponds or dams into downstream waterways.

6.5.2 Chemical and physical control

Spraying is an effective management tool for controlling small infestations or as part of an ongoing integrated control program. Most control programs use high volume spraying with hand gun power sprays from either a boat or the shore. Aerial spraying has also proved successful in treating larger infestations. Herbicide treatments should commence in spring prior to the plant flowering and will normally require several follow up treatments over the growing season.

Whilst herbicides will often provide the most cost effective treatment a potential drawback is the risk of the decomposing vegetation detrimentally affecting water quality, particularly dissolved oxygen. The risk of oxygen depletion can be reduced by spraying only one half of the infestation at one time or physically removing as much of the weed as practical prior to spraying.

Hand removal is most effective for small infestations such as small dams and drains. It is highly laborious and should only be used where the rate of removal can exceed the rate of regrowth. It should be done before flowering and seed set in spring. It is also the most appropriate method for removing infestations from ornamental fish ponds and water gardens.

Mechanical harvesting can be an effective tool for removing larger infestations, particularly where there is a need to immediately restore the functions of the water body, for example, boating. It traditionally involves a specially designed aquatic weed harvester, but small boats can also be used to push the floating mats of water hyacinth to an extraction area where it can be subsequently removed by an excavator or similar machinery.

Physical removal provides a number of advantages over other methods. It removes the water quality issues associated with spraying and the resulting decomposition of large quantities of plant material in the water column. In addition, there are no withholding periods associated with harvesting so waterways can be immediately used for irrigation, swimming or stock watering. However, it is an expensive and time consuming process due to the sheer weight and volume of the harvested biomass.

6.5.3 Biological control

Biological control is most effective on larger infestations but it can take several years for agents to provide successful control. Four insects from South America have been introduced into Australia for water hyacinth biological control. These include two weevil species *Neochetina eichhorniae* and *Neochetina bruchi*, and two moth species *Niphograpta albiguttalis* and *Xubida infusellus*. Both *N albiguttalis* and *X. infusellus* can be very damaging to young water hyacinth plants but their impact on water hyacinth is often temporary and patchy.

The two weevils can provide successful control. Adult weevils (normally only 4-5mm long in both species) feed on the leaves causing them to desiccate and curl. The weevil larvae tunnel through and damage the plants tissue, which is then attacked by bacteria and fungi. The combination of adult and larval feeding causes the plant to become waterlogged and eventually sink and die.

The weevils are particularly effective in tropical northern Australia but less so in sub tropical and temperate regions. The *N. eichhorniae* weevil is only active during warmer months whilst *N. bruchi* tends to be more active during winter. Because both species generally complement each other better control is often achieved when both are present. Both weevils are well established in New South Wales and Queensland.

6.5.4 Other control options

In many cases the best control is achieved when a combination of control methods are used in an integrated way. It is essential that control methods chosen suit the specific situation hence selection of methods will need to be done on a case by case basis.

Integrated control using mechanical removal and herbicides is commonly used in Australia to control severe infestations. This normally involves the removal of the bulk of material by specialised machinery followed by treatment of remaining and remerging plants with herbicides. This approach has been successfully used to restore a number of floodplain wetlands and creek systems in northern Queensland.

Herbicide strategies have been proven to enhance biological control performance. Research from the United States of America found that limited spraying of water hyacinth infestations allowed weevils to move from sprayed to unsprayed plants, which increased both the density of weevils on surviving plants and biological control damage. However, this integrated approach has not been tested in Australia.

Other control options that can be used in integrated situations include booms, hydrological manipulation and where possible reducing nutrients in a waterway. The deployment of floating booms can also help improve the effective use of other control methods. Booms can help contain infestations to one area, which helps reduce both herbicide and mechanical treatment costs. Booms also have the added benefit in that they can help prevent further spread downstream.

Hydrological manipulation involves use of draw down or altering water levels of a water body to desiccate water hyacinth. It is not widely used because plants can survive in the mud and fluctuating water levels can lead to seedling germination. In theory its integration with herbicides could be used to deplete seed banks as germinated plants could be controlled with herbicides, however the practical application of this approach is unknown.

The growth of water hyacinth responds well to nutrients. Discharge from sewage treatment plants, storm water and agricultural run off are the main preventable forms of nutrient input so strategies that target these can aid in its control.

6.6 Quarantine and legislation

Water hyacinth is a declared weed in all states and territories in Australia. It is illegal to sell, distribute and possess water hyacinth and in most cases landholders are required by law to control it when it occurs on their property. Its legal status is summarised in table 2.

State / Territory	Legislation	Declaration (July 2012)	Goals/Actions
Australian Capital Territory	*Pest Plants and Animals Act 2005*	C4.	Prohibited pest plant. Propagation and supply is prohibited
New South Wales	*Noxious Weeds Act 1993*	Class 2, 3 & 4	Class 2 - Regionally prohibited (must be eradicated from the land and the land must be kept free of the plant. Class 2 weeds are also notifiable) Class 3 – Regionally Controlled (must be fully and continuously suppressed and destroyed. Class 4 – Locally controlled
Northern Territory	*Weeds Management Act 2001*	Class A/C	Class A – To be eradicated Class C - Not to be introduced to the Northern Territory.
O	*Land Protection (Pest and Stock Route Management) Act 2002*	Class 2	Landowners must take reasonable steps to keep land free of Class 2 plants. It is an offence to keep or sell Class 2 plants without a permit.
South Australia	*Natural Resource Management Act 2004*	Class 1	Destruction is mandatory throughout SA; sale, entry to the State and movement on public roads is prohibited; and landowners are required to report any infestation on their land.
Tasmania	*Weed Management Act 1999*	Declared	Zone A (Eradication) across all of Tasmania
Victoria	*Catchment and Land Protection Act 1994*	State Prohibited Weed	Do not occur in Victoria, or it is reasonable to expect that they can be eradicated from the state
Western Australia	*Agricultural and Related Resources Protection Act 1976* *Plant Diseases Act 1914*	P1/3	P1 – Prevention of trade, sale or movement P3 – Control From 1 February 2013, declared plants will be managed under the *Biosecurity and Agriculture Management Act 2007* in WA, water hyacinth will be declared C2 (Eradication).

7 Appendices

7.1 Weed control contacts

State	Department	Phone	Email	Website
ACT	Environment and Sustainable Development Directorate	132281	environment@act.gov.au	www.environment.act.gov.au/environment
NSW	Biosecurity NSW, NSW Dept of Primary Industries	1800 680 244	weeds@dpi.nsw.gov.au	www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds
NT	Dept of Natural Resources, Environment, The Arts and Sport	08 8999 4567	weedinfo.nretas@nt.gov.au	www.nt.gov.au/weeds
QLD	Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry (Queensland)	132523	callweb@daff.qld.gov.au	www.biosecurity.qld.gov.au
SA	Biosecurity SA, Dept of Primary Industries and Regions SA	08 8303 9620	nrmbiosecurity@sa.gov.au	www.pir.sa.gov.au/biosecuritysa/nrm_biosecurity/weeds
TAS	Dept of Primary Industries, Parks, Water and Environment	1300 368 550	www.dpipwe.tas.gov.au/weeds scroll to the bottom of the page and click on "weeds enquiries"	www.dpipwe.tas.gov.au/weeds
VIC	Dept of Primary Industries	136186	customer.service@dpi.vic.gov.au	http://new.dpi.vic.gov.au/agriculture/pests-diseases-and-weeds
WA	Dept of Agriculture and Food	08 9368 3333	enquiries@agric.wa.gov.au	www.agric.wa.gov.au

7.2 Glossary

Asset protection – a weed management approach to reduce impact or threat on an asset

AWC – Australian Weeds Committee

Containment –a weed management approach that aims to prevent an increase in the current distribution of a weed, by using weed control procedures to reduce the density of existing infestations and limit the dispersal of propagules. Highly effective containment programs can actually result in a decrease in the current distribution of a weed

Coordinated control –a strategic weed management program that takes into consideration all occurrences of a weed and involves the application of weed control procedures towards a specific end (e.g., eradication or containment)

Core infestation – a weed infestation which is large and non eradicable for a defined scale

Eradication -the elimination of every single individual of a species from an area to which recolonisation is unlikely to occur, including propagules

NAWMG – National Aquatic Weeds Management Group

NRM – natural resource management

NRM Groups – regional Natural Resource Management Groups or Catchment Management Authorities

Outliers – small localised infestations separate from core and may be eradicable

Priority outliers – feasible to eradicate or contain or reduce / prevent spread

Priority assets –high value (environmental, primary production, cultural and social) assets determined to be at risk – can be applied at varying scales

Partner – person(s) or organisation actively supporting weed management

RWC – Regional Weeds Committee

Stakeholder – person, group or organisation interested in or concerned about weeds and or their management

WCA – Weed Control Authorities, depending on the jurisdiction they can include Local Government, County Councils, NRM Groups or State Government.

WoNS – Weeds of National Significance

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7.4 Acknowledgements

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