



Draft REGIONAL WEED MANAGEMENT PLAN

1.1 PLAN TITLE:

Aquatic Weed Management Plan for the South West Sydney and Sydney Central Regions.

1.2 PLAN PROPONENTS

Regional Weeds Advisory Committees: **South West Sydney Regional Weeds Committee and Sydney Central Regional Weeds Committee**

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Signature: (Chair) Date:

1.3 NAME OF PLANTS

***WONS = 2**

Botanical name(s):	Common name(s):
<i>Alternanthera philoxeroides</i>	Alligator Weed*
<i>Salvinia molesta</i>	Salvinia*
<i>Eichhornia crassipes</i>	Water Hyacinth
<i>Gymnocoronis spilanthoides</i>	Senegal Tea Plant

1.4 PLAN PERIOD (not to exceed five years)

Starting date: July 1 2008

Completion date: June 30 2013

1.5 AREA OF OPERATION:

This plan extends over the geographical area represented by the South West Sydney and Sydney Central regional weeds committees, and includes the local government areas of;

South West Sydney Region:

Bankstown, Camden, Campbelltown, Fairfield, Liverpool, Sutherland and Wollondilly.

Sydney Central Region:

Ashfield, Auburn, Botany Bay, Canada Bay, Canterbury, Hurstville, Kogarah, Leichhardt, Marrickville, Randwick, Rockdale, Strathfield, and Waverley.

1.6 AIM:

To reduce the impact of Alligator Weed, Salvinia, Water Hyacinth and Senegal Tea Plant on aquatic ecosystems within the South West Sydney and Sydney Central regions.

1.7 OBJECTIVES:

1. To continue to prioritise areas of works based on characteristics such as degree of infestation, class of creek, biodiversity & recreation values & anticipated success of treatment by 2009.
2. To reduce infestations of Alligator Weed, Salvinia, Water Hyacinth and Senegal Tea Plant in high

priority areas by 2013.

3. To contain infestations of Alligator Weed, Salvinia, Water Hyacinth and Senegal Tea Plant in medium and low priority areas by 2013.

4. To carry out inspections on nurseries and aquariums once every two years, and to target private property inspections near known infestations.

5. To increase awareness of the impacts, identification and control methods of Alligator Weed, Salvinia, Water Hyacinth and Senegal Tea Plant.

7. To ensure a continued strategic focus to control Alligator Weed, Salvinia, Water Hyacinth and Senegal Tea Plant through ongoing surveys, monitoring, research and evaluation.

2.0 STAKEHOLDERS

*LCAs of the South West Sydney And Sydney Central Weeds Committees, *Department of Environment and Climate Change (DECC), Hawkesbury Nepean Catchment Management Authority (HNCMA), Sydney Metropolitan Catchment Management Authority (SMCMA), *Department of Lands (DOL), *Department of Housing (DOH), *Mt Annan Botanic Gardens, *Sydney Water Corporation (SWC), *RailCorp, Dept of Primary Industry (DPI), *Roads and Traffic Authority (RTA), *Department of Defence (DOD),

* Key land managers who are critical to the success of this Plan

3.0 BACKGROUND and JUSTIFICATION

Alligator Weed, Salvinia, Water Hyacinth and Senegal Tea have been identified as **high priority weeds** for the South West Sydney and Sydney Central regions^(1 & 2). These four aquatic weeds cover a similar distribution and are generally treated in a similar manner. This plan provides for a co-ordinated and strategic approach to contain and reduce infestations of these major aquatic weeds.

Alligator Weed is the most widespread of these four priority weeds in the region, and is the main aquatic weed in the Sydney Central region, - its highest infestations are currently found in the Georges and Nepean Rivers and their tributaries. A WONS weed, it is of particular concern in the region because of its;

- Level of invasiveness and potential for spread,
- Ability to invade both land and water,
- Economic and environmental impacts, and
- Lack of effective control techniques.

Alligator Weed has also been found growing in Sydney backyards, with some in the community confusing it with a similar looking Sri Lankan vegetable.

The second of the aquatic weeds, **Salvinia** has the ability to double in size every two to three days, and the potential to infest every waterbody in Australia. Core infestations of Salvinia are found in South Creek, a tributary of the Hawkesbury, and along the Georges River. The remaining infestations are isolated but mobile and the potential for spread is significant. Salvinia is a major concern for the region due to its serious impacts on aquatic environments, including;

- It's ability to completely cover the surface of a water body and remove all light, subsequently resulting in the loss of all submerged plants and their associated fauna,
- Dense infestations greatly restrict river navigation, fishing and recreation, as well as reducing the value of the water body as a source of irrigation and drinking water.

Despite being banned throughout Australia *Salvinia* is still a popular aquarium and pond plant, from where it can continually re-infest local waterways.

Originally introduced to Australia as an aquatic ornamental plant, **Water Hyacinth** has also become a major pest of rivers and dams in the Sydney region. Rampant growth of water hyacinth can destroy native wetlands and waterways, killing native fish and other wildlife. Water hyacinth forms dense mats that spread out across water surfaces eventually choking the entire water body. Propagation is so rapid that an infestation may double in size every week under ideal conditions ⁽⁴⁾. Core infestations of Water Hyacinth are found in South Creek and along the Georges River. With the following impacts, Water Hyacinth is also a major concern for the region:

- Dense mats destroys aquatic habitats by depleting the water of oxygen and light,
- Mats restrict river navigation, fishing and impact on recreation values,
- Can create an unsafe swimming environment,
- With an estimated weight of 400 tons per hectare, large rafts of Water Hyacinth can damage structures such as bridges and dams.

Water Hyacinth is still being found as an ornamental plant in ponds and dams, where it has been obtained from other locations or commercial businesses illegally selling it. There is an ongoing risk that the plant may enter creeks and rivers via the stormwater system, especially after heavy rainfall events.

Senegal Tea Plant is a highly invasive plant that is difficult to control once established. Infestations are usually as a result of an aquarium escape. Infestations in the region are currently restricted to the local government areas of Sutherland and Parramatta. Senegal Tea Plant chokes drains and waterways, competes with native riparian vegetation, taints water and produces a strong odour as it decays.

If no action was taken to control Alligator Weed, Water Hyacinth, *Salvinia* and Senegal Tea Plant there would be:

- Continued loss of aquatic biodiversity
- Further spread and establishment across Sydney waterways
- Continual reinfestation of controlled areas
- Increased cost of control in the future
- Economic loss of industries and farming that are reliant on healthy freshwater ecosystems
- Continued impacts on recreational values of the Hawkesbury-Nepean and Georges River systems, and surrounding creeks and,
- Issues with public safety and navigational access of waterways.

3.1. Distribution of Infestations

Alligator Weed, Water Hyacinth, *Salvinia* and Senegal Tea Plant vary in their distribution and density across the regions. Considerable distribution mapping for these weeds was carried out by the Sydney Weeds Committees and the SMCMA during 2006 and 2007. Please refer to the maps on the following pages (5-8).

The South West Sydney Regional Weeds Committee established priority areas of works via the development of a matrix (please see Attachment 1); which took into account variables, such as: impact on biodiversity, class of creek, impact on recreation, agricultural productivity, dispersal via commercial activity, core or isolated site and likelihood of treatment success. These South West Sydney priority areas of works are also displayed in the maps.

As all the Sydney Central Alligator Weed infestations are small and isolated, but with significant potential for spread to new areas, all sites are managed as Priority 1 areas.

Please note that maps include local government areas of the Sydney Region which are not part of the South West Sydney or Sydney Central Weeds Committees. These additional areas have been included to illustrate the distribution at a catchment level.

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3.2 Weed biology

The following table is a summary of weed biology, including method and rate of spread for the four aquatic weeds.

Weed	Characteristics
Alligator Weed:	<ul style="list-style-type: none"> • Native of South America, • Stoloniferous perennial free-floating aquatic plant, capable of terrestrial growth. • Stolons reach up to 10 metres, dense mats reach up to 15 metres across • Root at nodes, roots can reach a depth of 1 metre. • Ability to grow in static or flowing waters. • Spreads extremely quickly, particularly in nutrient enriched water. • Spreads vegetatively, stem fragments break up easily and float or otherwise distributed to new areas. • Flowering and maximum growth occurs in summer, however viable seeds are not produced.
Salvinia:	<ul style="list-style-type: none"> • Native to Central and South America, • Free-floating aquatic fern up to 30 cm long, • Grows in still or slow-flowing water. • Prefers waters containing high nutrient levels. • Spreads vegetatively by fragmentation and can keep growing from a single node. Each plant is capable of rapid growth, • Can double in size in 2-3 days. • One plant added to a body of water will produce over 8,000 plants within the first month.
Water Hyacinth	<ul style="list-style-type: none"> • Native of the Amazon River basin of South America, • Erect free floating perennial aquatic plant up to 1 metre high. • Majority of growth and flowering occurs during the summer months. • Winter frosts cause leaves to die off, leaving crowns of the plant over winter and commence new growth the following spring. • Grows in fresh static or slow-flowing water. • The flower stalks bend into the water to release their seeds. • Seeds can germinate in 3 days or remain viable for at least 15 years. • Reproduces vegetatively from stolons, which form roots at the nodes to produce new plants. • Majority of biomass is produced by formation of daughter plants, one plant can produce as many as 50,000 daughter plants in one season (Dyason, 1987).
Senegal Tea Plant	<ul style="list-style-type: none"> • Native of tropical and subtropical America (Mexico to Argentina), • Scrambling or erect stems up to 1 metre high. • Stems are buoyant enabling them to float. • Plants are dormant during winter, re-shooting from the crown the next spring. • Prefers growth in wet marshy soils, still or slow flowing water. • Capable of rapid spread, particularly in nutrient enriched water. • Reproduces by seed and vegetative means.

* The following links have the most up to date data on weed biology;

<http://www.weeds.org.au>

http://www.weeds.crc.org.au/weed_management

<http://www.dpi.nsw.gov.au>

4.0 LEGISLATIVE and REGULATORY SITUATION

No declaration changes are required as part of this Plan.

Current declaration:

- Alligator Weed is a Class 3 weed across the region.
- Salvinia varies between local government areas as a Class 2 and Class 3 weed across the region.
- Water Hyacinth varies between local government areas as a Class 2 and Class 3 across the region.
- Senegal Tea Plant is a Class 1 weed across the State.

For current information on noxious weed declarations please see,

<http://www.dpi.nsw.gov.au/agriculture/farm/pest-weeds-management/weeds/noxweed>

5.0 CONSIDERATIONS and OPPORTUNITIES

5.1 Financial support to implement the Plan

To assist in the implementation of this plan, funding will be sought from various state and federal government agencies for on-ground works and to develop education and awareness raising programs.

5.2 Species Management

Alligator Weed

Alligator Weed is well known for being difficult to control, below are the current control techniques used in the Sydney region.

Control technique	
Physical	Physical removal is difficult because of the depth that roots and rhizomes can reach. It is recommended that all weed material be removed to a depth of one metre, and then be disposed of by deep burial. This is obviously a difficult and time-consuming task requiring mechanical assistance
Chemical	This is currently the most cost effective management strategy employed. Please see link to Noxious Weed Handbook (below) for most up-to-date list of registered chemicals.
Mechanical	This has been effectively used in the past. The extensive root system necessitates the removal of a large quantity of the substrate, which can result in severe environmental consequences if used in aquatic situations. The disposal of contaminated material also presents a barrier. Alligator Weed must be either deeply buried at an approved site, or burned.
Biological	The aquatic alligator weed flea beetle <i>Agasicles hygrophila</i> , has been reasonably successful in controlling alligator weed growing in the water, in the Sydney region. It does not, however, make a significant impact on terrestrial infestations, and is therefore not appropriate as a standalone treatment method. It is best used as part of an integrated approach.

For most up to date information on treating Alligator Weed refer to the *WONS Weed Management Guide for Alligator Weed*.

www.weeds.crc.org.au/weed_management/indiv_species_a.html#alligatorweed

Salvinia

In order to control Salvinia, an integration of chemical, mechanical and biological control techniques is required. The following excerpt is from the CRC Weed Management Guide for Salvinia, see http://www.weeds.crc.org.au/documents/wmg_salvinia.pdf

Type of infestation	Physical	Mechanical	Chemical	Biological
Small (few plants, small area)	Manually remove by hand. Booms or nets can be used to prevent short-term spread. Care needs to be taken to remove all plant material.	Not suitable.	Several herbicides are registered for use on salvinia. Note: do not spray large infestations all at once, as this causes a mass dieoff and pollutes water. Avoid this problem by removing most salvinia by hand or machine.	Biological control is unlikely to result in eradication, and is therefore not recommended for small infestations.
Medium (medium density, medium total area)	Not suitable.	Aquatic weed harvesters are available to regularly remove salvinia. However the results are similar to mowing a lawn, as it will regenerate.	All herbicides must be applied strictly in accordance with the directions on the label.	The salvinia weevil <i>Cyrtobagous salviniae</i> is extremely effective in destroying the weed. In warm environments control should take 1–3 years. Cooler climates may require a longer time or repeated introductions, or may not be suitable for the weevil.
Large (many plants, many ha)	Not suitable			

Water Hyacinth

Control technique	
Physical	In areas with small, isolated infestations the most effective strategy is to physically remove the infestation and allow it to dry out on the banks of the waterway. Rakes or nets can be used to drag the plant across the water surface to the water's edge.
Chemical	For large infestations, chemical control is more cost effective than mechanical control. The optimum time to spray the weed is when it is actively growing. However, the decaying plant matter is unsightly and can have a negative impact on the environment, particularly in slow moving water. Please see link to Noxious Weed Handbook (below) for most up-to-date list of registered chemicals.
Mechanical	Can be undertaken by means of an aquatic weed harvester. The machine collects the weed and deposits it onto a sealed truck or the banks of the waterway, according to the situation. This method improves the aesthetic appearance of the waterway immediately and the weed mass is instantly removed, therefore not adding to the nutrient load in the water. The option is also more desirable than a reliance on chemical herbicides.
Biological	Biological control is a long term management option for the weed and should be integrated with other forms of control. Two insects, a weevil and a moth, have been released for biological control of Water Hyacinth in New South Wales. They control the weed by burrowing into the plant and allowing water and bacteria to eventually rot the plant. Both agents have been released in the Western Sydney region.

For more information please see the NSW DPI Water Hyacinth AgFact:

http://www.dpi.nsw.gov.au/_data/assets/pdf_file/

Senegal Tea Plant

Control technique	
Physical	This is a viable control technique for small, isolated infestations
Chemical	Previous chemical control programs have not been effective at controlling Senegal Tea. However, please see link to Noxious Weed Handbook (below) for most up-to-date list of registered chemicals
Mechanical	Aquatic weed harvesting is required to remove accumulated biomass

**Please refer to the NSW DPI *Noxious and Environmental Weed Control Handbook* for lists of the current chemicals registered for use for each Aquatic weed.

http://www.dpi.nsw.gov.au/_data/assets/

Control of all aquatic weeds will be undertaken in accordance with the *NSW Noxious Weeds Act 1993*, *Protection of the Environment Operations Act (1997)*, and *the Pesticides Act (1999)*.

Prevention of spread of Aquatic Weeds

This requires the practice of good hygiene of boots, tyres, boating trailers, mowing equipment etc to prevent accidental and intentional spread to un-infested regions, in particular west of the Dividing Ranges. Areas may need to be quarantined, or wash down bays provided, to prevent spread of the weed through stock, produce or transported equipment.

5.3 Links to other strategies

The plan is a direct outcome of both the ***Draft Hawkesbury Nepean and Sydney Metropolitan Weeds Strategies***, the strategies which guide the actions of the Sydney Weeds Committees. The goals and objectives of both of these strategies are consistent with the goals and objectives outlined in the ***Australian Weeds Strategy***.

The plan meets several 'Desired Outcomes' of the **NSW Weeds Strategy**:

- The development and implementation of programs to reduce environmental degradation and the loss of biodiversity through weed invasions;
- The implementation and monitoring of weed control programs on public and State-owned and Crown Land to ensure that objectives are achieved in an efficient and cost effective manner;
- An effective and efficient system for delivery of noxious weeds control and the enforcement of weeds legislation.

The plan also contributes to the Natural Resource Commissions (NRC) Statewide target; 'By 2015 there is a reduction in the impact of invasive species'.

5.4 Extension and Education

The main focus of continuing education and extension activities will be to increase the skills of relevant council and public authority staff, bushcare volunteers and private landholders in the identification and control of Alligator Weed, Salvinia, Water Hyacinth and Senegal Tea. This will be carried out by:

- Undertaking regional aquatic weed field days/workshops
- Training of staff and volunteers in each organisation
- Media articles in local newspapers
- Production of alerts brochures to be sent to private landholders with potential for aquatic weed establishment
- Engagement of local nurseries and aquariums by inviting them to training workshops on aquatic weeds.

5.5 Barriers and Contingencies

The following barriers were identified in meeting the objectives of this plan, these have been considered and contingencies have been incorporated into the action plan.

1. Ease of spread of the weeds and reinfestation (Action 6.1, 6.3, 6.7, 6.8)
2. Some infested areas are difficult to access (6.7, 6.10)
3. Continual sale in nurseries and aquarium shops (6.12)
4. High cost of mechanical removal (6.7, 6.10)
5. Reluctance of landholders to control aquatic weeds (6.11, 6.14, 6.15)
6. Disinterest of private landholders, hobby farmers and absent rural landholders (6.11, 6.14, 6.15)
7. Lack of awareness and skills in aquatic weed identification and control, and its impacts to the environment (6.14)

6.0 ACTION PLAN

ACTION PLAN FOR CONTROL	PERFORMANCE INDICATOR	WHO	ADDRESSES WHICH OBJECTIVES (Number)
Surveying, Monitoring and evaluation			
6.1 Continue to carry out surveys and mapping to record the distribution of aquatic weeds,	Distribution mapping carried out by June 2008 and updated annually.	SWS & SC Weeds Committees	1
6.2 Use mapping to establish baseline data on the densities of aquatic weeds.	Density mapping carried out by June 2008.	SWS and SC Weeds Committees. Sydney Metro CMA.	1
6.3 Continue to determine high, medium and low priority areas of works, based on characteristics such as level of biodiversity, core or isolated sites, class of creek etc.	Priority areas of works determined for the region by June 2009	SWS & SC Weeds Committees	1
6.4 Determine adequate containment lines to prevent further spread.	Containment lines identified by June 2009	SWS & SC Weeds Committees	1
6.5 Record areas of works at a regional level in geographical information system.	GIS is used to store information on locations of regional works being carried out on an annual basis.	SWS & SC Weeds Committees	6
6.6 Review Aquatic Weed plan to incorporate new information and data.	Alligator Weed, Salvinia, Water Hyacinth and Senegal Tea Plant plan reviewed and any new information incorporated by 2011.	SWS & SC Weeds Committees	6
On-ground works			
6.7 Carry out control works using current best practise techniques, to reduce aquatic weeds in <u>high</u> priority areas on public land.	Works in high priority areas on public land begin by 2008.	SWS & SC LCAs, state agencies Sydney Weeds Committees, bushcare.	2
6.8 Carry out works using current best practise techniques, to contain aquatic weeds in <u>medium</u> and <u>low</u> priority areas on public land.	Containment works in med and low priority areas on public land begin by 2010	SWS & SC LCAs, state agencies Sydney Weeds Committees,	3

		bushcare	
6.9 Carry out works to contain aquatic weeds, using current best practice techniques to broadscale containment lines.	Works to contain aquatic weed within containment lines begin by 2010	SWS & SC LCAs, state agencies.	3
6.10 Carry out research, participate in trials and disseminate information that establishes improved aquatic weed control techniques.	Research carried out Information on best practice techniques distributed. Weeds Committee forum is used to share information on aquatic weed control.	SWS & SC Weeds Committees, DPI	6
Enforcement			
6.11 Target enforcement activities near known infestations.	Private property inspections carried out twice per year.	SWS & SC LCAs, private landholders	4
6.12 Inspect aquarium shops, pet shops and nurseries in each LCA area	Inspections on all nurseries and aquariums carried out at least once every two years.	SWS & SC LCAs	4
6.13 Identify and inspect other known distributors of aquatic weeds, e.g. landscaping companies.	Other known distributors identified and inspected at least once every two years.	SWS & SC LCAs	4
Education			
6.14 Provide information and training in Aquatic Weed identification and appropriate control to the community, local industry and LCA staff .	'Aquatic weed identification and awareness' training delivered to the community, staff and industry on an annual basis. Landholders near infestations are updated on current control sites and programs. Train landholders to inspect their land /dams on	SWS & SC LCAs, DECC, DPI, Sydney Weeds Committees	5

	<p>a regular basis, how to prevent spread and how to inform LCA's of any suspected outbreaks</p> <p>In-house aquatic weed training delivered to agency staff.</p> <p>Information on Aquatic weed identification and management distributed to agency staff, especially regulatory officers, health and building / development control officers and parks staff.</p> <p>Aquatic weeds material included in weed displays in conjunction with local festivals, tree giveaways, etc.</p> <p>Articles in Mayoral columns.</p> <p>Aquatic weeds included in regional weed brochures, WEEDeck and the committees' website.</p>		
<p>6.15 Implement incentives programs to encourage proactive private property control of Alligator Weed, Salvinia, Water Hyacinth and Senegal Tea Plant</p>	<p>LCAs, DECC and CMAs are encouraged to implement incentives programs.</p> <p>Incentives programs implemented to control Aquatic weeds on private land.</p>	<p>SWS & SC LCAs, CMAs, DECC, SWS & SC Weeds Committees, private landholders.</p>	<p>5</p>

7.0 MONITOR and REVIEW PROCESS

This plan is designed to be monitored and reviewed on an ongoing basis. Mapping has been incorporated into the plan to both illustrate the extent of currently known aquatic weed infestations and to record areas of works by members of the Sydney Weeds Committees - this will be updated on an annual basis and used to monitor the success of the plan.

Council and agency staff will also carry out monitoring on the ground via their regular field inspections and progress meetings with contractors. Quarterly reports to committee meetings. Please refer to surveying, monitoring and evaluation section in action plan.

8.0 BENEFITS

Controlling Alligator Weed, Salvinia, Water Hyacinth and Senegal Tea Plant will have a positive effect on aquatic ecosystems in the region, with potential benefits of;

- Enhanced biodiversity of freshwater ecosystems
- Improved capacity of agricultural industry
- Enhanced recreational values eg, ease of boating activities and safe swimming.

This plan complements the Aquatic Weed Management Plan for the Sydney West~Blue Mountains and Sydney North regions, and intends to absorb it when it expires in 2010. It is anticipated that a 'Sydney-Wide Aquatic Weeds Plan' will then be established.

9.0 RESOURCES

1. **Weed Management Strategy for the Sydney Metropolitan CMA Region 2007-2011**
2. Hawkesbury Nepean CMA Regional Weeds Strategy 2007-2011 (draft and not yet released).
3. CRC for Australian Weed Management, (2007): WONS Weed Management Guide for Alligator Weed.
4. Salvinia manual....
5. QLD Natural Resources and Water: Water Hyacinth Facts.
See <http://www.nrw.qld.gov.au/factsheets/pdf/pest>

ATTACHMENT 1

Matrix to determine Priority Areas of Works for Aquatics / Semi-Aquatic Weeds

Developed by the South West Sydney Weeds Committee – July 2007

Variable		score
Isolated site - mobile		4
Isolated site - contained		1
Core site		1
Class of Creek	Class 1	4
	Class 2	3
	Class 3	2
	Class 4	1
Conservation significance	Endangered species, Endangered community, Endangered population	5
	Site is vary close to endangered bushland, endangered species etc, or is part of a regional corridor.	4
	Intact local bushland	3
Impact on recreation	High	5
	Med	3
	Low	1
New infestation		4
Commercial activity - dispersal nurseries, aquariums, market gardens, car boot sales, earth works	High	5
	Med	3
	Low	1
Likliness of success	Eradication	3
	Reduction	2
	Containment	1
Agricultural productivity		5
Totals	13 + = High Priority	
	11-12 = Medium Priority	
	10 and less = Low Priority	