1.0 Cover Page

NSW Agriculture

REGIONAL WEED MANAGEMENT PLAN

1.1 PLAN TITLE: **South West Sydney Regional Salvinia Management Plan**

1.2 PLAN PROPONENTS

Regional Weeds Advisory Committee: **South West Sydney Regional Weeds Committee**
Address: **Campbelltown City Council PO Box 57 Campbelltown 2560**
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Signature:..... Date: .....

1.3 NAME OF PLANT(S) **WONS** Y

Botanical name(s): ***Salvinia molesta*** Common name(s): **Salvinia**

1.4 PLAN PERIOD (not to exceed five years)

Starting date: **July 2004** Completion date: **June 2009**

1.5 AREA OF OPERATION:
This plan extends over the geographical area covered by the South West Sydney Regional Weeds Committee (SWSRWC), which includes the Sutherland, Wollondilly, Camden, Campbelltown, Liverpool, Fairfield and Bankstown Local Control Authorities (LCAs).

1.6 AIM:
To contain, reduce and eradicate existing Salvinia infestations in the South West Sydney region, to prevent these from expanding and spreading to form new infestations elsewhere.

1.7 OBJECTIVES:
1. Ascertain the extent of Salvinia infestations on an annual basis
2. Contain and eradicate rare and isolated Salvinia infestations within 2 years.
3. Contain and eradicate marginal Salvinia infestations within 5 years.
4. Contain and prevent the spread of core Salvinia infestations within 5 years.
5. Increase awareness, identification and appropriate control of Salvinia by both relevant agency staff and private landholders.
6. Discourage/prevent the general public from introducing/dumping Salvinia into dams, ponds and waterways.

2.0 STAKEHOLDERS

Signatories and other landholders include Sutherland Shire Council, Wollondilly Shire Council, Camden Council, Campbelltown City Council, Liverpool City Council, Fairfield City Council, Bankstown City Council, Department of Environment and Conservation (DEC), Sydney Water Corporation (SWC), Department of Lands (DOL), NSW Agriculture, Roads and Traffic Authority (RTA), Department of Defence (DOD), and relevant private landholders.

3.0 BACKGROUND and GENERAL FACTS

3.1 Weed Biology/Ecology

Salvinia is a free-floating aquatic fern that can grow up to 30cm long. It forms dense mats on open water bodies and can withstand a range of climates. It prefers still and slow-flowing fresh water and can grow in a wide range of water-nutrient levels.

The leaves are initially round and 1-4cm long. The upper surface is covered in dense waxy hairs. The lower surface is covered with a dense mat of brown hairs. As the infestation becomes more established the leaves fold upwards. The size and shape of the leaves vary with age and the degree of density. The stems are slender, up to 30cm long, branched and covered with fine hairs. The roots are believed to be a modified leaf, which form trailing, hairy strands up to 25cm long underwater.

Salvinia was presumably introduced to Australia as an aquarium plant in the early post World War II period and was first recorded at Luddenham near Sydney in 1952. Since then it has demonstrated a rapid spread and become established in dams, streams and major rivers from North Queensland to the Sydney metropolitan area. Salvinia will not thrive free-floating in water containing low nutrient levels. The weed can survive in brackish water however prolonged exposure to dissolved salts will kill the plant.

3.2 Method of Spread

Salvinia reproduces by vegetative means and spreads within a water body by wind and water currents. Daughter plants are formed when old material attached to younger plants dies and decays, when an abscission layer develops at each node, or when mechanical interference severs pieces of the rhizomes. Such proliferation is promoted in nutrient rich situations with the plant doubling in 5-10 days. It generally grows best in water temperatures around 20-30°C, but can survive 10-35°C. Although frost sensitive, it can survive these conditions.

Salvinia's rapid dispersal across Australia is mainly a result of human intervention. Spread between aquatic systems can occur unintentionally on boats, machinery or from a flooding event, or intentionally by illegal sale, distribution or dumping from fish ponds and aquariums. Animals may carry Salvinia for short distances after drinking at infested ponds, and even ducks may spread Salvinia between catchments. Salvinia does not produce viable seed in Australia, however a small percentage of spores may be viable.

In the urban areas of Sydney, stormwater pollution further assists the spread of Salvinia through the high levels of nutrients that enter the waterways which encourage more rapid weed growth. It is also responsible for more readily transporting the weed material downstream and encouraging new infestations to establish.

3.3 Description of the Problem

Salvinia has the potential to spread across much of Australia's waterways. The impacts of Salvinia 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. 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. Light penetration and oxygen levels are adversely affected, pH levels are

reduced, and the weed mass acts as a haven for disease vectors. Salvinia also interferes with the functioning of river control structures, especially during flooding events.

Salvinia has been declared a Weed of National Significance (WONS) in Australia. According to the National Salvinia strategy, this is due to its severe impacts in freshwater ecosystems, as it adversely affects the biodiversity and functioning of wetland and riparian ecosystems, water quality, water storage and distribution infrastructure, recreation and amenity values. The strategy goes on to say that Salvinia "has often been described as one of the world's worst weeds". And despite being banned throughout Australia, Salvinia is still a popular aquarium and pond plant, from where it can continually reinfest local waterways.

3.4 Reason for the Plan

This plan has been developed in order to implement a coordinated approach to managing Salvinia in the southwestern region of Sydney. This weed has the potential to cause significant environmental damage and degradation, as well as economic loss, in the region. Salvinia can form a dense mass in waterways which reduces water flow, traps litter and other debris and seriously disrupts aquatic ecosystems, causing significant impacts on biodiversity, recreational activities and the aesthetic appearance of the area.

In the South West Sydney region, Alligator Weed, Ludwigia, Water Hyacinth and Salvinia are all considered high priority weeds, and are often found growing in the same locations or environments. The committee believes that it is more effective and cost efficient to manage these aquatic weeds together in an integrated manner and implement combined programs wherever possible. Thus this plan complements the existing regional plans for Alligator Weed, Ludwigia and Water Hyacinth.

Salvinia is widespread across the South West Sydney region and continuing to spread, however, the number of infestations are currently limited with many of these in isolated locations. This plan aims to contain, reduce and eradicate these existing infestations, to prevent them from expanding and spreading to form new infestations elsewhere.

If Salvinia is not controlled and eradicated, it will spread to areas where it is not currently a problem. For this reason, neighbouring local governments in the region have committed to a coordinated catchment management approach. This includes those LCAs who currently have no known infestations, as they will monitor and survey for new infestations on an on-going basis.

Salvinia has long been a popular ornamental plant for ponds and aquariums, with many people still unaware that it is a declared noxious weed, highlighting the need to raise awareness of Salvinia and it's impacts, and how to prevent its spread

The null hypothesis approach would lead to the spread of Salvinia to new areas throughout the South West Sydney region, as well as the nearby Sydney Central and Sydney West~Blue Mountains regions, including LCAs where it does not currently occur. In particular, Salvinia is currently not found in the upper reaches of the Nepean River in the South West Sydney region, and if no action is taken, it could become established there and therefore intensify the problem in the greatly affected Hawkesbury Nepean Catchment. Additionally, if the infestations in the South Creek catchment in the Camden and Liverpool LGAs are not treated and eradicated, they will continue to spread downstream towards Windsor and exacerbate the Salvinia problem there. If left uncontrolled in the Georges River, Salvinia threatens to impact on several downstream LCAs. Severe Salvinia infestations could potentially jeopardize recreational activities available to the local community as well as diminish the aesthetic quality of the river, which is one of the principle drivers for local tourism in the Campbelltown LGA.

3.5 Distribution of the infestations

Bankstown LGA
Salvinia occurs at Lake Gillawarna, Georges Hall (UBD 250 L12), and Newlands Reserve, Milperra (270 K10).

Camden LGA
Salvinia is found at the following locations:
1. Suttons Dam (UBD Sydney 2000 ref 324 F10);
2. South Creek originating at UBD 2000 Map ref 305 E9;
3. Rileys creek originating at UBD 2000 Sydney Map ref 305 N4;
4. Lowes Creek originating at UBD 2000 Sydney Map ref 284 L7; and
5. Previously found in Sedgwick Reserve (UBD Sydney 2000 Map ref 325 G11) however has not been sighted here since control work was undertaken in August 2000.

Campbelltown LGA
Two Salvinia outbreaks seasonally occur in the Campbelltown LGA:
1. The wetland system at the Campbelltown Golf Course - UBD Map 345 Q11.
2. The Georges River in the vicinity of Cambridge Avenue, Glenfield - UBD Map 288 Q8.

Fairfield LGA
The only known Salvinia infestation is on private land on the corner of Cecil Road & Elizabeth Drive, Cecil Park, which has been treated in the past and biological control released.

Salvinia was also found in DeFritas wetland in the past, but has been eradicated.

Liverpool LGA
Salvinia is found at the following locations:
1. Hinchinbrook Creek, Hinchinbrook UBD Map 247 G9.
2. Cecil Hills Water Retention Basin, Cecil Hills, Corner of Lascelles, Map 247 G9.
3. Anzac Creek, Wattle Grove Map 269 L12.
4. Georges River, CBD area to Moorebank, Map 269 G4 to A16 and Map 288 Q1 to Q8.
5. Clinches Pond, Moorebank, Map 269 H8.

Sutherland LGA
Salvinia is found at the following locations:
1. Mina Road constructed wetland, Menai. 316 500 easting and 6 234 900 northing. Infestation approx 1200 sq metres.
2. Garden ponds on private residences, Bundeena. Three properties around 329 600 easting and 6 226 500 Northing. Area 20 sq m.

Wollondilly LGA
Salvinia has almost been eradicated from several locations.

Department of Conservation and Environment
Salvinia is located in an old quarry within Royal National Park, Heathcote. 316 600 easting and 6 227 500 northing. Infestation approx 3500 sq m.

Department of Defence
Salvinia is found in waterways on the Moorebank golf course.

4.0 LEGISLATIVE and REGULATORY SITUATION

4.1 Current Declaration

Salvinia is a declared W1 noxious weed under the Noxious Weeds Act 1993 in Bankstown, Fairfield, Liverpool and Sutherland LCAs. With a W1 noxious weed, *the presence of the weed on land must be notified to the local control authority and the weed must be fully and continuously suppressed and destroyed.*

Salvinia is listed as a W2 noxious weed in the Campbelltown, Camden and Wollondilly LCAs. A W2 noxious weed *must be fully and continuously suppressed and destroyed.*

4.2 Declaration Changes

As part of this regional plan, it is proposed that Campbelltown, Camden and Wollondilly LCAs will seek to apply, from their relevant Council committees, for changes to their noxious weed declarations for Salvinia from W2 to W1 so they are consistent with the other LCAs in the South West Sydney region.

5.0 CONSIDERATIONS and OPPORTUNITIES

5.1 Opportunities to be exploited

To assist in implementation of this plan, funding will be sought from various state and federal government agencies, including NSW Agriculture and the Catchment Management Authorities through their regional funding programs for Catchment Blueprint implementation (eg. NHT2). In particular, funding will be sought from Environment Australia through any relevant WONS or National Weeds Strategy grants.

5.2 Species Management

In order to control Salvinia, an integration of chemical, mechanical and biological control techniques is required. Due to the fragmentation potential of Salvinia, mechanical/manual removal may be ineffective and expensive on larger dams or in rivers, but integrating mechanical/manual methods with chemical and/or biological control, and reduction of nutrient inflows to the water body, can be successful. Small isolated infestations can be physically removed however care needs to be taken to remove all plant material to prevent rapid re-infestation.

Chemical control is more cost effective for large infestations. The NSW Agriculture Noxious and Environmental Weed Control Handbook (2001/2002) lists the following chemicals registered for use in controlling Salvinia:

Chemical	Rate: Spot/Boom	Comments
Diquat Reglone®	400ml in 100L of water 5.0 to 10.0L per hectare	Spray to wet all foliage thoroughly, add Agral 600. **Observe withhold period.**
Vegetrol®	4.0L in 100L of water 50-100L per hectare	Apply as an overall spray, thoroughly wet foliage. Best if water is clean, use higher rate if dense weed or dirt water. **Observe withhold period**
Calcium dodecylbenzensulponate AF-100	1 part to 19 parts kerosene	Apply 1 litre of mixture to 100 square metres, as per label.

Glyphosate 360 g/L Approved for use in aquatic situations Various trade names		The SWSRWC will apply for a National Registration Authority (NRA) Permit for the use of Glyphosate 360 g/L on Salvinia
Orange Oil Water Clear®	1L in 100L of water	Spray onto free-floating plants.

The use of biological control agents where appropriate can be an effective method of removing Salvinia. The Salvinia weevil, originally from South-Eastern Brazil has had varied success across Eastern Australia. There have been cases in the Richmond and Clarence River systems in northern NSW, where the weevil has successfully controlled infestations. The success of the weevil in New South Wales depends on the local climate and nutrient status of Salvinia, as it doesn't like cool temperatures.

In the South West Sydney region, the weevil has been successfully released in the past at Lake Gillawarna, Georges Hall (Bankstown) and at Clinches Pond, Moorebank (Liverpool). The latter is believed to be the most southerly point where the beetle has survived. The weevil was unsuccessfully released in Alma Road, Leppington, (Camden) by NSW Agriculture prior to March 1996, with the colder weather blamed for this.

The adult weevil feeds on the growing tips of the plant suppressing further growth. The larvae tunnel through the horizontal stems or rhizomes, particularly in younger sections of the plant. The overall effect of the weevil is to impede growth by damaging the plant's vascular system.

However, it takes a long time for the weevil to build up a large enough population late in the Summer season, a disadvantage if immediate control is desired. And when the plants are all consumed there is little left for the weevil to survive on, so it may need to be re-introduced if the Salvinia returns. The weevil can also interfere with other weed spraying programs as it is unknown what effect spraying has on their populations.

It is proposed that the SWSRWC further investigate the potential for introducing the weevil to more locations in the region as part of an integrated control program.

5.3 Extension and Education

Education and extension activities will be undertaken to increase the skills of relevant council staff, Bushcare volunteers and private landholders in the identification and control of Salvinia, and make them aware of its regional importance. This will be carried out by:

- Undertaking regional aquatic weed field days and training workshops;
- Training staff and volunteers;
- Media articles in local newspapers;
- On-site advice to private landholders with Salvinia infestations;
- Production and distribution of aquatic weed brochures to private landholders with potential for Salvinia infestations;
- Contact with relevant nurseries, aquariums and other commercial enterprises to restrict the sale of Salvinia, and encourage the use of alternative ornamental aquatic plants that do not have weed potential.

5.4 Links to other Strategies

This plan ties in directly to the **National Salvinia strategy** which has been established to provide a framework for coordinated management of Salvinia across the country. The vision in the national strategy is "to maintain the health of our waterways by limiting the impact and restricting the spread of Salvinia".

The four main goals of this strategy are to:

- Prevent and/or reduce the introduction and spread of Salvinia through education, extension and development of management plans including surveillance and property surveys.
- Upgrade efforts to prevent the trading of Salvinia using targeted extension programs, enforcing current regulations and introducing industry codes of practice and accreditation.
- Minimise the impacts of Salvinia by further extending the use of biocontrol and integrated control methods through best practice management plans.
- Coordinate management linking existing programs and developing management schemes together.

The plan also complements the regional Salvinia plan developed by the Sydney West / Blue Mountains Regional Weeds Committee, and meets several 'Desired Outcomes' of the **NSW Weeds Strategy**:

- Prevention of new weed problems in New South Wales through promoting awareness of new and potential weed risks and the preparation of guidelines and codes of practice to facilitate the early detection and control of new weed species;
- Environmental changes which favour weed invasion discouraged;
- The development and implementation of programs to reduce environmental degradation and the loss of biodiversity through weed invasions. This can be achieved through monitoring river systems and wetlands to identify aquatic weed problems at an early stage so that they can be controlled with minimal environmental damage and implementing control programs for weeds which cause major environmental problems;
- 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

This plan falls within the Southern Sydney and Hawkesbury Lower Nepean Catchment Management Board (CMB) regions and assists in the implementation of the following Catchment Blueprints:

- The **Hawkesbury Lower Nepean Catchment Blueprint**, in particular:
  Management Target 12: Weeds and pests:
  By 2006 implement adequately funded and closely linked strategies and effective actions plans for all major and potential terrestrial and aquatic weed/pest species; and
  Prioritised Management Actions for Biodiversity 6:
  Resource and implement closely linked strategies and effective action plans developed on a catchment basis for all major aquatic and terrestrial weeds and pests using environmentally appropriate management practices, and develop contingency plans for potential invasive weeds and pests.
- The **Southern Sydney Catchment Blueprint**, in particular:
  Management Target 14:
  By 2012 the threats posed to aquatic and terrestrial ecosystems by pest species are measureably reduced; and,
  Management Action 4:
  Implement closely linked strategies and effective action plans, supported by government for all major aquatic and terrestrial weeds, pests and pathogens using environmentally appropriate management practices, and develop contingency plans for potential invasive weeds and pests.

5.5 Barriers and Contingencies

Effective management of Salvinia will be achieved by overcoming the following barriers through the implementation of the respective Actions detailed in Section 6.0:

- Limited information on present extent of Salvinia (Actions 6.1 and 6.2);
- Land owner complacency (Actions 6.4 and 6.6);
- Lack of awareness of the weed and its effect on the environment (Actions 6.5 and 6.6);
- The public's desire for the plant to be used for ornamental purposes in ponds and lakes (Actions 6.6 and 6.7);
- Licensing requirements from the Environment Protection Authority for spraying over waterways (Action 6.3).
- Stormwater pollution and increased nutrients in waterways encouraging the growth of the weed (Action 6.8)

6.0 ACTIONS and PERFORMANCE INDICATORS

ACTION PLAN FOR CONTROL:	**Performance indicators:**	**Who:**	**Addresses which objectives:**
6.1 Undertake surveys and inspections along waterways on public land for new and existing infestations, especially at sites previously treated/eradicated.	Annual inspections undertaken each summer, with maps produced showing extent of core, marginal and rare and isolated infestations.	LCAs, DEC, DOD	1. Ascertain the extent of Salvinia infestations on an annual basis
6.2 Undertake surveys and inspections of private properties in high-risk areas, such as those with waterways near past or present infestations.	Annual inspections undertaken each summer, with maps produced showing extent of core, marginal and rare and isolated infestations. No. of properties inspected compared to previous years.	LCAs	1. Ascertain the extent of Salvinia infestations on an annual basis
6.3 Control and eradicate known Salvinia infestations on public land - using best practice management techniques and obtaining EPA licences where required - including the investigation of the use of biological control. High priority will be given to rare and isolated infestations at risk of spread.	Control and eradication undertaken each growing season, with following results: * Rare and isolated infestations eradicated within 2 years; * Marginal infestations eradicated within 5 years; and * Core infestations contained within 5 years.	LCAs, DEC, DOD,	2. Contain and eradicate rare and isolated Salvinia infestations within 2 years. 3. Contain and eradicate marginal Salvinia infestations within 5 years. 4. Contain and prevent the spread of core Salvinia infestations within 5 years.

6.4 Notify private landholders whose properties contain Salvinia of their obligations to eradicate the weed, provide technical advice and assistance, and enforce the Noxious Weeds Act if required.	Control and eradication undertaken with following results: * Rare and isolated infestations eradicated within 2 years; * Marginal infestations eradicated within 5 years; and * Core infestations contained within 5 years No. of letters and notices issued compared to previous years.	LCAs, private landholders	2. Contain and eradicate rare and isolated Salvinia infestations within 2 years. 3. Contain and eradicate marginal Salvinia infestations within 5 years. 4. Contain and prevent the spread of core Salvinia infestations within 5 years.
6.5 Implement training and awareness programs on an annual basis for agency staff to improve detection and control and prevent spread.	One regional training and awareness program undertaken annually. 20 staff trained per year. Prevention protocols developed and implemented.	LCAs, DEC, SWC, RTA, DOD, NSW Ag, regional weeds committee	5. Increase awareness, identification and appropriate control of Salvinia by both relevant agency staff and private landholders.

6.6 Undertake public education and awareness raising activities and programs.	Media articles 1 per year per LCA. Regional field day 1 per year No. of aquatic weed brochures distributed. Salvinia included in Weedbuster Week displays. Salvinia included in regional weeds brochure	LCAs, regional weeds committee, NSW Ag	5. Increase awareness, identification and appropriate control of Salvinia by both relevant agency staff and private landholders. 6. Discourage/prevent the general public from planting/dumping Salvinia in dams, ponds and waterways.
6.7 Undertake annual inspections of nurseries, aquariums and other commercial businesses which sell aquatic plants.	No. of inspections undertaken annually.	LCAs, NSW Ag	6. Discourage/prevent the general public from planting/dumping Salvinia in dams, ponds and waterways.
6.8 Identify potential causes of Salvinia infestations e.g. stormwater pollution and increased nutrients and ensure they are being addressed in relevant Stormwater Management Plans.	Issue is addressed in Stormwater Management Plans	LCAs	4. Contain and prevent the spread of core Salvinia infestations within 5 years.

7.0 MONITOR and REVIEW PROCESS

All participants in this plan will monitor and review the progress of the plan in their area, against the performance indicators, in their quarterly and annual reports. The plan may also be amended annually to allow for any additional/new information.

All infestation sites will be monitored, and follow-up treatments undertaken where required, as part of the on-going implementation of the action plan.

8.0 BENEFITS

The benefits of implementing this regional plan are that it:

- Provides for the sustainable, coordinated long-term control and eradication of Salvinia in the South West Sydney region.
- Prevents significant environmental damage and degradation, as well as economic loss, which would occur if this weed is not controlled.
- Is achievable, as the number of infestations are currently limited with much potential for success.
- Will prevent the spread of Salvinia into the Upper reaches of the Hawkesbury Nepean River Catchment.
- Will control the spread of Salvinia downstream along South Creek into the Hawkesbury River.
- Will prevent the spread of Salvinia in the Georges River. All significant Salvinia infestations up stream of the Glenfield Causeway will be controlled and contained.
- Complements and works in conjunction with the Sydney West / Blue Mountains Regional Weeds Committee's regional plan for Salvinia.
- Allows for joint management with the other high priority aquatic weeds Alligator Weed, Ludwigia and Water Hyacinth.

9.0 RESOURCES/REFERENCES

Agriculture & Resource Management Council of Australia & New Zealand, Australian & New Zealand Environment & Conservation Council and Forestry Ministers, (2000) **Weeds of National Significance Salvinia (*Salvinia molesta*) Strategic Plan.** National Weeds Strategy Executive Committee, Launceston.

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