

# REGIONAL WEED MANAGEMENT PLAN

**1.1 PLAN TITLE:** Sydney-wide Regional Ludwigia Management Plan

## 1.2 PLAN PROPONENTS

Regional Weeds Advisory Committee: **South West Sydney Regional Weeds Committee; Sydney Central Regional Weeds Committee; Sydney North Regional Weeds Committee; Sydney West ~Blue Mountains Regional Weeds Committee**

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## 1.3 NAME OF PLANT(S)

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Botanical name(s);

*Ludwigia peruviana*

*Ludwigia longifolia*

Common name(s):

**Ludwigia, Peruvian Primrose**

**Longleaf Willow Primrose.**

NB: For the purposes of this plan, the term 'Ludwigia' refers to both *Ludwigia peruviana* and *Ludwigia longifolia*.

## 1.4 PLAN PERIOD (not to exceed five years)

Starting date: **1 July 2003** Completion date: **30 June 2008**

**1.5 AREA OF OPERATION:** This plan extends over the geographical area represented by the four Regional Weeds Committees in the Sydney region.

## 1.6 AIM:

The reduction and eradication of current infestations of Ludwigia on both public and private property, and preventing the spread and establishment of new infestations of Ludwigia.

## 1.7 OBJECTIVES:

1. Determine the location and extent of existing Ludwigia infestations.
2. Reduce and eradicate where possible, rare and isolated Ludwigia infestations on public land within 2 years.
3. Reduce and eradicate marginal Ludwigia infestations on public land within 5 years.
4. Reduce and prevent the spread of core Ludwigia infestations on public land within 5 years.
5. Ensure Ludwigia infestations on private land are contained and eradicated.
6. Increase awareness, identification and appropriate control of Ludwigia by both relevant council and public authority staff, and private landholders.

## 2.0 STAKEHOLDERS

Signatories and other stakeholders include:

**South West Sydney:** Sutherland Shire Council, Wollondilly Shire Council, Camden Council, Campbelltown City Council, Liverpool City Council, Fairfield City Council, Bankstown City Council

**Sydney Central:** Canterbury City Council, Randwick City Council, Hurstville City Council, Botany Bay Council, Rockdale City Council

**Sydney North:** Warringah Council, Pittwater Council, Manly Council, Hornsby Council, Ku-ring-gai Council

**Sydney West~Blue Mountains:** Parramatta Council, Baulkham Hills Council, and Hawkesbury River County Council

**Participating State Agencies:** Dept of Primary Industries (DPI), Department of Environment and Conservation – Parks & Wildlife Service (DEC), Sydney Water Corporation, Department of Lands, Department of Infrastructure, Planning & Natural Resources (DIPNR), Upper Parramatta River Catchment Management Trust, Department of Environment and Conservation - EPA

**Community:** La Perouse Aboriginal Land Council, Cowan Catchment Weeds Committee, Ingleside Landcare Group, Dundundra Falls Bushcare group, and other private landholders and Bushcare and Landcare volunteers

## 3.0 BACKGROUND and GENERAL FACTS

### 3.1 Weed Biology/Ecology

*Ludwigia peruviana* is a perennial wetland shrub which grows to approximately 4m in height. Leaves are 4-12cm long, broad, hairy, alternate and dark green or brownish green. The showy yellow flowers have 4 petals (rarely 5), only last one day, and are produced in succession at the end of the stems. In Sydney, flowering lasts from mid-summer to early-autumn. Four-angled fruit are produced, 1-2.5cm long, 0.6-1cm wide containing small seeds like finely ground pepper, with approximately 1000 – 3000 per capsule.

*L. peruviana* was introduced to Australia from Central and South America and cultivated at the Royal Botanic Gardens, Sydney, in 1907. It was first recorded as naturalised in Australia in the Botany Wetlands in 1970 and recognised as a potential weed in 1971.

*Ludwigia longifolia*, also an introduced aquatic plant, is an erect shrub up to 2 m tall. It has narrowly winged stems that usually branch near their ends. The leaves are sessile, generally lanceolate and 10 to 15 cm long covering upright, reddish stems. The flowers are pale yellow to cream, with notched petals about 2cm long. The fruit are similar to *L. peruviana* with tiny seeds approximately 1mm in size. Swollen stem bases are an adaptation for growing in aquatic conditions. It was first recorded in Australia near Sydney - National Herbarium of New South Wales Report 1993-94.

There is also a native *Ludwigia* in the Sydney region, *Ludwigia peploides ssp. montevidensis* – a herb with creeping or floating vegetative stems and erect flowering stems to 50cm tall which is fairly common in ponds and streams on the Cumberland Plain.

### 3.2 Method of Spread

*Ludwigia* propagates by seed as well as vegetatively. The tiny seeds which are produced prolifically, readily adhere to moist surfaces and feathers, and are dispersed by water, wind, birds (especially ducks), machinery, footwear, clothing and mud. Machinery used to clean out drains, four wheel drive vehicles and boats can easily spread the minute seeds. Stem layering can occur where stems come into contact with moist soil. Dislodged branches and stem pieces can take root after dispersal by flood or machinery during removal, and develop into new plants.

### 3.3 Description of the Problem

Ludwigia is a vigorously opportunistic plant, clogging wetlands, slow moving watercourses and waterways, limiting their usefulness for recreational and navigational purposes as well as reducing biodiversity. Reducing the rate of flow in streams causes wide ecological damage through increased sedimentation and accumulation of additional organic material resulting in the deoxygenation of the water column. This leads to the death of aquatic fauna and a change in flora species composition. Dense stands of Ludwigia can intercept almost all incident light, dominate all other water plants and in some cases lead to the loss of native plants and animals. For example, in the Botany Wetlands, *Ludwigia peruviana* displaced all other wetland vegetation to the extent that bird populations were significantly reduced.

*Ludwigia peruviana* seedlings flower approximately two years after germination. Seed viability is high (up to 99% in the first year) declining significantly within 2 years. The small seeds germinate readily in spring, especially in drying mud at the edges of swamps and streams. According to a report on the Botany Wetlands (Jacobs, S. et. al., 1994), seed production in 1990-1991 was approximately 450 000 seeds m<sup>2</sup>. In addition there were approximately 65 000 seeds m<sup>2</sup> in the soil seed bank and approximately 300 000 seeds m<sup>2</sup> in old fruits that remained on the stems over winter. An estimated 20% of seed may remain dormant for over 10 years, allowing dispersal through time.

According to Csurches and Edwards (1998), *L. longifolia* has the potential to spread along the eastern and northern coasts of Australia. Ecosystems most at risk include wetlands and riparian communities. *L. longifolia* plants can form dominant colonies that result in reduced biodiversity and habitat, threatening native species. It is not known how long *Ludwigia longifolia* seeds remain viable.

### 3.4 Reason for the Plan

This plan has been developed to coordinate the regional, strategic management of Ludwigia in the Sydney region where it is considered a high priority weed. Although its potential for spread is considerable, due to its current limited extent successful control and eradication is achievable if adequate funds are available, as demonstrated in the Botany Wetlands and Warriewood Wetlands.

A five year plan for *Ludwigia peruviana* was commenced in 1999 by the Sydney North Regional Weeds Committee. This plan included participation by Warringah, Pittwater, Manly and Ku-ring-gai councils and NPWS-Sydney North in the Sydney North region, as well as Parramatta, Baulkham Hills councils and the Hawkesbury River County Council in the Sydney West~Blue Mountains region. Funding under the plan greatly facilitated the implementation of control programs in all areas covered by the plan, and resulted in a significant reduction in levels of infestation. Community awareness programs included media and newsletter articles, the development of brochures and road signs, targeted private land inspections and collaborative initiatives, field days and inclusion in Weedbuster displays. As this regional plan expired in June 2004, the Sydney North and Sydney West~Blue Mountains participants elected to merge with the Southern Sydney Regional Ludwigia Management Plan .. This took effect from 1<sup>st</sup> July 2004, and the plan was retitled as Sydney-wide.

In Australia, *Ludwigia peruviana* is currently found only in the Sydney region where it is now well established and has spread south to Heathcote, north to Gosford and west to Campbelltown and Liverpool. At present it does not appear to be established elsewhere in Australia.

*Ludwigia longifolia* has only recently appeared in the Sydney region, and has the potential to become as extensive as *Ludwigia peruviana*. Large infestations already exist in the Port Stephens LCA in the Hunter Valley. *Ludwigia longifolia* plants have also recently been found in 'wetland landscaping' projects in new developments in the region.

The null hypothesis approach could result in Ludwigia becoming a major weed not only throughout the Sydney region, but up and down the east coast and along the north coast of Australia, to the detriment of native flora and fauna in wetland and riparian environments. It has already naturalised

world wide and is recognised as a major weed problem in Asia, Indonesia and North America. *Ludwigia* would spread to new areas throughout the Sydney region, including LCAs where it does not currently occur. For example, *Ludwigia* 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 further impact the Hawkesbury Nepean Catchment.

In Sydney, controlling and reducing the spread of *Ludwigia* will help conserve the integrity of endangered ecological communities classified under the *Threatened Species Conservation Act 1995*, such as the Sydney Freshwater Wetlands and Kurnell Dune Forest.

The control of *Ludwigia* will also ensure the protection of rare or threatened species, for example the rare plant *Grevillea longifolia* in the Sutherland LCA, due to its presence in the same habitat niche as the *Ludwigia* infestations. Also in the Sutherland LCA, many of the wetlands on the Kurnell Peninsula are potential habitat of the (respectively) endangered and vulnerable amphibian species - *Litoria aurea* (Green and Golden Bell Frog) and *Crinia tinnula* (Wallum Froglet).

### **3.5 Distribution of the infestations**

#### **South West Sydney Region**

##### **Sutherland LCA**

In the Sutherland Shire Council area, visual mapping of *Ludwigia peruviana* has revealed 6 main infestations covering approximately 24 hectares of streamline and wetland habitats. A further 4 occurrences of limited extent have also been recorded to date. Isolated occurrences of *Ludwigia longifolia* have also recently been found.

- Unalienated Crown Land in Loftus Creek catchment, Loftus managed by the DLWC. Spread along creek length of 5.5 km, covering approximately 11.0 hectares.
- A 2-hectare wetland in vacant Crown Land off Joseph Banks Drive, Kurnell, also managed by DLWC but subject to a land claim by the La Perouse Aboriginal Land Council.
- Dents Creek catchment, Kirrawee. Spread along creek length of 2.6 km, covering approximately 5.2 hectares, managed by both SSC and private land holders.
- Carina Gully catchment, Como. Spread along creek length of 1.7 km, covering approximately 3 hectares, managed by SSC.
- Still Creek catchment, Menai. Spread along creek length of 1.5 km, covering approximately 3 hectares, managed by SSC.
- Kareela Golf Course drainage lines up to 0.5 km ~ 0.5 hectare.

Minor occurrences are known at:

- Wonga Road Reserve, Yowie Bay.
- Polo Street Reserve, Kurnell.
- Oyster Creek Gully, Carvers Road, Oyster Bay, all of which are under the management of Sutherland Shire Council.
- Privately owned land at 23 Porter Road, Engadine.

##### **Campbelltown LCA**

*Ludwigia peruviana* infestations in Campbelltown LCA are limited to the Georges River Catchment.

The weed has been observed in:

- Georges River from Simmos Beach, Macquarie Fields to Cambridge Avenue, Glenfield
- Smiths Creek, Leumeah
- Bunbury Curran Creek, Ingleburn and tributaries
- Bow Bowing Creek, Campbelltown and tributaries
- Airds Dam

### **Camden LCA**

Only one small *Ludwigia peruviana* infestation has recently been found, alongside Cobbitty Rd where it crosses Cobbitty Creek. It has been treated and is being monitored for follow up treatment. Inspections have also been undertaken both up and downstream.

### **Fairfield LCA**

No known *Ludwigia* infestations.

### **Liverpool LCA**

*Ludwigia peruviana* is found on the banks of the Georges River mainly near Light Horse Park, particularly on the south side of the river as far as the Casula Golf Course. It has not been located anywhere else in the LCA.

### **Wollondilly LCA**

*Ludwigia peruviana* has recently been found for the first time in Wollondilly LCA - two small infestations at the top of 2 creeks.

### **Bankstown LCA**

No known infestations

## **Sydney Central Region**

### **Canterbury LCA**

Three known infestations occur in Canterbury:

- along Wolli Creek near the corner of Bray Ave and Hartill-Law Ave, Earlwood, approximately 80m<sup>2</sup> in size;
- along drainage channel in Turrella Park at end of Finlays Ave, Earlwood, approximately 50m<sup>2</sup> in size; and
- Isolated plants along Wolli Creek, Earlwood.

### **Hurstville LCA**

- Trafalgar Street/Pearce Avenue Peakhurst – scattered infestation in drainage channel through reserve.
- Johnstone Street Reserve, Peakhurst - in drainage channel. This site is downstream of Trafalgar St. Treated. As at May 2004, no plants present. Will be monitored regularly.
- Peakhurst Foreshore (adjacent to Rainbow Pde/Waterside Pde) – scattered seedlings coming from an unknown upstream source.
- Harvey Dixon Reserve – mature infestation approximately 7m<sup>2</sup> in size

### **Randwick LCA**

*Ludwigia peruviana* has been found at the following locations:

- Chifley Reserve (along Bunnerong Rd) - Size of infestation is about 20m \* 20m. Nearest access street is the end of Warburton Street, Chifley. The area has three stakeholders - Council, DLWC and RTA.
- Along creekline between Woomera Reserve, Little Bay, and the Horse Paddocks on the corner of Bunnerong and Little Bay Rd, and extending across Bunnerong Rd into the Market gardens. Full extent not yet known, but the infestations around Bunnerong Rd (on either side) are quite extensive. All these infestations are either on leased crown land, housing corporation land, (or Aboriginal land in one section - Hill 60). Woomera Reserve is council land.

### **Botany LGA**

*Ludwigia peruviana* has been found in one of the ponds in Sir Joseph Banks Park, Botany near the Fremlin Street entry, as well as various drains etc. on council land.

## **Rockdale LCA**

A couple of small infestations occur along Wolli Creek, Turrella on state rail land. Significant infestations occur in ponds at Bicentennial Park and may also occur in Scarborough Park, Monterey.

## **NPWS**

*Ludwigia peruviana* infestations are located:

- Along entire creekline in area known as 'Happy Valley' from Marconi Place to Congwong Beach in Botany Bay National Park, La Perouse (including land owned by DLWC and Telstra).
- Immediately behind Little Congwong Beach in Botany Bay National Park, La Perouse.
- In drainline between the Coastal Cemetery and the Pistol Club access road in Botany Bay National Park, La Perouse.
- In drains beside Cape Banks Road, 100 metres east of Anzac Parade in Botany Bay National Park, La Perouse.
- In a pond 40 metres south-east of the NPWS workshop in Botany Bay National Park, La Perouse.
- Kangaroo Creek in the Royal National Park, extent yet to be determined.
- Scout Gully and Heathcote Creek in Heathcote National Park

## **Sydney Water Corporation**

Significant *Ludwigia* infestations once occurred throughout the Botany Wetlands, however these have been treated since 1996 and much reduced.

*Ludwigia* is also found along the Chullora Pipeline Corridor which is owned and managed by Sydney Water

## **Sydney North Region and Sydney West ~ Blue Mountains Region**

Mapping has occurred throughout many of the LCA's. See attached regional map indicating areas where large infestations of *Ludwigia* have been found. Additionally, site assessment and monitoring sheets are being used by volunteer bushcare and landcare groups throughout the area, to record infestations and treatment over time. Most of the infestations are on Council-managed land, Crown Land and National Parks although some smaller infestations have been identified on private properties.

**Sydney Northern Beaches Catchment** (Pittwater, Warringah and Manly councils and Garigal and Ku-ring-gai Chase NPs) has been mapped with the assistance of their community.

Most creeks in Warringah Council and Pittwater Council, particularly in Ingleside, are infested to varying degrees. Scattered infestations are found in Manly Council in Burnt Bridge Creek, and the National Parks waterways around Pittwater. In all these areas intensive works programs are currently being undertaken.

The largest infestation, Warriewood Wetlands covering 26ha in Pittwater, was highly infested before the current program commenced in 1998. This project has resulted in near eradication in the initial work areas, where previously impenetrable *Ludwigia* infestations have been replaced by natural regenerating wetland species and open water. A boardwalk through the worst affected area now attracts ornithologists from across Sydney.

**Middle Harbour, Lane Cove and Cowan Catchments:** Various creeks with scattered infestations have been mapped and current work programs are being implemented in Warringah, Ku-ring-gai and Hornsby councils and Garigal NP.

**Upper Parramatta River Catchment:** Dense infestations occur on Darling Mills Creek, Toongabbie Creek, and scattered infestations occur on the Parramatta River, in Parramatta and Baulkham Hills councils areas, and are also under current works programs.

**Hawkesbury Nepean Catchment:** Scattered infestations occur on Smalls Creek, Windsor Downs, and on the Hawkesbury River from Castlereagh to Sackville which are currently under a control program.

## **4.0 LEGISLATIVE and REGULATORY SITUATION**

### **4.1 Current Declaration**

Ludwigia is a declared Class 3 noxious weed under the Noxious Weeds Act 1993, "*The plant must be fully and continuously suppressed and destroyed.*"

*Ludwigia longifolia* is also a declared Class 5 noxious weed under the Noxious Weeds Act 1993, "*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with.*". This means it cannot be sold, propagated or knowingly distributed.

## **5.0 CONSIDERATIONS and OPPORTUNITIES**

### **5.1 Opportunities to be exploited**

To assist in the implementation of this plan, alternative sources of funding will continue to be sought from other state and federal government departments, including the various regional funding programs for Catchment Action Plan implementation through the Sydney Metropolitan and Hawkesbury Nepean Catchment Management Authorities.

Grants for weed control on Crown land will also be sought. Sutherland Shire Council has received funding from Dept of Lands for the last several years for Ludwigia control on Crown Land, and an application was again submitted in 2002/03 to follow up on previous work, start treating new areas and start mapping and treating *Ludwigia longifolia*. In 2001/02, Randwick Council received funding from both the RTA and Dept of Lands for noxious weed control including Ludwigia at Chifley Reserve, and has applied again in 2002/03 for stage 2 of these works.

## 5.2 Species Management

### Control Options

#### 1. Herbicides

The *Control of Noxious Weeds Handbook* (1999) published by NSW Agriculture lists the following chemicals registered for use in controlling *Ludwigia*:

Chemical	Rate: Spot/ Boom	Comments
<b>Glyphosate 360 g/L</b> Roundup Biactive® Nufarm Weedmaster®	1.0 L in 100 L of water	Actively growing at or beyond the early bloom stage but before autumn change of colour. Thorough coverage is necessary for best results.
<b>2,4-D Amine 500g/ L</b> Nufarm Amicide® 500 PER 2360 PER 2164	125 ml in 100 L of water	Apply as direct application to foliage minimising run-off from leaf surface. <b>Do not apply as a broadcast spray over water.</b>

The warning comments on 2,4-D Amine 500g/ L in relation to its use near water precludes its use, unless the subject of an off-label permit eg. Warriewood Wetlands in Pittwater.

#### 2. Physical Control

Seedlings are hand pullable, but mature plants are more difficult with many long roots embedded in the mud. Where the majority of the root is not removed, the plant will resprout. In some areas *Ludwigia* acts as a bank/ steam bed stabiliser and manual removal would increase disturbance. NSW Agriculture (1999) recommends slashing and burning dense stands. Where fruit is formed, cut and bag these before removing the rest of the plant. The cut and paint method is ineffective as plants normally reshoot after 6-12 months, however it has been reported that the scrape and paint method is effective during the active growing season.

#### 3. Biological Control

No known research has been conducted on introduced biological control agents, although there is some evidence of ecological control by shading under dense planting. Because *Ludwigia* seedlings require high light levels for germination, it can be appropriate in some locations to establish dense, shady cover following clearing, thereby gaining lasting control.

In the long term, reducing nutrient levels entering water bodies can also lower the risk of invasion or spread.

#### 4. Proposed Best Practice

A combination of the above methods is proposed for controlling *Ludwigia*. The proximity of both water bodies and native vegetation to the majority of infestations suggests that initial manual slashing prior to flowering or stem scraping of dense stands would be the first step. Spraying regrowth with Glyphosate 360 g/L Roundup Biactive® should then follow. This action would reduce the risk of over spray of herbicide onto native flora and into water bodies. Results can be improved by slashing stands prior to flowering, then spraying the regrowth 2-4 weeks later. Repeat applications may be required for larger plants, and a follow up program will be required to deal with seedlings.

Care should be taken not to inadvertently spread seed attached to clothing.

Correct disposal of seeding material is essential. Unless suitably contained on site, all seed capsules should be carefully handled and bagged in single use rip-proof bags to contain seeds and then carefully disposed of in domestic garbage. Discarded plant material should also never be left in contact with the soil as it may take root.

Weed seed spread protocols for *Ludwigia* are currently being developed.

### 5.3 Extension and Education

The main focus of the proposed 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 *Ludwigia*, and make them aware of its regional importance. This will be carried out by:

- Undertaking regional *Ludwigia* field days
- Training of staff and volunteers in each organisation
- Media articles in local newspapers
- Production of *Ludwigia* alerts brochures to be sent to private landholders with potential for *Ludwigia* establishment
- Contact with relevant nurseries and landscape architects to discourage the sale and planting of *Ludwigia longifolia* seedlings in new developments.

### 5.4 Links to other Strategies

This plan complements the regional *Ludwigia* plan developed by the Sydney North 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;
- 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,

It also conforms to the Mission Statement for the National Weeds Strategy "...to reduce the detrimental impact of weeds on the sustainability of Australia's productive capacity and natural ecosystems", and to:

Objective 1.2: ensure early detection of, and rapid action against, new weed problems;

Objective 1.3: reduce weed spread to other areas within Australia; and

Objective 3.2: encourage the development of strategic plans for weed management at all levels.

The area covered by this plan falls within the Southern Sydney Catchment Management Board (CMB) and Hawkesbury Lower Nepean Local Government Advisory Group (LGAG) regions. This plan assists in the implementation of the following Catchment Blueprints:

## **Draft Southern Sydney Catchment Blueprint developed by the Southern Sydney Catchment Management Board:**

- Management Target 14: By 2012 the threats posed to aquatic and terrestrial ecosystems by pest species are measureably reduced.
- Management Target No. 18: 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.

## **Draft Hawkesbury Lower Nepean Catchment Blueprint dated June 2002 developed by the Hawkesbury Lower Nepean Local Government Advisory Group (LGAG):**

- 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.
- 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.

### **5.5 Barriers and Contingencies**

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

1. Lack of information on precise extent of Ludwigia in the region (Action 6.1);
2. Inconsistency of effective weed management over the region (Actions 6.2 and 6.3);
3. Ease of spread of the weed and the need to control it before it seeds (Action 6.2);
4. Infestations of Ludwigia on Crown land where Councils do not have 'care control, and management' (Action 6.6);
5. Lack of awareness of Ludwigia and the potential it has to cause significant environmental degradation (Actions 6.3 and 6.4);
6. *L. longifolia* being sold by nurseries, planted in new developments and not declared noxious (Action 6.5);
7. Limited possibility of achieving effective control of Ludwigia in core areas within the planning period (5 years) without considerable funding (Action 6.6).

## 6.0 ACTIONS and PERFORMANCE INDICATORS

ACTION PLAN FOR CONTROL	PERFORMANCE INDICATOR	WHO	ADDRESSES WHICH OBJECTIVES
6.1 Undertake comprehensive surveys to locate and map and monitor new and existing Ludwigia infestations.	Surveys and mapping undertaken by June 2004.	LCA's, DEC, Sydney Water, DIPNR	1. Determine the location and extent of existing Ludwigia infestations.
6.2 Strategically eradicate, contain and prevent the spread of Ludwigia on public land - giving highest priority to rare and isolated infestations, then marginal infestations followed by core infestations.	No. of hectares/m <sup>2</sup> of Ludwigia infestations treated.  No. of rare and isolated infestations eradicated by November 2004.	LCA's, DEC, Sydney Water, DIPNR	2. Reduce and eradicate where possible, rare and isolated Ludwigia infestations on public land within 2 years 3. Reduce and eradicate marginal Ludwigia infestations on public land within 5 years. 4. Reduce and prevent the spread of core Ludwigia infestations on public land within 5 years
6.3 Strategically coordinate the control and eradication of Ludwigia on private land through inspections, notifications and enforcement of the Noxious Weeds Act 1993. This will be integrated wherever possible with control works on public land.	No. of inspections and notifications compared to previous years.  No. of landholders who have undertaken Ludwigia control and eradication.	LCA's, relevant private property landholders	5. Ensure Ludwigia infestations on private land are contained and eradicated.
6.4 Undertake education and awareness raising activities in Ludwigia identification and appropriate control.	Ludwigia alerts sent to all high risk landholders by November 2004.  1 training workshop per region per year  1 field day per region per year.	LCA's, DEC, Sydney Water, DIPNR	6. Increase awareness, identification and appropriate control of Ludwigia by relevant council and public authority staff, and private landholders.

	<p>20 staff and volunteers trained in each region per year.</p> <p>2 media articles per year per newspaper.</p> <p>Weed seed spread protocols for Ludwigia developed</p>		
6.5 Investigate alternative funding to ensure more effective and efficient control and eradication of Ludwigia.	Alternative avenues of grant funding explored and achieved (eg. Dept of Lands) annually.	LCAs, DEC, DPI, DIPNR, Dept of Lands	<p>2. Reduce and eradicate where possible, rare and isolated Ludwigia infestations on public land within 2 years</p> <p>3. Reduce and eradicate marginal Ludwigia infestations on public land within 5 years.</p> <p>4. Reduce and prevent the spread of core Ludwigia infestations on public land within 5 years</p>

## 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 will also be reviewed annually to allow for any additional/new information.

All known infestation sites will be monitored, and follow-up treatments undertaken where required, as part of the on-going implementation of the action plan. The effectiveness of the control techniques will also be monitored and modified as required.

Follow up inspections and mapping will be undertaken annually to measure changes in the extent of Ludwigia infestations and if there has been a reduction in size and numbers of infestations.

## 8.0 BENEFITS

The implementation of this plan will halt the environmental damage caused by Ludwigia infestations on both public and private land, and prevent the establishment of new infestations in areas where it is not yet found, thus resulting in significant long term cost savings. Ludwigia has the potential to occupy every wetland and creek line in the Sydney region (as well as other regions in Australia) and the signatories to this plan are committed to preventing this from happening.

Controlling Ludwigia will be of enormous benefit to the biodiversity of both native flora and fauna in wetlands and riparian areas. It will assist in the conservation of various Endangered Ecological Communities and Threatened Plants listed under the *Threatened Species Conservation Act 1995*. It will also result in less sedimentation in wetlands and waterways due to excess organic matter causing deposition. This deposition can cause eutrophication resulting in deoxygenation of the water column, death of fauna and loss of biodiversity. Controlling Ludwigia will prevent the reduction of the rate of flow in waterways, which can result in flooding and will also ensure the continual use of waterways for recreational and navigational purposes.

## 9.0 RESOURCES

Jacobs, S. et. al (1994). *Ludwigia peruviana* (Onagraceae) in the Botany Wetlands near Sydney, Australia. Aust. J. Mar. Freshwater Res., 1994, 45, 1481-90

Parsons, W.T. and Cuthbertson, E.G. (1992). *Noxious Weeds of Australia*. Melbourne: Inkata press.

Csurches and Edwards (1998). *Potential Environmental Weeds in Australia*.

*Control of Noxious Weeds Handbook* (1999) published by NSW Agriculture.

Robinson, L. (1994). *Field Guide to the Native Plants of Sydney*. Kangaroo Press, Sydney

*Noxious and Environmental Weed Control Handbook-2004/2005 (A guide to control weed control in non-crop, aquatic and bushland situations)*. Published by NSW Agriculture.