

*Hawkesbury River County
Council*

AQUATIC WEED
MANAGEMENT
PLAN

Revised April, 2006

6 Walker Street
SOUTH WINDSOR N.S.W 2756

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Hawkesbury River County Council Aquatic Weed Management Plan

Summary

Aquatic weed species have been recognised as a serious problem in the Hawkesbury River County Council area. This document is an important step in the coordinated response to the problem and serves as an efficient means of communicating the scope of activities necessary to effectively deal with the issue. With regard to the major goals of prevention, control, and abatement, there are corresponding discussions of existing problems, necessary strategic actions, and specific tasks. Also included are the concepts of monitoring and evaluation related to the major goals and the strategic actions.

This outline provides the framework for the development of a comprehensive program to address the aquatic weed problem in the County. The New South Wales weeds strategy provides guidance for the development of such local and regional plans, upon approval by the Noxious Weeds Advisory Committee (NWAC), funds may be provided for elements of the program.

While this plan provides guidance, it does not stand alone as an instrument to deal with the problem. For funding requests from NWAC, an annual workplan is developed which specifies annual budgets for Hawkesbury River County Councils' noxious weeds control programs and activities linked to the plan. Although the Department of Primary Industries acts as the grants coordinator, it is expected that there will be participation in the program by various State Agencies and neighbouring local Councils. With this coordinated effort, it is anticipated that success in qualifying for the State funds as well as a more efficient approach for implementing Regional weeds strategies. Beyond the State funding incentive, it is believed that State Agencies will find this document essential for designing projects, preparing proposals, and prioritising activities related to aquatic noxious weed issues.

Aquatic Weed Background

Alligator Weed* (*Alternanthera philoxeroides*). **Class 3.*

Origin.

A native of South America. First reported in Australia in 1944, believed to have been introduced to Botany Bay and Newcastle Harbour in ships ballast from South America (Bowmer, McCorkelle and Eberbach, 1991).

Biological Habits.

Alligator weed is a stoloniferous perennial free-floating aquatic plant which is capable of terrestrial growth. Stolons can reach up to 10 metres long with dense mats reaching 15 metres across water surface, rooting at nodes, roots can reach a depth of 1 metre. Flowering in mid-summer, however viable seeds are not produced, the plant reproduces by vegetative means. Can withstand high salinity levels (Sainty and Jacobs, 1981).

Beneficial Effects.

- May prevent soil erosion.
- High in digestible protein.

Detrimental Effects.

- " Perhaps of all the aquatic weeds that are currently a problem in Australia Alligator Weed has the potential to do the most damage to rivers, wetlands and irrigated agriculture" (Bowner, McCorkelle and Eberbach, 1991).
- Alters biodiversity.
- Competes with useful plants for nutrients, light and space.
- Renders grazing land useless.
- Makes turf unsalable.
- Restricts navigation.
- May entangle stock during drinking.
- Harbour for disease vectors.

Status.

Alligator weed is very common in the area. It was first detected in the County in the Nepean River at Upper Castlereagh in 1995. The infestation now extends from Menangle (Camden) to Ebenezer (in varying degrees). 47klms of the River from Wallacia weir to Ebenezer is being monitored and controlled by Hawkesbury River County Council.

Chemical Control.

In aquatic situations, due to the physical nature of the plant and its ability to regrow rapidly from underground quiescent auxiliary buds follow-up applications are required to achieve reasonable control, using Roundup Biactive® (active constituent 360 g/L glyphosate) at a concentration of 1%.

Problems associated with using glyphosate are that only 2% of the herbicide enters the plant, of this 2%, 25% is immediately expelled by the plant as carbon dioxide. The major concern with the use of glyphosate in aquatic situations is that the plant has the ability to close down stems that have been sprayed. These stems may have viable nodes which break off and drift downstream, establishing new infestations.

Biological Control.

The flea beetle (*Agasicles hygrophila*) is established in the area, however, the beetle only attacks aquatic forms of the plant and only down to water line. The activity of the beetle is too short per season to effect any major reduction in plant biomass early in the season, with major effects late in summer on biomass reduction.

Mechanical Control.

Alligator weed is difficult to control by mechanically removing the plant, due to its physical nature. The plant is extremely soft, fragile and buoyant and tends to break-up when physically handled which can aid in its dispersal, however, "If 10% is lost due to mechanical harvesting, it is less damaging than the effects of using glyphosate (Turrel, 1997). The root system can be very deep and the plant can regrow from underground root segments if not completely removed.

Senegal Tea (*Gymnocoronis spilanthoides*). Class 1.

Origin.

Native of South America.

Biological Habits.

Senegal Tea has scrambling or erect stems up to 1 metre high, stems buoyant enabling them to float. Prefers still or slow moving water. The plant reproduces by seed and vegetative means.

Beneficial Effects.

- Stabilises river banks.

Detrimental Effects.

- Competes with other species.
- Chokes drains and waterways.
- Taints water and produces an objectionable odour due to decaying vegetable matter.

Status

Senegal Tea is becoming a major problem in the County due to difficult terrain and ineffectiveness of chemical control. It is common in Red Bank Creek, Hawkesbury River, Rickabys Creek and Glenorie. Only 2 infestations have been eradicated by mechanical means to date.

Chemical Control.

There is no registered herbicide for the control of Senegal Tea. Reasonable control can be achieved using Roundup Biactive® (a.c 360 g/L glyphosate), however this product is not registered for the purpose and a pesticide permit would have to be acquired for its use.

Biological Control.

No biological control agents are available at present.

Mechanical Control.

The only viable option is mechanical removal, however, the plant is fragile and care should be taken when physically removing the plant so as not to infest areas downstream.

Water Lettuce (*Pistia stratiotes*). Class 1.

Origin.

Native of Asia, Africa and equatorial America. First recorded in Australia in 1887 in the Northern Territory.

Biological Habits.

Water Lettuce is a free floating stoloniferous perennial aquatic herb, which consists of a dense rosette of overlapping leaves on a very short stem with long feathery roots. The plant reproduces by seed and vegetative means (Parsons and Cuthbertson, 1992).

Beneficial Effects.

- Provides shelter for fish.
- Useful as a compost, due to its high concentrations of Nitrogen and Phosphorus.
- Extracts heavy metals from sewerage effluent.

Detrimental Effects.

- Small children and animals may become entangled after mistaking Water Lettuce for grassed area.
- Disrupts aquatic ecosystems, affecting native plants and animals.
- Degrades water quality by accumulation of organic material.
- Degrades the aesthetic appearance of waterways.
- Interferes with navigation and recreational activities.
- Reduces biodiversity.

Status.

Water Lettuce is not common in the area, but on occasion is found in small dams and fish hatcheries.

Chemical Control.

Reglone® (a.c 200 g/L diquat dibromide monohydrate) at a rate of 5 to 10 L/ha is recommended. Small areas can be treated with 400 mL of Reglone® /100 L of water, plus prescribed rate of non-ionic surfactant.

Biological Control.

No biocontrol agents available.

Mechanical Control.

Water Lettuce can be physically removed using nets, booms or other devices. Care must be taken to remove every piece of plant material to avoid regrowth. This is often impractical or impossible to achieve, and mechanical control should be incorporated into an integrated control strategy that combines as many control options as possible.

Water Hyacinth (Eichhornia crassipes). Class 3.

Origin.

A native of South America

Biological Habits.

Water hyacinth is an erect, free floating perennial aquatic plant up to 1 metre high. The plant reproduces vegetatively from stolens which form roots at the nodes to produce new plants. The plant is capable of living on land if sufficient moisture is available. During summer flowers are produced. Each flower opens for 1 to 2 days before withering. The flower stalks bend into the water and release their seeds. These seeds can germinate in 3 days or remain viable for at least 15 years. Seeds are not an important means of spread. The 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).

One hectare of water hyacinth can yield as many as 2,000,000 plants and weigh as much as 400 tonnes (Sainty and Jacobs, 1981).

Beneficial Effects.

- Provides nesting material for water fowl which often use floating rafts of the plants as artificial islands.
- Shelter for fish from predators and exposure to excessive sunlight.
- Feed for livestock, herbivorous fish, native animals and birds.
- Filters excess nitrogen and phosphorus from water.

Detrimental Effects.

- Restricts boating and recreational activities.
- Dense mats interfere with fish and water fowl.
- Reduces oxygen levels.
- Increases water loss due to evapotranspiration.
- Leads to eutrophication and general degradation of water quality.
- Is a harbour for mosquitoes.
- The physical nature of the plant can damage structures such as bridges and dams and clog foot valves of irrigation pumps.

Status.

Water hyacinth is common in the area, particularly the Castlereagh and Richmond Lowland areas. 45kkm of the River has been maintained since 1993, this is an on-going program.

Chemical Control.

Reglone® (a.c 200 g/L diquat dibromide monohydrate) at a rate of 5 to 10 L/ha is recommended. Small areas can be treated with 400 mL/100 L of water, plus prescribed rate of non-ionic surfactant.

The control of water hyacinth by chemical means is a long-term undertaking. Seedling regrowth may have to be sprayed annually for up to 15 years, due to the length of time seed remains viable in sediment.

For long term control, a spraying program should be integrated into a control strategy that combines as many methods as possible.

Biological Control.

Two biological control agents, the weevil *Neochetina eichorniae* and the moth *Sameodes albiguttalis* have been released in selected areas, however, these have been unsuccessful due to heavy frosts and flooding, killing the colony before adequate numbers were able to establish.

Releases of the weevil *Neochetina bruchi* have been carried out in selected areas, unfortunately with very poor results.

Manual Removal.

Small areas of water hyacinth can be removed manually, provided it can be accomplished faster than the plant can reproduce.

Large scale manual removal is often impractical and extremely labour intensive. "As a guide, it takes between 600 and 900 hours to harvest one hectare of dense water hyacinth" (Dyason, 1987).

Mechanical Harvesting.

The most appropriate and sustainable method of controlling large accessible areas of water hyacinth.

Salvinia* (*Salvinia molesta*). **Class 3.*

Origin.

Salvinia is a native of Central and South America. First recorded sighting in Australia was at Luddenham, N.S.W in 1952, believed to have been introduced as an aquarium plant.

Biological Habits.

A free-floating aquatic fern up to 30 cm long, preferring still or slow moving water. The plant spreads vegetatively by fragmentation and can grow from a single node and is capable of doubling in size in 5 to 10 days. Mature plants produce sporangia in sporocarps on segments of the submerged leaves.

Up to 55 sporocarps in 2 rows may be produced along each segment, the first 2 or 3 are macrosporangia, the remainder microsporangia. The plant appears to be a hybrid and has not been reported to produce fertile spores in this country (a major concern to quarantine if viable spore producing species were to be introduced) (Sainty and Jacobs, 1981). The plant reproduces by vegetative means.

Beneficial Effects.

- Provides shelter for fish.
- Useful as a compost, due to its high concentrations of Nitrogen and Phosphorus.
- Extracts heavy metals from sewerage effluent.

Detrimental Effects.

- Small children and animals may become entangled after mistaking Salvinia for grassed area.
- Disrupts aquatic ecosystems, affecting native plants and animals.
- Degrades water quality by accumulation of organic material.
- Degrades the aesthetic appearance of waterways.
- Interferes with navigation and recreational activities.
- Reduces biodiversity and creates monocultures.

Status.

Salvinia is common in the area, particularly in the Hawkesbury/Nepean River and tributaries with major infestations occurring above HRCC's boundary in the Liverpool LCA.

Chemical Control.

Reglone® (a.c 200 g/L diquat dibromide monohydrate) at a rate of 5 to 10 L/ha is recommended, this is not effective on dense layered infestations. Small areas can be treated with 400 mL/100 L of water, plus prescribed rate of non-ionic surfactant.

AF 100® (a.c 300 g/L calcium dodecylbenzene sulphonate) is registered for the control of salvinia, but is not recommended due to the environmental and handling hazards associated with kerosene, which is used as the secondary carrier.

Glyphosate may be use under permit from the APVMA, however, varying effects may be achieved with this product.

Biological Control.

The weevil, *Cryptobagous salviniae* has been released in extensively in the area with varying degrees of success. The biological agent is hoped to aid in the control of salvinia in inaccessible, low lying regions, if establishment of a colony is successful, it is expected to take 7 years for appreciable control levels to be achieved.

Mechanical Control.

Salvinia can be physically removed using nets, booms or other devises. Care must be taken to remove every piece of plant material to avoid regrowth. This is often impractical or impossible to achieve, and mechanical control should be incorporated into an integrated control strategy that combines as many control options as possible.

Mechanical harvesting would dramatically reduce the biomass and reduce the amount of herbicides required to effectively control the weed.

***Ludwigia* (*Ludwigia peruviana*). Class 3.**

Origin.

Native of South America.

Biological Habits.

Ludwigia is a perennial, open, hemispherical shrub up to 3 metre tall. Branches, particularly the young ones, hairy. Leaves alternate (rarely opposite), 5-10 cm in length, 1-3 cm wide, hairy. Flowers bisexual, axillary, solitary, on pedicels about half the length of the leaves, 2-4 cm in diameter. Sepals 4, 8-12 mm long, pale green. Petals 4 (sometimes 5), yellow, 1-3 cm long (Sainty and Jacobs, 1981).

Beneficial Effects.

- Stabilises river banks.

Detrimental Effects.

- Competes with other species.
- Chokes drains and waterways.

Status

Ludwigia is common in the Hawkesbury/Nepean River from Upper Castlereagh to Ebenezer and Darling Mills Creek and other sites in the West Pennant Hills district.

Chemical Control.

Reasonable control can be achieved using Roundup Biactive® (a.c 360 g/L glyphosate) on *Ludwigia*. Chemical control needs to be on-going to control new germinations.

2,4-D Amine is a far more effective herbicide for the control of *Ludwigia*, however, it is not registered and a permit from the APVMA is required for its use.

Biological Control.

No biological control agents are available at present.

Mechanical Control.

Mechanical removal is a viable method of control, however, the plant produced a large amount of fine seed and care should be taken when physically removing the plant so as not to spread seed further.

Long-leaf Willow Primrose* (*Ludwigia longifolia*). **Class 4.*

Origin.

Native of South America, grows naturally from Brazil to Argentina and is considered a major weed in its native range.

Biological Habits.

Ludwigia is a annual shrub up to 3 metres tall. Leaves alternate, up to 15 cm in length, 2.5 cm wide reducing in size up the stem. Stems are red, narrow, winged and usually branch towards the apex. Flowers are solitary and found in the junction of upper leaves and stems. Petals 4 (sometimes 5), yellow, 20-25 mm long. Flowering occurs from summer to winter.

Beneficial Effects.

- Stabilises river banks.

Detrimental Effects.

- Competes with other species.
- Chokes drains and waterways.

Status

Long-leaf Willow Primrose is restricted at present to the Nepean River around Upper Castlereagh and sites in the West Pennant Hills district.

Chemical Control.

Reasonable control can be achieved using Roundup Biactive® (a.c 360 g/L glyphosate) on Long-leaf Willow Primrose. Chemical control needs to be on-going to control new germinations.

2,4-D Amine is a far more effective herbicide for the control of Long-leaf Willow Primrose, however, it is not registered and a permit from the APVMA is required for its use.

Biological Control.

No biological control agents are available at present.

Mechanical Control.

Mechanical removal is a viable method of control, however, the plant produced a large amount of fine seed and care should be taken when physically removing the plant so as not to spread seed further.

***Dense Waterweed* (*Egeria densa*). (Introduced/NOT Noxious)**

Origin.

A native of Brazil, Uruguay and Argentina

Biological Habits.

A submerged, attached, dioecious perennial with floating flowers. Stems to 1.5 metres long, rooting at the lower nodes, buoyant, so most of the growth is near the surface, upper internodes short. (Sainty and Jacobs, 1981). The plant reproduces by vegetative means.

Beneficial Effects.

- Provides nesting material for water fowl.
- Shelter for fish from predators and exposure to excessive sunlight.
- Collects silt.
- Filters water.

Detrimental Effects.

- Alters bio-diversity of an aquatic eco-system.
- Restricts boating and recreational activities.
- Dense mats interfere with fish and water fowl.
- Reduces oxygen levels.
- Leads to eutrophication and general degradation of water quality.
- Causes severe bank degradation by accumulated biomass forcing trees to topple during flood events.

Status.

Egeria is wide spread throughout the Hawkesbury/Nepean River system and increasing at an alarming rate. In 1996 Egeria contributed to more than 60% of the total biomass downstream of Penrith weir (Cummins, et, al, 1997). Eutrophication, increased siltation and changes to flow have altered the biological and physical processes of the River system, this has aided the distribution of Egeria.

Egeria is NOT declared noxious at the present time.

Chemical Control.

There are registered herbicide available for the control of dense waterweed (and other submerged aquatic plants), however, these herbicides are inappropriate in large bodies of moving water.

Biological Control.

No biological control agents are available in Australia at present.

Mechanical Control.

The only practical and sustainable method of controlling submerged aquatic weeds is their physical removal.

Policy Background.

The complex environmental and economic impacts posed by the intrusion of aquatic weed require policies and programs to address prevention and control at various levels of Government. In addition, improved coordination of new and existing policies could more effectively focus attention on the problems and achieve more positive results.

In accordance with the Noxious Weeds Act, 1993;

Classes are:-

CLASS 1: State Prohibited Weeds. “The plant must be eradicated from the land and the land must be kept free of the plant”.

CLASS 2: Regionally Prohibited Weeds. “The plant must be eradicated from the land and the land must be kept free of the plant”.

CLASS 3: Regionally Controlled Weeds. “The plant must be fully and continuously suppressed and destroyed”.

CLASS 4: Locally Controlled Weeds. “The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority”.

CLASS 5: Restricted Plants. “The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with”.

The control objectives for each Class are as follows:

CLASS 1: the control objective for weed control class 1 is to prevent the introduction and establishment of those plants in NSW.

CLASS 2: the control objective for weed control class 2 is to prevent the introduction and establishment of those plants in parts of NSW.

CLASS 3: the control objective for weed control class 3 is to reduce the area and the impact of those plants in parts of NSW.

CLASS 4: the control objective for weed control class 4 is to minimise the negative impact of those plants on the economy, community or environment of NSW.

CLASS 5: the control objective for weed control class 5 is to prevent the introduction of those plants into NSW, the spread of those plants within NSW or from NSW to another jurisdiction.

Management Actions

The goals of Hawkesbury River County Council's Aquatic Weeds Management Plan are designed to address different stages of aquatic weed invasion:

- 1) the introduction of the non-indigenous species transported from water bodies from other parts of the State;
- 2) the spread of an established, reproducing aquatic weed population to other water bodies and
- 3) the colonisation of aquatic weed populations within water bodies, including the harmful impacts resulting from colonisation.

The three goals on which Hawkesbury River County Councils Management Plan for aquatic weeds is based are as follows:

Goal 1:

Preventing new introductions of aquatic noxious weeds into Hawkesbury River County Council s' area.

Problem:

The introduction of aquatic weeds into the County region, frequently causes environmental, socioeconomic, and public health impacts. The severity of these impacts is often not known or recognised on a wide-scale basis, impeding the investment of resources needed to prevent new introductions.

Although 6 noxious aquatic weed species have already been introduced into the County's ecosystem, new introductions are still highly likely. The prevention of new introductions is critical in ameliorating aquatic weed problems in the County region and in adjoining areas.

Multiple mechanisms transport aquatic weeds into the County area, some such mechanisms transcend the authority of the County to control. The absence of interjurisdictional authority is problematic in regulating the movement of aquatic weed propagules into the County. Cooperative efforts are necessary between State and Local Government, to promulgate and enforce regulations to ensure that management practices and other related transport mechanisms are employed to prevent aquatic weed introductions.

Other significant transport mechanisms increasing the potential for new introduction of aquatic weeds into the County included; aquaculture industries, recreational boating, the bait industry, the pet shop trade and plant nurseries, all of which have the potential to introduce aquatic weeds.

Strategy: In partnership with the Sydney West/Blue Mountains Regional Weeds Committee and State agencies, develop regional listings of aquatic weeds that have the potential to infest the County. As part of this cooperative effort, identify existing and potential transport mechanisms that facilitate new aquatic weed introductions.

- Action 1: Research and/or support research on the movement and transport of aquatic weeds on a National scale and use findings to help predict potential viable aquatic weed invasions into the County, Region and State.

Strategy: Cooperate with, and support interjurisdictional approaches to facilitate legislative, regulatory, and other actions needed for the prevention of new aquatic weed introductions into the County, Region and State.

- Action 1: Cooperate with and support the State to promote legislation/programs for the prevention of new aquatic weed introductions in the County, Region and State.
- Action 2: Cooperate with and support an interjurisdictional process to ensure compatibility and consistency between the County, Local Control Authorities and between State and Federal agencies.
- Action 3: Participate and cooperate in the development of a regional approach through the Sydney West/Blue Mountains Regional Weeds Committee to prevent new introductions of aquatic weeds into the County.

Strategy: Utilize effective State legislation and regulations to prevent new aquatic weed introductions into the County.

- Action 1: Continued support of the reformation of the Aquatic Weeds Task Force (with input from the public and private sectors) to review and recommend statutory and regulatory changes for State legislative consideration.
- Action 2: Develop and implement an outreach program that informs relevant groups of the regulations, their rationale, and compliance procedure.
- Action 3: Review, recommend, and implement effective enforcement programs.

Strategy: Develop and maintain monitoring programs in the County to provide for the early detection of infestations of aquatic weeds.

- Action 1: Inventory and coordinate information from existing monitoring programs.
- Action 2: Recommend implementation of additional monitoring techniques if needed.

Strategy: Conduct or support research and actions for prevention of new introductions of aquatic weeds into the County.

- Action 1: Determine the transport mechanisms potentially responsible for new aquatic weed introductions into the County. Develop preventative action plans to interrupt pathways of introduction.
- Action 2: Examine trophic changes and habitat alterations in the County to predict the potential effect on new aquatic weed introductions into the region.

It is also difficult to manage the spread of aquatic weeds since infestation frequently occurs in catchments that occupy more than one LCA area. Cooperation among LCA's sharing aquatic weed infested catchments is needed to implement consistent management strategies that will effectively limit the spread of aquatic weed populations.

Strategy: Identify and prioritise aquatic weeds whose spread should be limited.

- Action 1: Utilise the Sydney West/Blue Mountains Regional Weeds Committee and Aquatic Weeds Taskforce with input from user groups to select and prioritise those aquatic weeds that merit management.

Strategy: Monitor the spread of those aquatic weeds determined to be a priority.

- Action 1: Coordinate a monitoring program within the catchment that will indicate or document the spread of aquatic weeds.
- Action 2: Develop identification materials for each aquatic weed that is being monitored to facilitate participation of all stakeholders.

Strategy: Develop and implement control strategies to limit the spread of each aquatic weed determined to be a priority.

- Action 1: Develop voluntary and regulatory control strategies to limit the spread of aquatic weeds into catchment.
- Action 2: Implement a catchment approach to limit the spread of aquatic weeds in the region and establish cooperative policies with LCA's sharing catchments to limit the spread of aquatic weed populations.

Strategy: Inform and educate the appropriate resource user groups on the management strategies needed to limit the spread of targeted aquatic weed populations. To support this effort, the target groups should be informed on how the spread of aquatic weeds threatens the health of a diverse native aquatic community, and other harmful aquatic weed impacts.

- Action 1: Assess existing aquatic weed information and education programs on the spread of aquatic weed populations. Build on the strengths and address the weaknesses of these programs.
- Action 2: Identify pathways that disperse aquatic weeds and inform these groups on practices to help limit the spread. This outreach program should focus on changing the behaviour of user groups to limit the spread of targeted aquatic weed populations in the catchment.
- Action 3: Coordinate with other authorities management programs to ensure, where appropriate, that public access projects and interpretive displays include information about aquatic weeds.
- Action 4: Establish monitoring programs to evaluate the effectiveness of information and education efforts.

Strategy: Utilise effective State regulations to limit the spread of aquatic weeds within the catchment.

- Action 1: Utilise the Sydney West/Blue Mountains Regional Weeds Committee and Aquatic Weeds Task Force to review and recommend statutory and regulatory changes for State legislative consideration.
- Action 2: Develop and implement an outreach program that informs relevant groups of the regulations, their rationale, and compliance programs.
- Action 3: Review, recommend, and implement effective enforcement programs.

Strategy: Support and coordinate scientific research between State and Federal agencies and academic institutions that investigate potential management strategies to limit the spread of aquatic weed populations and associated environmental impacts.

- Action 1: Prioritise research needs to help in establishing program structure.
- Action 2: Conduct priority research, or promote the conduct of such research via research initiatives, academia, or the private sector.
- Action 3: Develop a technology transfer program to be used in distributing research findings.

Goal III:

Abating harmful ecological, economic, social and public health impacts resulting from infestation of aquatic weeds.

Hawkesbury River County Council recognises that, to facilitate accomplishment of these goals, it must coordinate with jurisdictions outside the County and build its tasks upon sound science. Therefore, mechanisms will be established to ensure that all prevention, control and abatement tasks developed and implemented by the County under this plan are:

- (1) done so in cooperation with State agencies, Local Governments, interjurisdictional organisations and other entities, as appropriate.
- (2) based upon the best scientific information available at the time.
- (3) conducted in a sustainable and conscientious manner.

Problem:

The infestation of aquatic weeds in the County can cause, to varying degrees, ecological, economic, social and public health impacts. Strategies to control aquatic weeds in infested water bodies, in efforts to abate their impacts, are not always known or technically and/or economically feasible. Control strategies must also be designed so as not to cause significant environmental impacts.

The infestation of aquatic weeds in the County can alter or disrupt existing relationships and ecological processes. Without co-evolved parasites and predators, some exotic aquatic species out-compete and even displace aquatic native plant or animal populations. As part of this process, the invading species can also influence to some extent the foodwebs, nutrient dynamics, and biodiversity of the ecosystems. To abate the ecological impacts of the invading weeds, it is necessary to understand the mechanisms by which the species disrupts the natural balance of the ecosystem.

The waterways of the County provide valuable economic benefits for the region, some of which include commercial and sport fishing, recreational use, water storage and industry. Several aquatic weeds have been found to cause adverse economic impacts. Water hyacinth forms thick mats on the surface of water which can interfere with many types of water recreational activities, such as swimming, water skiing and boating. The invasion of alligator weed, could pose a serious threat to the turf and vegetable industries of the area.

Strategy: Assess the ecological, socioeconomic, and public health impacts of aquatic weeds in the County. Use this assessment as guidance to develop action levels that warrant implementation of control strategies.

- Action 1: Identify and assess economic value and resource implications for each aquatic weed.
- Action 2: Identify the aquatic weeds that should be targeted for abatement strategies because they threaten the public safety, human health, and ecological integrity of the County.

Strategy: Based on the above impact assessments, encourage the development and implementation of abatement strategies, including mechanical, physical, chemical and biological mechanisms with a reasonable potential to eradicate or reduce populations of targeted aquatic weeds.

- Action 1: Establish protocols that will provide guidance in designing and implementing abatement strategies, the following principles should be incorporated.
- The abatement strategy must not create problems greater than those related to the aquatic weeds themselves.

- An abatement strategy must be well focused and not have serious, long term impacts to the environment or non-target organisms.
- The abatement strategy must not reduce the long term human utilisation of the water body or threaten human health.
- Action 2: Support and coordinate scientific research between State and Federal agencies and academic institutions that investigate potential abatement strategies and associated environmental impacts. Develop a technology transfer program to be used in distributing research findings.

Strategy: Develop and implement means of adapting human activities to coexist with infestations of aquatic weeds where effective control and eradication are not feasible.

- Task 1: Support and coordinate scientific research between State and Federal agencies and academic institutions that investigate potential means to coexist with infestations of aquatic weeds. Develop a technology transfer program to be used in distributing research findings.
- Task 2: Actively seek potential beneficial and alternative uses for these aquatic weeds and disseminate this information through a technology transfer program.

Strategy: Conduct an information and education program providing information on aquatic weed impacts and related abatement strategies. Utilise existing groups/programs responsible for information dissemination when appropriate.

- Task 1: Design programs targeting public agencies needed in promoting management action to abate impacts; user groups needed for effective control of targeted species; and communities that need to learn how to live with aquatic weed problems.
- Task 2: Establish monitoring programs to evaluate the effectiveness of information and education efforts.

Control Options

Chemical.

There are advantages and disadvantages of using herbicides to control weed infestations in or near waterways.

Advantages:

- (i) Flexibility of application.
- (ii) Speed which infestations can be controlled.
- (iii) Relative low cost.

Disadvantages:

- (i) Herbicide residues present in water and sediment.
- (ii) Weeds remain present until completely decomposed.
- (iii) Depleted oxygen levels due to decaying vegetation.
- (iv) Off-target damage.
- (v) Public safety.
- (vi) Altered eco-systems.
- (vii) Increased algal blooms.

Biological.

The use of biological control agents has been given considerable research due to their ability for self perpetuation, spread and minimal impact on the environment.

Mechanical.

Where possible, plant growth should be removed manually, this will reduce the amount of decaying plant material that could lead to algal blooms (Julian, 1985) and a reduction in the reliance of herbicides.

Program Monitoring and Evaluation

The evaluation process of Hawkesbury River County Council's Aquatic Weeds Management Plan will enable us to monitor our progress toward prevention, limitation, and abatement of aquatic weeds. The County will be able to ensure appropriate implementation of our management actions as well as make the necessary "mid-course" corrections. In essence, by incorporating the best scientific and management knowledge with periodic public evaluation, we will be implementing an adaptive management program. The process will involve three components: oversight, evaluation, and ultimately, dissemination of information.

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This Aquatic Weed Management Plan has been revised and adopted by
Council.



General Manager

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