Emerging aquatic weeds

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Introduction

There are four emerging weeds that are currently threatening Goulburn-Murray Water's (G-MW) waterways. All of these plants are introduced and most have been present for over ten years. They are arrowhead (*Sagittaria graminea*), alligator weed (*Alternanthera philoxeroides*), yellow waterlily (*Nymphaea mexicana*) and fanwort (*Cabomba caroliniana*). Control of all of these weeds is being undertaken but it is only with the help of the community that these weeds can be eradicated. G-MW exercises extreme caution and control when using herbicides in or near waterways.

Yellow waterlily

Yellow waterlily has floating leaves, attached to the ground by a stem up to 2 m long. Its beautiful, bright yellow flower is the reason why it was introduced into Australia. Yellow waterlily has rhizomes which are stems that are capable of starting a new root system (and so a new plant). In slow moving waters, such as lakes and backwaters, yellow waterlily can rapidly infest large areas. Yellow waterlily is controlled by spraying with the herbicide glyphosate, commercially known as Roundup® Biactive™.

Arrowhead

Arrowhead is an emergent plant that grows in slow moving waters, up to 1 metre deep. Its leaves are a distinctive bright green and lanceolate in shape. Germination of arrowhead occurs from November to April, resulting in a continuous show of flowers. The flowers are white, with three petals and are found in clusters at the end of a stem.

Arrowhead may be confused with the tuberous native water plantain (*Alisma plantago-aquatica*). Water plantain also has arrow-shaped leaves but unlike arrowhead, its white flowers are on a panicle extending above the leaves. Arrowhead is spread by rhizomes and seed, which leads to the rapid development of infestations. The herbicide 2,4-D amine (low volatile formulation) is used to control arrowhead. If arrowhead is treated with 2,4-D amine, the leaves become very narrow. G-MW is currently researching timing and rates of 2,4-D amine applications, for more effective control.

Alligator weed

Alligator weed is a rhizomatous, perennial herb from South America that is being grown as a vegetable by the Asian community. It is legally registered as a noxious weed in all states and territories of Australia. Currently the Victorian Department of Natural Resources and Environment (DNRE) is responsible for the eradication of alligator weed in Victoria. Alligator weed is different to other aquatic weeds in that, it has the ability to infest terrestrial situations as well. It has stalkless dark green leaves arranged oppositely. Its leaves are 2–12 cm long and 0.5–4 cm wide. White flowers (1.2–1.4 cm) appear during January–March on the end of a stalk.

It can be confused with another leafy vegetable plant, Mukunu-wenna (*Alternanthera sessilis*) although this herb has smaller flowers (less than 5 mm) which are found at the leaf joints (not on the end of a stalk). If you suspect alligator weed is growing near you, please contact the DNRE.

Fanwort

Fanwort is a submerged plant that is more often found in aquariums. It has dark leaves that are branched to form a bottle brush appearance. Its branched leaves start from a single stalk connected to the main stem. Fanwort often clears the water by taking up the nutrients and settling the soil particles. However, its rapid spread and ability to take over large areas leads to its weed status. Fanwort can be confused with the native hornwort (*Ceratophyllum demersum*) which can be distinguished from fanwort by its leaves that are whorled directly around the main stem.

Control of submerged weeds in Australia is difficult with herbicides as there are no publicly available herbicides registered for this use. Herbicides in Australia that may control submerged weeds usually persist for long periods or may even kill aquatic life. Safer, alternative herbicides that are used overseas are being investigated.

Aquatic weed control in irrigation

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Goulburn-Murray Water (G-MW) is one of Australia's largest irrigation areas, covering over 68 000 square kilometres. It is located in northern Victoria, in an area bounded by The Great Divide to the Murray River and from Tallangatta to Swan Hill.

Goulburn-Murray Water has:

- Approximately 10 000 km of irrigation channels, drains and pipelines.
- Fourteen major storages (including Eildon, Dartmouth, Eppalock and Waranga Basin).
- Ten rivers (including the Murray, Goulburn, Campaspe and Loddon Rivers).

Aquatic Plant Services (APS) is a business unit of G-MW that offers specialist advice for controlling weeds within the irrigation area. Weeds can block water flows, infest large areas, destroy natural habitats, damage irrigation structures or contaminate agricultural production. However, not all plant growth in these waterways is detrimental to the environment or to the delivery of water to irrigators. Plants can play an important part in:

- Reducing nutrients in the water.
- Providing food and shelter for fish and wildlife.
- Reducing bank erosion.

Therefore, it is important to determine whether the plants are causing a problem, before considering them as weeds.

In irrigation systems, two main control methods are considered; mechanical control (excavation, weed cutting, etc.) and chemical control (herbicides).

Mechanical control

In irrigation channels and drains, mechanical control methods are generally not used, as they can:

- Provide a short-term fix only.
- Change the hydraulic effectiveness of the waterway by altering the shape of the banks, beds etc.
- Spread the weed downstream.
- Be ineffective.

Chemical control

Correctly applied herbicides are often the most effective control method for aquatic weeds. Glyphosate, 2,4-D amine, amitrole and acrolein are the only herbicides used in irrigation waters. They are selected because they do not persist for long periods

in the environment and are safe for fish and wildlife, although acrolein can be harmful to aquatic life and its availability and use is restricted. It is important that when using herbicides, the user reads and understands the herbicide label before use.

Residue limits

To ensure the environment is protected, there are concentration limits for herbicides that are used in water. These limits should be observed especially when others are using the water. There are three concentration limits:

- Aquatic life limit – below this limit, aquatic life will not be affected by the herbicide. It is often the lowest concentration limit because fish and other aquatic life can be extremely sensitive to chemicals.
- Potable limit – below this limit, water may still be used for human consumption.
- Irrigation limit – Below this limit, water may still be used to irrigate pastures, crops, etc.

Aquatic weeds

Once it is established that the aquatic plants are a problem the following steps should be followed:

i. Identify the plant(s) and the problem(s).
ii. Choose an appropriate control method.
iii. For chemical control, choose a registered herbicide.
iv. Consider potential uses of the water.
v. Aim to reduce residues.
vi. Check result and retreat if necessary.

Herbicide application

When applying herbicides in aquatic situations, the following points should be followed to minimize residues and ensure good results:

- Apply herbicide in a direction away from the water (when spraying near water).
- Apply herbicide in the opposite direction of water flow.
- Use efficient droplet size and pressure to reduce run-off from the plant.
- Apply when infestations are small.
- Use herbicides when the plant is most susceptible.

CD-Rom reviews

Wild Plants of Victoria on CD-Rom

Viridans Biological Databases, 614 Hawthorn Road, Brighton East 3187

Price $90 plus $5.00 post and packing.

In 1996 Viridans, in collaboration with the Victorian Department of Conservation and Natural Resources (now the Department of Natural Resources and Environment – DNRE), published the first complete interactive database of the distribution of Victorian plants, called the *Victorian Flora Database*. This CD-Rom was intended primarily to provide information on what plants were in Victoria and where they could be found.

Even though the CD-Rom also incorporated colour photographs of over 1100 of the species and provided descriptive text on about 600 it was often felt that necessary information was missing. It was also difficult to identify plants from the CD-Rom. *Wild Plants of Victoria* to a large extent has remedied this situation.

All the features of the original CD-Rom are included on the new one, complete with updated plant names and new distribution data. The original 10 map layers which included soils, topography, rainfall and land use have been doubled in number and now include maps such as geology, temperature, vegetation and a new feature that allows the dates of the most recent records to be displayed. Species are mapped on a grid of 10' × 10' with cells that are about 270 km^2 in area.

Many more pictures and much more text has been incorporated on the CD-Rom. There are now colour photographs of over 2500 species (a greater than two-fold increase) and descriptive text for all species (a fivefold increase). In addition many of the original illustrations have been replaced with better ones or have had more informative pictures added (eg flowers, fruit etc.). The photographs now cover virtually all of the orchids, nearly all of the ferns and most of the native trees, shrubs, climbers and larger herbs as well as many non-native, weedy species.

The descriptive text has been written as much as is possible, in simple, non-scientific terms. Where scientific terms had to be used, however, there is now an on-line glossary to help the user out.

Plant identification aids are the most significant and a totally new feature of this publication. Every plant species has been categorised, within the database, with respect general appearance (tree, shrub, climber etc.), flower colour and type, leaf size and shape, and a variety of habitat or survival features (aquatics, parasites, insectivores etc.). These can be used with the built-in filter system along with the distribution data, as a very simple means of narrowing down the identity of a plant.

There are also non-identification characters built into the database such as conservation status of the species, whether or not it is a weed (noxious or environmental), whether the koories had a use for it, and many others.

Information on fifteen botanical topics in a book-on-a-computer format is also included. The topics include Rare Plants, Weeds, Animal Plant Interactions, Koorie Plants and Biodiversity. Each illustration (over 200) and section of text (over 150) can be printed to create a 90 page booklet.

This publication will now appeal to a much wider audience than the original *Victorian Flora Database*. It will be a valuable tool for all those interested in the identification, conservation and management of the flora of Victoria. While *Wild Plants of Victoria* has its origins in the *Victorian Flora Database* it has gone from being an interactive database on the what and where of Victorian plants to become a major publication on the flora of this State.

Wild plants of the Ballarat area

Viridans Biological Databases, 614 Hawthorn Road, Brighton East 3187

Price $60 plus $5.00 post and packing.

This database is based on the structure of *Wild Plants of Victoria* but is limited in scope to the Ballarat area. It encompasses an area of 11 800 km^2 and is based on a two minute by two minute grid with cells approximately 11 km^2 in area. Fewer map overlays are available but this should not restrict the usefulness of the database.

The database resulted from a collaboration between Tim D'Ombrain, a young nurseryman and field naturalist from the Ballarat area and Viridans with the help of the Ballarat and Golden Plains Councils, the Ballarat University and DNRE. New local information was gathered with the assistance of local naturalist, education and Landcare groups using a simple data-recording program.

Residents of the Ballarat area now have access to a first class database of the plants of their area. This will enable them to become familiar with plants of their area and will assist visitors to the region in identifying and understanding the local flora.

R.G. Richardson, Meredith