



# Salvinia

## *Salvinia species*

### DECLARED CLASS 2



There are several species of salvinia that occur naturally in America, Europe and Asia. So far, only one species—*Salvinia molesta*, a native of Brazil—has become established in Queensland.

*Salvinia molesta*, a Weed of National Significance in Australia, can rapidly form mats that completely cover water storages, affecting water quality, water flow, wildlife, irrigation, and recreational activities (including fishing and swimming).

As all species of salvinia are declared weeds in Queensland, it cannot be sold in, or introduced into, the state. *Salvinia molesta* can be controlled by a

combination of biological, mechanical and herbicide methods. The biological control agent—a small weevil that is already established throughout much of the state—may take many years to establish in colder areas.

Salvinia is mainly spread by people who carelessly empty aquariums and ponds into waterways. It is suspected that some salvinia is 'farmed' in natural waterways for harvest and sale by irresponsible people.

## Description

All species of salvinia are free-floating aquatic ferns, with small, spongy, green leaves positioned in pairs along a common stem. The surface of each leaf is covered with long, stiff, water-repellent hairs. When the plant matures, the leaves become thick and fold at the mid-rib.

The young leaves of *Salvinia molesta* are oval, about 12 mm across, and lie flat on the water surface, often resembling duckweed. A root trails from each pair of young leaves and, as salvinia matures, its long filamentous roots resemble wet hair. Trailing stems with small, hairy spore capsules may also be found among the roots of mature plants.

Salvinia does not flower or release fertile spores, and reproduction only occurs by vegetative means.

## The problem

The spread of weeds threatens the sustainability of Queensland's environment, natural resources and primary industries. Salvinia reproduces from fragments that can form large thick mats which can completely cover water storage areas in a relatively short time. To prevent salvinia spreading into other states, it is important that all infestations are controlled—especially those in the Murray–Darling catchments.

### Safety and health risk

Children and livestock may be in danger of drowning if they become entangled in the roots and stolons of a heavy infestation. Salvinia mats also create a haven for mosquitoes, which are vectors of Ross River Fever and Encephalitis.

### Interference with irrigation and stock watering

Stock may have difficulty gaining access to drinking water if the surface is completely covered by salvinia. Water flow to irrigation equipment is reduced due to the restrictive action of the roots, which in turn increase pumping times and costs.

### Damage to structures

Under flood conditions, rafts of weed material build up at fences and bridges that, in turn, collect other floating debris. The combined weight may cause these structures to collapse.

### Loss of water

High rates of transpiration through the leaves during summer can cause up to four times more water to be lost than is normally lost through water surface evaporation.

### Degradation of water quality

Heavy salvinia infestations reduce the infiltration of sunlight necessary for native plant growth in creeks and riverbeds. Heavy weed cover also prevents the exchange of air that normally occurs on an open water surface.

As the plant dies and decomposes, oxygen is removed from the water, causing water pollution and stagnation. This stagnation affects water quality, and may result in the death of aquatic animals.

### Destruction of wildlife habitats

A large infestation of salvinia is a physical barrier to aquatic and semi-aquatic animals, restricting their territorial movements and breeding activities.

### Recreation and aesthetics

Large infestations of salvinia stop the passage of boats by clogging the inlets of boat engine water-cooling systems. The mats of weed also interfere with swimming and make fishing impossible. As native aquatic plants, birds and animals are displaced, the natural beauty of an open water body can be spoiled and further degraded.

## Life cycle

Salvinia is a fern, and is believed to be a sterile hybrid. It does not produce flowers—reproducing only by vegetative means. Salvinia prefers warmer temperatures and, although frost sensitive, produces little growth in winter. When summer temperatures rise, salvinia increases its vegetative growth. Under optimal growth conditions salvinia can **double in volume every two to three days**.

## Habitat and distribution

*Salvinia molesta* is a native of South America and was first reported in Queensland in 1953. It is now found in isolated water bodies from northern Queensland to the New South Wales border, and west to Mount Isa. Many salvinia infestations can be traced back to plants discarded by aquarium owners.

Generally, salvinia prefers slowly moving streams, or still water ponds with high nutrient levels and water temperatures around 20–30°C.

## Declaration details

*Salvinia molesta* is a declared Class 2 plant under the *Land Protection (Pest and Stock Route Management) Act 2002*. A **Class 2** pest is one that has already spread over substantial areas of Queensland, but its impact is so serious that we need to try and **control** it and avoid further spread onto properties that are still free of the pest. By law, all landholders must try to keep their land free of Class 2 pests and it is an offence to keep or sell these pests without a permit. A local government may serve a notice on a landholder for the control of declared pests.

## Prevention

Prevention is the best form of weed control.

The best way to prevent the spread of salvinia is to stop its introduction into waterways from aquariums. It is essential that the washing of plants, or plant parts, into gutters, waterways, creeks, streams and rivers is avoided when ponds and fish tanks are emptied.

The community can also help to prevent the spread of salvinia by reporting its sale to the local council or the Department of Natural Resources and Water, Queensland.

## Control

Weed control is not cheap, but it is easier and more economical to treat infestations when they are small. Act now to prevent weed establishment before you, your property and the environment are affected.

A pest management plan can help to ensure value for money and time if the pest problem is carefully investigated when the plan is developed. Some issues to consider include:

- Where is the weed coming from?
- Can the weed realistically be eradicated?
- How can I contain the weed and stop new infestations?
- What can I do to reduce existing infestations?
- What does the legislation require me to do?
- What does the Local Government Area Pest Management Plan require me to do?
- How does weed control fit into my property plan?
- What can I do to restore areas and prevent the weed re-establishing?
- Who can I work with to get a better result?
- What other impacts do I need to consider when I control the weed?

In most cases, the best management approach combines herbicide, mechanical, fire, and biological control methods with land management changes. It is essential that the control methods chosen suit the specific weed and the particular situation.

### Integrated control

Integrated control is a sensible strategy that includes complementary mechanical, biological and herbicide methods.

First, make certain that the biological control agents are established on the infestation, then carry out mechanical control, or a spray program using a selective herbicide.

Selectively controlling strips of the salvinia mats helps to concentrate the biological control insects onto the remaining weed, increasing the damage done. Mechanical removal of dead plants will prevent masses of rotting weed from degrading water quality.

### Mechanical control

Removal of salvinia by hand or machine is a practical control method often used for small areas, or when weed numbers are low.

Mechanical control can take advantage of flooding or water flushes that deposit salvinia in dams, lagoons and calm water areas of rivers and creeks. When using this approach, it is essential that salvinia is removed before rapid growth commences.

Salvinia can survive for long periods out of water when it is deposited on moist banks. To help prevent its reintroduction into a watercourse, it is essential that it be moved away from the water's edge and, preferably, burnt.

### Biological control

As a result of CSIRO research, *Cyrtobagous salviniae* (Salvinia weevil) has been extensively released. In Queensland, it is the main form of biological control of salvinia. The salvinia weevil is 2–3 mm long and dark brown to black. It is most effective when air temperatures are between 27°C and 35°C, and plant nitrogen levels are high.

The salvinia weevil larvae feed on the new growth buds, and tunnel into the rhizome. The tunneling weakens the salvinia, reducing its ability to grow and compensate for bud loss. As they prefer to feed on buds, adult weevils also affect plant growth.

In the initial stages of weevil damage some salvinia leaves will turn brown. As the salvinia weevils continue their control efforts, the whole mat will turn brown, sink underwater, and finally decompose.

Although effective in tropical areas, the salvinia weevil is not establishing as intensely in cooler southern Queensland and may take several years to control infestations there. Depending on the size of the infestation and the environmental conditions, the time taken for weevils to control salvinia varies from 1–3 years. They may take more than five years to get established in cooler areas.

To ensure maximum build up it is best to release salvinia weevils in spring. When releasing weevil-infested salvinia, it is essential to choose warm, sunny positions where a drop in water level will not leave the salvinia stranded. To establish an effective breeding population of weevils, infested plants should be placed in an area where the salvinia is concentrated. Your local government office or local land protection officer from the Department of Natural Resources and Water can assist you with protocols and information on the collection site nearest to you.

### Herbicide control

All herbicides must be applied strictly in accordance with the directions on the label, so read it carefully before use. When a wetting agent is recommended, always use a commercial wetting agent or surfactant.

## Further information

Further information is available from the vegetation management/weed control/environmental staff at your local government office.

TABLE 1 – HERBICIDE REGISTERED FOR THE CONTROL OF SALVINIA

Situation	Herbicide	Rate	Comments
Aquatic areas (drains, channels, margins of streams, lakes and dams)	calcium dodecylbenzene sulphonate  (AF-100)	1 part in 19 parts kerosene	Sprinkle onto free-floating plants and adjacent water surface lightly, just enough to change their normal colour. <b>Do not</b> use water for potable consumption.
Minor water impoundments	orange oil + sufactant  (Water Clear Aquatic Weed Control)	1 L / 100 L water	<b>Do not</b> use water for potable consumption. <b>Not</b> for use in natural water bodies.
Aquatic areas	diquat (Vegetrol)	50–100 L/ha or 4L/100 L water	Thoroughly wet foliage. Use higher rate for heavy infestations. <b>Do not</b> use water for 10 days after application.
Aquatic areas	diquat (Watrol)	50–100 L/ha or 4L/100 L water	Thoroughly wet foliage. Use higher rate for heavy infestations. <b>Do not</b> use water for 10 days after application.
Aquatic areas	diquat (Reglone®)	5–10 L/ha or 400 mL+ 150 mL Agral /100 L water	Thoroughly wet foliage. Use higher rate for heavy infestations. <b>Do not</b> use water for 10 days after application.



Fact sheets are available from NRW service centres and the NRW Information Centre phone (07 3237 1435). Check our web site <[www.nrw.qld.gov.au](http://www.nrw.qld.gov.au)> to ensure you have the latest version of this fact sheet. The control methods referred to in this Pest Fact should be used in accordance with the restrictions (federal and state legislation and local government laws) directly or indirectly related to each control method. These restrictions may prevent the utilisation of one or more of the methods referred to, depending on individual circumstances. While every care is taken to ensure the accuracy of this information, the Department of Natural Resources and Water does not invite reliance upon it, nor accept responsibility for any loss or damage caused by actions based on it.