

Salvinia

Salvinia species

DECLARED



There are several different species of salvinia that grow naturally in America, Europe and Asia. So far only one species, *Salvinia molesta*, a native of Brazil, has become established in Queensland. In Queensland *Salvinia molesta* can grow rapidly, forming mats that can completely cover water storages affecting water quality, water flow, wildlife, irrigation areas and recreational activities.

All species of salvinia are declared plants in Queensland and cannot be sold or introduced into the state.

Salvinia molesta can be controlled by either biological or chemical methods. The biological control agent, a small weevil, is established throughout much of the state though in the colder areas it may take many years to establish.

Salvinia is spread largely by people through careless emptying of aquariums and ponds into waterways. It is suspected that some salvinia is actually 'farmed' in natural waterways for harvest and sale.

Description

All species of salvinia are free-floating aquatic ferns. These have small spongy, green leaves in two ranks along a common stem. It has no flowers and the long filamentous roots resemble wet hair.

The young leaves of *Salvinia molesta* are about 12 mm across, oval and lie flat on the water surface. As the leaves mature they become thick and folded at the mid-rib and are positioned in pairs along the stem. A root trails from each pair of leaves. The surface of each leaf is covered with long, stiff, water-repellent hairs.

Trailing stems bearing small, hairy spore capsules may be found amongst the roots of mature plants. Salvinia species do not release fertile spores and all reproduction is vegetative.

The problem

Salvinia reproduces vegetatively from fragments and can form large, thick mats that can completely cover water storage areas in a relatively short time.

It is particularly important that infestations be controlled in the Murray-Darling catchment as infestations may spread through three states (including areas of extensive irrigation).

Safety and health risks

Children and livestock may drown if they become entangled in the roots and stolons of a heavy infestation. Because salvinia can grow a number of layers it creates an artificial 'ground' which can be mistaken for sure ground. Animals and children can sometimes walk on these layers and risk falling through the mat and drowning as the mat closes over above them. The plants 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 water to drink if the surface is completely covered by plants. Water flow to irrigation equipment can be reduced due to the restrictive action of the roots, thus increasing pumping times and costs.

Loss of water

High rates of transpiration through the leaves during summer can cause up to four times the loss of water from normal water surface evaporation.

Pollution

Heavy infestations of the plant reduce the infiltration of sunlight necessary for photosynthesis in the plant life of creek and river beds. As plant material decomposes it causes water pollution and stagnation through a reduction in the water quality and oxygen content, resulting in the death of aquatic wildlife and fish.

Destruction of wildlife habitats

Apart from destroying the food sources of waterfowl and semi-aquatic mammals through pollution and prevention of oxygen exchange, the physical barrier presented by large infestations also restricts territorial movements and breeding activities. The natural beauty of an open water body can be spoilt

and further degraded as native aquatic plants, birds and animals are displaced.

Damage to structures

Under flood conditions the rafts of plants can build up at obstructions (such as fences) creating a dam effect which, in turn, collects other floating debris and the combined weight eventually causes the structure to collapse.

Restriction of activity

Waterfowl activity and recreational water sports may be restricted due to the plant's presence.

Life cycle

Salvinia produces little growth in winter and, although frost sensitive, it is able to survive this condition. Summer temperatures produce rapid vegetative growth and **plants can double in volume in two to three days**. Being a fern, salvinia does not produce flowers and, in fact, is believed to be a sterile hybrid. Plants reproduce vegetatively.

Habitat and distribution

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

It grows mainly on slowly moving streams or still water ponds and generally prefers high nutrient levels and water temperatures around 20-30° C.

Declaration details

Salvinia molesta is a declared plant under Queensland legislation. Declaration requires landholders to control declared pests on the land and waters under their control. A Local Government may serve a notice upon a landholder requiring control of declared pests.

Prevention

Initially the best prevention is to stop introductions into the waterways. As many of our aquatic weed problems come from aquarium situations, is important to take care where ponds and fish tanks are emptied to avoid washing plants and plant parts into the water bodies. Report the sale of salvinia to your local council or the Queensland Department of Natural Resources.

Because of the rapid growth potential of salvinia it is important to control the weed while numbers are still low. Following extensive flooding, plants may be deposited in dams, lagoons and in calm water areas of rivers and creeks. Attempts to physically remove the plant should be made before its characteristic rapid growth makes this task too difficult. A good time to treat areas is shortly after they have been flushed out by flooding before plants build up again.

Control

The spread of weeds threatens the sustainability of agriculture and other land uses. Weeds also devastate native plants and animals.

The best form of weed control is prevention. Always treat weed infestations when small, do not allow weeds to establish. Weed control is not cheap, but it is cheaper now than next year, or the year after. Proper planning ensures you get value for each dollar spent.

Look at your weed problem carefully. Can you realistically eradicate it? Or should you contain the weed to stop new infestations developing while you reduce existing ones? What are you required to do by legislation? How does weed control fit into your property plan? What can you do to restore areas and prevent re-establishment?

The best approach is usually to combine different methods. Control may include chemical, mechanical, fire and biological methods combined with land management changes. The control methods you choose should suit the specific weed and your particular situation.

Integrated control

A combination of mechanical, chemical and biological control has provided some outstanding achievements in the control of salvinia. Spraying the entire infestation on large water bodies can result in pollution from the rotting weed. This problem can be avoided by spraying strips of the weed or by mechanically removing a large proportion of the weed before spraying and has the advantage of concentrating biological control insects on the remaining weed, which is then quickly destroyed. Chemical control of part of the infestation at a time also allows a small insect population to remain which can build up again in numbers should further infestations occur.

Mechanical control

Removal by hand or machine is practical for small areas only. Mechanical control can be used to take advantages of water flushes and prevent further build up of weed numbers.

The plant can survive for some time when stranded on moist banks. Following physical removal of the plant it should be left to dry (and preferably burnt) some distance from the bank so that subsequent rainfall and flooding does not re-introduce it to water catchment areas.

Biological control

As a result of CSIRO research a weevil, *Cyrtobagous salviniae*, has been extensively released in *Salvinia molesta* infestations throughout Queensland. The weevil is very small dark brown to black and 2-3 mm long. It is quite effective in tropical areas but may take several years to control infestations in cooler areas. The weevil is the main method of salvinia control in Queensland (the cooler southern areas having patchy results).

The larvae feed on the buds and tunnel in the rhizome, weakening the plant and making it less

able to compensate for loss of buds. The adults prefer to feed on buds and hence, stop plant growth. The weevil is most effective when air temperatures are between 27° C and 35° C and plant nitrogen is high.

Initially weevil damage will turn some of the salvinia leaves brown. Next the whole mat of salvinia will turn brown and then sink and decompose. The time taken for weevils to control salvinia varies from 1-3 years. In cooler areas it may take more than five years for the weevil to get established.

Weevils are established on water bodies throughout Queensland and can be collected for introductions to other infestations. Contact the Land Protection Officer from the nearest Department of Natural Resources and Mines Office for information on the collection site closest to you.

Weevil infested salvinia should be released into warm sunny positions where a drop in water level will not leave the salvinia stranded. The infested plants should be placed in a concentrated area to establish an effective breeding population.

The best time to release weevils is in the spring to allow maximum time for numbers to build up prior to winter, where activity and breeding is minimal.

Herbicide control

Before using any herbicide always read the label carefully. All herbicides must be applied strictly in accordance with the directions on the label. When addition of wetting agent is recommended always use a commercial wetting agent or surfactant.

Caldec is the recommended treatment as it is a specially formulated wetting agent that when mixed with kerosene spreads rapidly across the water surface destroying the buoyancy of the salvinia plants. The plants will sink below the water surface in less than a minute and will darken and sink completely in one to ten days.

The mixture is best applied when plants are few in number as direct contact with the plants is not necessary but water contact adjacent to the plants is essential. The mixture should be applied at low pressures to ensure that droplet size is kept to a maximum and plants are not pushed into the water as the mixture is applied.

The mixture is virtually non-pollutant and water can be used almost immediately, although there may be a slight kerosene taint for a day or so that stock may not like.

Further information

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

TABLE 1 - HERBICIDE REGISTERED FOR THE CONTROL OF SALVINIA

Situation	Chemical	Rate	Comments
Aquatic areas	caldec (AF 100 ^R)	1 part in 20 parts kerosene	Lightly spray free-floating plants and adjacent water surface. Repeat sprayings every three weeks for nine weeks
Aquatic areas	diquat (Reglone ^R)	400 mL/100 L water + 15 mL non-ionic wetting agent	Thoroughly saturate salvinia Do not use the water for 10 days

<p>Find more <i>NRM Facts</i> at <www.nrm.qld.gov.au>; on the NR&M Free Faxback Line, phone 1800 240 691 and PrimeNotes CD-ROM, phone 1800 816 541.</p>	<p>The control methods suggested above should be used in accordance with restrictions (for example, federal and state legislation, local government laws, product manufacturer's guidelines) directly or indirectly relating to each control method. These restrictions may prevent the use of one or more of the methods referred to, depending on individual circumstances. While every care is taken to ensure the accuracy of the information in this fact sheet, the Department of Natural Resources and Mines does not invite reliance upon it, nor accept responsibility for any loss or damage caused by actions based on it.</p>
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