## Management information: *Salvinia molesta*

**Preventative measures**:

The optimum strategy is to prevent the introduction of *S. molesta* into a wetland or other water body. Legislation may restrict the import of the plant into a country. Within-country movement is more difficult to achieve and may depend on increased public awareness and education. This may be addressed by targeting stakeholders and organisations that are implicated in the spread of the weed, such as those associated with the aquarium trade. Encouraging people to identify and report new infestations and restricting access to heavily infested sites may limit the spread of existing infestations. This is particularly appropriate if a weed is found in areas used for boating, fishing or where motor vehicle use is common. Identifying the potential spread of a weed in an area by correlating climatic data with salvinia temperature tolerance may help prioritise management policies by determine which areas would benefit most from preventative measures (Howard and Harley 1998; Bowcher and Lee 2003; ARMCANZ ANZECC 2000).

**Biological**:

A two millimeter black subaquatic beetle, *Cyrtobagous salvinae*, has proven to be the best biological control agent for use against *S. molesta*. First collected in 1980 by Australian researchers (from the native range of *S. molesta* in Southern Brazil), the beetle adults and larvae feed on the leaf buds and young terminal leaves of the plant, causing leaf darkening, senescence and abscission. The beetle larvae tunnel into the rhizome. *C. salvinae* has been successful in at least 16 countries and is cheap, efficient and host-specific to *Salvinia*. Its use in place of herbicides is incalculable in terms of the benefit to the environment. It is known to be extremely effective, for example, please see these photos of a Sepik river lagoon in New Guinea, Papua New Guinea, before and after treatment with *C. salvinae* at the website: *Biological Control* *of Invasive Salvinia sp. in the United States*. Efficiency of control using *C. salvinae* depends on many variables, including:

- temperature
- nitrogen level (nitrogen stimulates beetle reproduction)
- vegetation density (secondary vegetation slows beetle dispersal)
- rainfall (water dilutes nitrogen levels in salvinia).

The size of the infestation is not important because an increase in weed biomass can support exponential growth of the beetle population for a longer period. Optimum beetle population growth occurs between 27°C and 31°C; reproduction ceases below 21°C. Cool temperatures and very high temperatures have been correlated with a lower density of *C. salvinae*. (In contrast salvinia may continue to grow at temperatures as low as 12°C). In Kakadu National Park, Australia, low beetle population densities have been correlated with late wet seasons (followed by flooding) and with absent or halted wet seasons. Cooler areas sustain a lower density of salvinia, which limits the ability of beetles to establish. If the control of salvinia using *C. salvinae* is limited in a particular situation then integrated management, which includes a number of control measures, may be necessary (Pieterse *et al* 2003; ARMCANZ ANZECC, 2000; Room and Fernando 1992; Chikwenhere and Keswani 1997; Howard and Harley 1998; Dye and Heinz Undated; Bowcher and Lee 2003; PIER 2003).

Physical:

Floating ropes anchored to the bank have been used to reduce the spread of *S. molesta* within water bodies. Salvinia may be eradicated without subsequent re-infestation by draining a water body and drying out the weed. This may not be appropriate for large or environmentally significant water bodies (Bowcher and Lee 2003; Howard and Harley 1998). Manual or mechanical removal of salvinia is difficult and expensive and nets may be damaged by the weight of the plants. Machines, including land-based scoops and floating barges, may be used to harvest plants. Booms may be used to divert mobile mats, protect infrastructure and maintain shoreline access to the water (Howard and Harley 1998).