Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL
Centre for Aquatic Plant Management

Information Sheet 22: *Azolla filiculoides* Water fern

Azolla filiculoides is probably the only species of floating fern found in Britain, although there are some known observations of *A. caroliniana* but no herbarium specimens to check. The plant is a native of North America, where *A. filiculoides* occurs in the west and *A. caroliniana* occurs in the east. The two species differ in the number of leaf hairs and the number of edge cells to the leaf fronds.

The most characteristic feature of this plant is the red colouration taken on over the winter or when the plant is stressed, it is usually green during the summer months. It reproduces both vegetatively as the fronds grow and sexually by producing spores. Germinating spores can give rise to dense infestations of this plant and are the main method of overwintering. Spore production occurs as a result of stress when the plants start to form dense mats. The spores are released into the water so that controlling or harvesting the floating mats after this stage will not prevent re-infestation. The plant is free-floating often building up into thick layers where wind and currents collect it. *Azolla* can grow in any depth of water but is not tolerant of waves or turbulence and can be flushed away in fast flowing waters.

Free-floating weeds tend to be most troublesome in static or very slow moving water and are usually flushed out of faster flowing rivers, except where they are held back by dams or weirs. It is unusual for *Azolla* to cause serious land drainage problems because it causes relatively low impedance to flow and tends to be washed out in periods of high flow. Dense infestations, which completely cover the water surface, are a danger to children, pets and livestock who may attempt to walk onto the apparently dry land without appreciating that there is deep water underneath. The dense cover of floating weeds also reduces the light level beneath the surface so that submerged weeds and algae die off causing serious deoxygenation problems. Free-floating weeds can also be drawn into water intakes, blocking pumps and filters, and can mat together forming floating rafts, which cause flow problems and obstructions to weirs, locks and other structures.

Mechanical control

Conventional cutting equipment has no effect on this plant. It can be harvested with weed buckets and flushing out the weed using baffle boards or barriers to raise the water level temporarily and then removing the barrier when wind and currents have collected the weed against the barrier. This technique is generally effective only in smaller water bodies and requires frequent operation. If spores have already been released in the current or previous year, it may be necessary to carry out repeated control operations until all the spores have germinated and been controlled.

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Chemical control

Herbicides are the most effective form of control. The floating fronds can be sprayed with either diquat or glyphosate. Glyphosate will kill almost all emergent and floating weeds onto which the spray is directed. Diquat (as Reglone) will burn off emergent and other floating weeds but will not kill them (except Duckweeds). Surviving fronds may require a second or subsequent treatment if the weed is to be eliminated. This is best carried out when a gentle wind or currents have collected floating fronds together at suitable points.

This plant can also be controlled by subsurface injection of diquat (as Reglone) or by an application of terbutryn granules (as Clarosan 1FG). Both of these herbicides will control other submerged weeds and algae. If spores have already been released in the current or previous year, it may be necessary to carry out repeated control operations until all the spores have germinated and been controlled.

Herbicides should be applied before a complete surface cover has developed to increase effectiveness. If this is not possible a repeat application may be necessary to kill any surviving plants.

Azolla is very susceptible to the selective herbicide Asulam (as Asulox) but the herbicide is not approved for use in water.

Biological control

A weevil, effective against this plant in South Africa, has been observed on several occasions to be associated with *Azolla* in the UK, most recently in Surrey and Cumbria. The weevil is called *Stenopelmus rufinasus* and is characterised by a yellow striped back. It is about 2 mm long. This should be encouraged wherever it is found.

These weevils can be ordered through www.azollacontrol.com

Grass carp will feed on small infestations.

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