Alligator Weed (Alternanthera Philoxeroides)., , CRC Weed Management, 2003, 0958701091, 9780958701099, . .

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Alligator weed can grow in a variety of habitats, including dry land, but is usually found in water. It may form large interwoven mats over the water or along shorelines. Alligator weed stems are long, branched, and hollow. Leaves are simple, elliptic, and have smooth margins. Alligator weed flowers during the warm months of the year and has whitish, papery ball-shaped flowers that grow on stalks.

When alligator weed invades waterways it can reduce water flow and quality by preventing light penetration and oxygenation of the water. It can also reduce water bird and fish activity and cause the death of fish and native plants. Alligator weed mats create a favorable habitat for breeding mosquitoes. Alligator weed is also difficult to control.

Insects have been released for the biological control of alligator weed. The most successful and widely used is Agasicles hygrophila commonly called the alligator weed flea beetle; it has been released for biocontrol in Australia, China, Thailand, New Zealand and the United States. Amynothrips andersoni, the alligator weed thrips, and Vogtia malloi, the alligator weed stem borer, have also been released in the United States.

It is a native of South America and a major problem in south-eastern United States, China, New Zealand, Burma, Thailand, Indonesia and India. Alligator weed has not reached its potential distribution in Australia or within NSW, but has the ability to devastate the environment and agriculture if left unchecked.

Alligator weed is a native plant of the Parana River floodplains in northern Argentina and adjacent countries. It was possibly introduced into Australia in the Newcastle area via cargo from ships during the Second World War. Since its introduction alligator weed has spread to nearby seasonally flooded agricultural and grazing lands of Fullerton Cove, Williamtown and the Raymond Terrace area, and has steadily expanded to infest many creeks, lowlands and drainage channels in the lower Hunter region. It was recorded in a dam at Woomargama near Albury in 1967, and after its first recording in the Sydney basin at Duck Creek in 1969 it spread within the Parramatta catchment and throughout the Georges River catchment. In 1981 it was recorded at Camden and new infestations were then reported throughout the 1990s, with alligator weed found higher in the Hunter catchment in the Williams and Paterson Rivers in 1993; in Barren Box Swamp near Griffith in 1994; and in Byron Creek, a tributary of the Richmond River on the far north coast in 1998.

In 1995 alligator weed was observed in a backyard vegetable garden in Brisbane, grown as a substitute for the herb and vegetable Mukunawanna (Alternanthera sessilis), favoured by Sri

Lankans. Investigations during the following years found it growing in many NSW backyards. More than 500 infestations have been found in the Sydney metropolitan area, and numerous infestations have been reported in many regional areas across NSW.

Alligator weed will grow in ponded and flowing waterways, on the banks of waterways, on floodplains and poorly drained land, and less commonly in drier situations above flood level. To date in Australia all infestations have occurred in temperate and subtropical climates, thriving in areas with high summer rainfall. Alligator weed will grow in a range of soils and substrates from sand to heavy clay, and can easily tolerate dry periods. Infestations have been found growing in saline conditions (flowing water with 30% of the salinity of seawater), and on beaches above the high tide zone. Frost and ice kill exposed stems and leaves, but protected stems can survive these conditions and support the next season’s growth.

Alligator weed disrupts the aquatic environment by blanketing the surface and impeding the penetration of light. Such blanketing can also impede gaseous exchange (sometimes leading to anaerobic conditions) which adversely affects aquatic flora and fauna. It also competes with and displaces native flora along river and creek banks and in wetlands.

In the Sydney Basin alligator weed is currently threatening the turf industry valued at over $50 million annually. The vegetable industry valued at $150 million annually is also under threat in the Hawkesbury–Nepean catchment. The extraction industry in the Hawkesbury–Nepean is also under threat. This industry supplies most of Sydney's sand, gravel and soil resources. If contaminated, the movement of these resources would be severely restricted. Sugar cane and soy bean industries are also threatened in the Richmond catchment.

Alligator weed restricts access to and use of water, blocking and damaging pumps and other infrastructure. Mats of alligator weed can impede stream flow and lodge against structures promoting sedimentation which contributes to flooding and structural damage. It is currently threatening Warragamba Dam, Sydney's major water supply and storage system.

Tourism and recreation are affected when alligator weed limits recreational activities, reduces aesthetic values, and increases mosquito populations. Dense mats reduce the visual impact of waterways and affect the presence of other native flora and fauna. They also limit water vessel movement and access to waterways, and create a hazard for swimming and other water sports.

Alligator weed is a problem in 30 countries. It is a serious weed in eight of these and a major weed in the others. In the USA floating alligator weed caused major impediments to navigation on the Mississippi River. In North Carolina aquatic infestations increased from 152 ha in 1963 to 1000 ha in 1999 along with a conservative estimate of 4000 ha of infested cropping land. It is a major weed of transplanted rice wherever it is grown in the world. In China crop production is reduced between 20 to 63%. It impacts on hydro electric power production, fishing and has seriously degraded famous scenic spots.

The plant forms dense mats of interwoven creeping and layering stems. Over water, stems grow to 60 cm high and up to 10 m long and have large, hollow internodes. Mats may extend 15 metres over the water surface and become so robust they can support the weight of a person. On land, stems are shorter and internodes are smaller and less hollow.

Alligator weed has an extensive underground root system. Roots are relatively fine and short in water but become thicker, starchy and rhizome-like in soil, able to penetrate to depths of over 50 cm. Roots and stems have been found growing more than 1 m below the surface. Root storage tissues allow for survival over long dry periods.

The Alligator Weed Control Manual provides a comprehensive overview of the various chemical, physical and biological control options. Management options for alligator weed depend on the site and location of the infestation, its age and extent and the resources available. Any new infestation should be assessed to determine if immediate eradication is a feasible management objective (small

numbers of scattered plants; infestations up to 5 m x 5 m). If not, management should aim for suppression leading to eradication over a period of approximately 6 years (infestations with roots more than 1 m deep; areas of infestation over 10 m x 10 m), or ongoing suppression (in extensive, long established infestations).

Control methods and their application will vary depending on the management aim. While containment and prevention of spread will be necessary in all infestations, controls should be closely aligned with management aims. Table 1 provides a guide for selecting appropriate control methods for the situation.

It is currently agreed that a program based on three treatments of herbicide products containing metsulfuron-methyl per growing season is the most effective for suppression of both aquatic and terrestrial alligator weed. For application rates and concentrations in aquatic and terrestrial situations please refer to the current range of permits and label registrations for the use of herbicide products containing metsulfuron-methyl 600 g/kg on alligator weed in NSW. These are listed in the NSW DPI Noxious and Environmental Weed Control Handbook (available at any office of Industry & Investment NSW (formerly NSW DPI) office, or on the Australian Pesticide and Veterinary Medicines Authority website (www.apvma.gov.au).

Note: Make the second and third treatments only if there has been sufficient regrowth (at least 5 or 6 sets of leaves on stems, 10 cm of stem length, or 30 cm crown width in prostrate growth). In dry conditions the plant may be suppressed and depleted to the point where only 2 applications are possible over the growing season. This can also occur after 2 consecutive years of treatment, as the depleted plants take longer to reach the required level of regrowth. Always maintain at least 2 sprays per growing season.

For alligator weed, physical control involves either deep manual digging or shallow mechanical excavation. Deep manual digging can be done in terrestrial and shallow aquatic situations and requires an infested area to be hand dug in order to find and remove all the roots associated with each individual stem arising from the ground. While time-consuming, local weed authorities have shown this technique to be successful for eradication of small or new infestations.

Shallow mechanical removal can be used to remove large amounts of above-ground plant material and small amounts of below-ground root material. Excavations should only be made to a depth of 20 cm due to the sheer volume of contaminated soil to be disposed of. An excavated site is then inspected regularly for signs of regrowth, which are then either treated with herbicide or removed by deep manual digging, depending on the management aim. Shallow mechanical removal is generally not appropriate in aquatic situations and the risks of spreading fragments are high.

Plant material can be dried and incinerated, boiled or microwaved. Large volumes of contaminated soil are difficult to process, and if possible need to be spread on an impenetrable surface and dried prior to burial (preferably sealed in containers) at a secure disposal site that can be monitored for any signs of regrowth.

Accidental spread on machinery can introduce the plant to new areas with disastrous consequences. Any machinery working in an infested area should be thoroughly cleaned before it is moved to a new site. Cleaning should include removal of all mud and vegetation, followed by complete and thorough inspection of the machine.

The flea beetle (Agasicles hygrophila) was first introduced to Australia in 1976. It provides good control in aquatic environments in the Sydney region, successfully reducing the area of floating mats in the Georges River and in parts of the Hawkesbury Nepean system. However, this insect is limited to warm temperate and subtropical areas and the predicted range for alligator weed in Australia far exceeds the predicted range for the flea beetle.

Alligator weed is declared a Class 2 or 3 noxious weed throughout NSW. Under the NSW Noxious Weeds Act 1993, the presence of a Class 2 weed must be notified to the Local Control Authority and

the weed must be fully and continuously suppressed and destroyed. In areas where there are dense infestations of alligator weed regional management plans outline the appropriate actions to be undertaken. For new incursions of alligator weed, initial treatments may be undertaken by the Local Control Authority. Follow up works will then be the responsibility of the owner or occupier of the land, who must take effective measures towards eradication. Failure to do so could result in legal action and a fine.

Leaves and stems vary greatly in size and shape. Fleshy, succulent stems can grow horizontally and float on the surface of the water, forming rafts, or form matted clumps which grow onto banks. The horizontal stems (called stolons) may reach a length of 10 m. The leaves are opposite in pairs or whorls, with a distinctive midrib, and range in size from 5-10 cm (Environment Waikato undated, Virginia Cooperative Extension undated).

Fibrous roots arising at the stem nodes may hang free in water or penetrate into the sediment/soil. Flowers, which appear from December to April, are thin and clover-like in shape. The white flowers grow on stalks and are approximately 1.25-7.6 cm in length and 13 mm in diameter (Virginia Cooperative Extension undated).

A number of non-native Alternanthera species occur in the United States, including sessile joyweed Alternanthera sessilis which is similar in appearance to A. philoxeroides and co-occurs with it in the IRL region of Florida. Mis-identification of these two species has had negative ecological ramifications elsewhere. A. philoxeroides was accidentally spread in Australia by members of the Sri Lankan immigrant community because it was mistaken for its congener A. sessilis which is the Indian herb mukunawanna (Hosking, et al 1996).

Alternanthera philoxeroides was substantially more abundant in the southeastern U.S. four decades ago than it is now. In 1963, over 65,000 ha of land in 8 southern states were overrun with invasive alligatorweed. Within two decades, however, the infested land in those states was brought down to only about 1% of that total, primarily through successful biological control (Coulson 1977). During this same period, however, the amount of infested land in Texas and Louisiana increased (Cofrancesco 1988). Biocontrol of A. philoxeroides is further discussed below.

Reproduction in Alternanthera philoxeroides is predominantly through vegetative means; individuals rarely produce seeds, and when they do the seeds are typically non-viable. Vegetative growth occurs at the apical stem buds and axillary stem and root buds and the plant is spread through fragmentation (Julien et al. 1992, Virginia Cooperative Extension undated).

Closely associated with Alternanthera philoxeroides is the alligatorweed flea beetle, Agasicles hygrophila, an insect not native to the U.S. but intentionally introduced here in the mid-1960s as potential biological control agent of A. philoxeroides (Buckingham 2002). A. hygrophila has the distinction of being the first biocontrol insect released in the U.S. in order to combat an invasive plant. Overall, management impacts on alligatorweed have been excellent as indicated by the dramatic decrease in the amount of infested aquatic habitat since the the insect was first released. However, it is not considered to be effective against plants occurring in terrestrial habitats (UF/IFAS CAIP undated).
http://edufb.net/1883.pdf
http://edufb.net/2753.pdf