The spread and control of Reed Sweet Grass (*Glyceria maxima*)

Over the 4 years of my PhD study, I explored five questions related to the factors influencing the distribution and spread rate of Reed Sweet Grass, and the cost and effectiveness of controlling the weed with herbicide. My aim was to provide waterway managers and local landholders with information on the weed that may assist with the long and short term control of the weed. The main findings from my study are presented below.

Finding 1: Reed Sweet Grass spreads more quickly in areas fenced off from livestock (in this case cattle) compared to those where grazing occurred.

I chose eight patches where the riparian zone was unfenced and eight patches where there was a fence to keep out livestock. I measured the change in area covered with Reed Sweet Grass as it grew from September through to April. Over two years, the fenced patches expanded in size more rapidly than the unfenced patches. Additionally, larger, older patches expanded faster than smaller patches. The greatest increase in area was 38 m^2 for an unfenced patch in one growing season.

Management recommendation

Fencing of riparian zones in areas with Reed Sweet Grass should be accompanied by a maintenance strategy to deal with the likely expansion of the area infested by Reed Sweet Grass.

Finding 2: The amount of woody vegetation in the riparian zone influences the occurrence of Reed Sweet Grass.

I surveyed 222 stream sites between 2004 to 2006 in West Gippsland. At each site, the presence or absence of Reed Sweet Grass was recorded and an estimate of the amount of woody riparian vegetation cover, as an indicator of the level of shading, was taken. Reed Sweet Grass was not found at sites with dense native vegetation or dense willows. The absence of the grass may be because sites where dense native vegetation or willows were present allowed only 2% and 1% of the available light through to the stream bank, respectively. Reed Sweet Grass was found most frequently at sites with no woody riparian vegetation and these were the sites with the greatest

light levels. In conclusion, the denser the woody riparian vegetation is, the less likely Reed Sweet Grass is to be present.

Management recommendation

This study confirms that replanting the riparian zone with native species is an effective long term control method for Reed Sweet Grass. The removal of willows may improve conditions for Reed Sweet Grass to establish, so a management plan to deal with the possible invasion of Reed Sweet Grass once willows are removed is needed. If a Reed Sweet Grass infestation does appear after the removal of willows, it is crucial that the infestation is controlled when it is young and small (see finding 4 below).

Finding 3: Reed Sweet Grass can be effectively controlled with Roundup® Biactive™.

Seven patches were monitored over two years to measure the costs and effectiveness of herbicide application on the area infested by Reed Sweet Grass. All patches that were sprayed with Roundup® Biactive™ decreased in area. After two years, five of the seven test cases had been eradicated, but these were the smaller sites (see finding 4 below). Autumn spraying was found to be more effective than summer spraying, but for the best results, spraying, at both times of year was required.

Management recommendation

Local patches of Reed Sweet Grass can be controlled or eradicated using herbicides. Each patch of grass should be sprayed twice each year, once in summer and once in autumn, with the glyphosate-based Roundup® Biactive™, applied at a concentration of 15 ml to 1 L of water. No surfactant should added as it may cause harm to aquatic life.

Finding 4: Large patches (over 100 m^2) of Reed Sweet Grass are cheaper to control in terms of the cost per m^2 reduction in area. However, large patches are more expensive to eradicate than small patches, since they require more treatments of herbicide in total.

Seven patches of different sizes were monitored over two years to measure the costs and effectiveness of herbicide application on the area infested by Reed Sweet Grass. Large patches

were more cost effective to control in terms of the reduction of infested area per dollar invested, but they spread faster than small patches (see finding 1). By reducing the number of large infestations, fewer seeds are produced and fewer fragments will be generated, lowering the chance of further infestations. I have shown that large patches can be controlled effectively, but managers must be diligent in monitoring season after season for stray survivors.

The need to act early when an environmental weed is detected is a well established principle in weed management. I found that it is more cost effective to focus control effort on small patches (particularly in a region that is newly invaded) because these are cheaper to eradicate than large patches and their elimination may limit the rate of spread. However, the small patches I controlled had been located before herbicide control began. Incorporation of detection costs in an eradication program may increase costs of control of small patches because these generally require intense search efforts.

Management recommendation

The best management action depends on the objectives. If the objective is to reduce the overall infested area of a catchment, it is better to target large infestations. If the management objective is to reduce the number of sites infested by Reed Sweet Grass, it is more cost effective to focus on small patches because these are cheaper to eradicate than large patches and their elimination may limit the rate of spread.

Finding 5: The key environmental variables that influence if Reed Sweet Grass is present or not varies depending on the spatial scale examined.

I examined the effect of environmental variables on the distribution of Reed Sweet Grass over continental, regional and local scales in Australia. The analysis was conducted by comparing the environmental characteristics of sites that were infested with Reed Sweet Grass to those where it did not occur.

On a continental scale, climatic, topographic and hydrological factors influenced the distribution of Reed Sweet Grass. Temperate regions were identified as being the most susceptible to invasion by the weed. On a regional scale, dense, woody, riparian vegetation inhibited the establishment of Reed Sweet Grass, and the grass was found less often on biotite granite and on

fluvial geology types, potentially because these erode into nutrient poor soils. The grass was found over a range of land-use types, and did not seem to have a preference for one land-use type over another. At a local scale, Reed Sweet Grass was found to favour soils high in phosphorus and nitrogen, and low in organic carbon.

Management recommendation

Increased community awareness is essential for successful control of aquatic weeds. Early detection and eradication or confinement of new infestations are crucial, and will be possible only through targeted monitoring. It is recommended that monitoring effort and prevention of the spread of Reed Sweet Grass should be focused into temperate regions with soils high in nitrogen and phosphorus, especially if there is little shading from riparian vegetation. For long-term control of Reed Sweet Grass, the protection and/or replanting of riparian vegetation is essential.

Reed Sweet Grass (*Glyceria maxima*) blocking a waterway in Neerim, Victoria.
Photo: Sarina Loo

Prepared by: Sarina Loo
Date: June 2008
Monash University
Sarina.Loo@dse.vic.gov.au