Management information: *Egeria densa*

Biological:

Fusarium sp. (isolation FCAV#940) has potential for the biological control of the macrophytas *Egeria najas* and *E. densa* (Mendes *et al.* 2004). Barreto *et al.* (2000) report that, "R.A. Pitelli at UNESP (Universidade Estadual Paulista) of has been working on the biocontrol of *E. densa* on a project funded by CESP (Center for Environmental Science and Policy) for several years. After a series of field surveys and obtaining isolates from other institutions, collections of hundreds of fungal isolates were formed. Laboratory tests have shown that eight *Fusarium* sp. isolates appeared to have potential for the development as biocontrol agents. One isolate of *Fusarium graminearum* was the most pathogenic and the easiest to be manipulated. Plants of both species of *Egeria* developed progressive chlorosis followed by necrosis and complete tissue disintegration after being exposed to inoculum of this isolate. This possible product was provisionally called FUSGRA and may become a pioneering mycoherbicide for *E. densa*.

Results of a study (Mendes *et al.* 2004) which evaluated the inhibitory effects of several concentrations of herbicides (used to optimize weed control) on *Fusarium* sp. mycelial growth, sporulation and spore germination, indicated that the herbicides at the tested concentrations did not inhibit *Fusarium* sp. mycelial growth, macroconidia production or germination. The herbicide concentrations analyzed were: ½, 1.0 and 2.0 the concentration recommended by the manufacturer. Since these aquatic weeds are submerged, a diluted concentration in 15cm water depth was considered. The herbicides and concentrations (a.i.) evaluated were: triclopyr at 6.0; 3.0 and 1.5 mg L-1; glyphosate at 6.87; 3.44 and 1.72 mg L-1 ; 2.4-D at 8.54; 4.27 and 2.14 mg L-1 ; diquat at 2.0; 1.0 and 0.5 mg L-1 ; fluridone at 200; 100 and 50 µg L-1 ; and a control (non-amended PDA).

Triploid grass carp find *E. densa* highly palatable (when older than fingerlings) and have been successfully employed as a management tool. *E. densa* is highly preferred over most native species and theoretically, it should be possible to remove *E. densa* while favoring the growth of native species. In practice, however, grass carp have been noticed to often remove the entire submersed aquatic community and hence introduction of grass carp should be should be undertaken with great care (The Washington State Department of Ecology, 2003).

Chemical:

The Washington State Department of Ecology (2003) states that, "Westerdahl and Getsinger report excellent control of *E. densa* with diquat and complexed copper, endothall dipotassium salt, and endothall and complexed copper.Good control was obtained with fluridone. California reports good control achieved using complexed copper alone."

Physical:

The Washington State Department of Ecology (2003) states that, "Localized control (in swimming areas and around docks) can be achieved by covering the sediment with a opaque fabric which blocks light from the plants. Managers of reservoirs and some lake systems may have the ability to lower the water level as a method of managing aquatic plants. Because this plant spreads readily through fragmentation, mechanical controls such as cutting, harvesting, and rotovation (underwater rototilling) should be used only when the extent of the infestation is such that all available niches have been filled. Using mechanical controls while the plant is still invading will tend to enhance its rate of spread." In a eutrophic river basin of the Pen Mur dam in France, Dutartre *et al.* (1999) suggested that, "Harvesting and dredging of *E. densa* would have been possible." They later state, though, that, "Consequently, it was probably advantageous to keep *E. densa* as a natural filter in the upstream part of the reservoir and to restrict any intervention to a local level, and by mechanical means." Dutartre *et al.* (1999) go on to report that,

"At some later date, partial dredging of the upstream part of the pond would make it possible to remove large quantities of phosphorus contained in the sediments and in the plants themselves." The authors suggest that, "For drinking water production from the reservoir, a water treatment station could take out cyanobacteria." On the other hand they also affirm that, "harvesting *E. densa* when macrophyte beds were very dense and dredging the reservoir bottom could reduce amounts of nutrient in the dam, particularly phosphorus".