Invasive Species of the Pacific Northwest:

Brazilian Elodea, *Egeria densa*, Anacharis, Philotria densa, Giant Elodea, Brazilian waterweed

Hannah Darrin

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Figure 1: Left picture shows size and leaf arrangement. Right picture shows the boater's nightmare, a tangled mat of Brazilian Elodea.. Photos from http://www.awc-america.com/plant_id_utility/submersed_index.html and http://www.mainevolunteerlakemonitors.org/mciap/herbarium/BrazilianWaterweed.php

Classification

Order: Hydrocharitales
Family: Hydrocharitaceae
Genus: *Egeria*
Species: *densa* (Planchon)

Identification Key

Brazilian Elodea is a bright green, perennial aquatic plant. It grows and survives either planted in the sediment of freshwater lakes or drifting at the surface as a fragment. The stalk can grow up to 3m tall, but is commonly less than one meter. The height is dependant on the depth of the water; because the plant will grow to the surface then create branches that reach out horizontally to form a mat (Figure 1). The slightly serrated cauline leaves are 1-3 cm long and 5 mm across (Haynes, 1988). They grow in whorls most commonly in sets of four at a node. If the node is fertile it is possible for there to be as many as 10 leaves at one node, this is where a branch can form. The nodes are evenly spaced apart, separated by internodes. The internodes range from 2.5- 24 mm long, this length depends on nutrients and light availability (Yarrow et al., 2009). When found in large stands the bottom half of the plant is less leafy with longer internodes. These leaves can appear yellow or brown due to either decay or lack of sunlight from the upper canopy. The top of the plant has a higher leaf density with short internodes, and bright green leaves (Carillo et al., 2006). This species can easily be confused with the native *Elodea canadensis*, or *Hydrilla verticillata*, they are all within the same order.

The root system is not very strong, which allows individuals to be easily pulled from the sediment and carried by currents to inhabit a new area. The species does not have rhizomes or tubers, unlike *Hydrilla*, so there is little storage for excess starches. The roots are able to extend outward from an initial plant and form a new individual. The interconnectedness of the root system can make manual removal difficult (Yarrow et al., 2007; Washington State Department of Ecology, 2001).

Once on the surface the plant can produce white 18 -25 mm flowers with three petals each. As the flower bobs in waves the petals close around the yellow stamen or pistil to keep them dry (Yarrow et al., 2009) Male and female flowers are often found in separate regions, and in the United States only male flowers have been observed. Female flowers have only been found in the species' native range, Chile (Washington State Department of Ecology, 2001; Haynes, 1988).

Figure 2. *Egeria densa* three petal flower

Reproduction

The reproductive organs for male and female part are on separate plants, meaning this species is dioecious (Washington State Department of Ecology, 2001). Sexual reproduction can occur within the flowers. The female plant when pollinated by insects creates fruits and only the male flowers produce the pollen. The insects Order Diptera, or true flies, are the main pollinators in their native habitats. Yet seeds are the less common form of reproduction. The plants can and often do reproduce asexually by fragmentation. If a part of the rooted plants is broken off, the separate piece can readily form roots and create new shoots to develop the new area (Haynes, 1988). The large stands often seen in the US, Canada, New Zealand and Europe are genetically identical monocultures because of this sole reproduction strategy.

Environmental Conditions

Light is observed to be one of the more determining factors for *Egeria densa* growth success. Bini and Thomaz (2005) found that the levels of the light attenuation coefficient (k) were rarely more than 1.5 m^{-1}, but *E. densa* can survive in a broad range of light. They also determined that the Secchi depth showed that the plants were more likely to grow in areas with values greater than 1 m in depth, so little turbidity and little phytoplankton in the water. In less than 75% of shade *E. densa* tends have the best growth rate (Barko and Smart, 1981).

Seasonal changes do little to affect the growth rates however, in the beginning of spring, April, any reserves of energy the plant has stored are used up and the plant is most vulnerable during this time. Water temperature is important to the growth rate of stands. Ideal conditions are between 16 and 28 degrees centigrade. Above 30 degrees and damage begins to occur and below 10 degrees growth stops, at 3 degrees the plant will die. During the winter season about 25% of the species mass remains dormant and will initiate the growth in the spring, or when the temperature increases beyond 10 degrees centigrade (Washington State Department of Ecology, 2001; Yarrow et al, 2009).

E. *densa* shows preferential growth in lightly flowing water to circulate nutrients, with little turbidity. Their optimal depth range is 1.5-3m , but can be found between 1 and 9 m. Their optimal pH averages at 7.6, but can be as low as 5.5 and up to 7.9 (Mony et al., 2007). Due to the thickness of the stands that *E. densa* forms, they can slow the flow regime of a water system and alter the sediment composition by catching suspended particles and causing sedimentation. This increases the light attenuation through the water column and promotes further plant growth (Yarrow et al., 2009).

Egeria densa can out compete the North American native Hydrocharitaceae, *Egeria canadensis*, which has smaller leafs spaced farther apart. Yet another Hydrocharitaceae,

Figure 2: comparison of *Egeria densa* and the Pacific Northwest native species *Elodea canadensis*, seen on the left with smaller less bushy stems (Washington State Department of Ecology, 2001).

Hydrilla verticillata, also an invasive in North America, can out compete *E. densa* in conditions where there is little turbidity and when the soil is not primarily constituted of sand (Mony et al., 2007). *E. densa* not only shades out others by creating a thick canopy but it also absorbs nutrients efficiently. This diminishes the number of photosynthetic organisms able to survive within the surrounding environments (Mazzeo, 2003).

It it's natural habitat *E. densa* is the primary food source for the Black Swan, *Cygnus melancoryphus* and some coot species such as *Fulica armillata*. The large stands of the plant provide critical habitat for some of the fish species native to Brazilian reservoirs. It provides protection for juveniles as well some small adults and are a food source for the herbivorous species (Pelicice et al., 2005). This protection is also available to fish species in the plant's non-native range. *E. densa* is also eaten by Grass Carp *Ctenopharyngodon idella* in North American lakes, Grass Carp is not a natural predator, but a generalist feeder (Osborne and Sassic, 2003). It has no known natural pathogens or commensal relationships with other species (Wisconsin Department of Natural Resources, 2009).

Distribution

The native range of Brazilian Elodea began primarily in Brazil, as the name suggests, along the coastal region southward to Argentina and Peru in the neotropical range. (Yarrow et al., 2009) Now it has naturalized on all continents (except Antarctica), in New Zealand, Australia, Japan, South Africa, France, Germany, Denmark, Italy, Switzerland, Greece, the United Kingdom, Peru, Colombia, Cuba, Puerto Rica, Mexico, and British Columbia. In the US the species has naturalized in most of the fifty states: NH, VT, MA, CT, NY, NJ, DE, MD, PN, VA, WV, NC, SC, GA, FL, AL, MI, LA, TN, KY, OH, IL, IN, MS, AR, OK, NE, KS, TX, CO, AZ, NM, UT, HI, CA, OR and WA. Most of these releases are either from the aquarium trade or the unintentional introduction

Figure 3: Global native and non-native distribution (Yarrow et al., 2009)

from transport on recreational boats (Meacham, 2001). In Washington state the species has been found in all the western counties (except Whatcom): Skagit, San Juan, Snohomish, King, Kitsap, Pierce, Thurston, Mason, Clallam, Jefferson, Grays Harbor, Pacific, Lewis, Wahkiakum, Cowlitz, and Clark. In King county of the 56 lakes present 5 are known to have Brazilian Elodea: Doloff, Fenwick, Sammamish, Union and Washington. There is similar spread in Oregon and its western counties as well. *E. densa* is deemed a Class B noxious weed in the state of Washington. This means that it is found in few dispersed lakes where eradication efforts are made, and the rest of the lakes without the species are taking preventative measures against possible invasion (Washington State Department

In the lakes and waterways infested by *E. densa* the near-shore areas with depths up to 7m are most affected by the invasion. An 8.5-km2 lake can be completely covered within two years if growing conditions are ideal. This species can grow up to 0.4 cm per day (Carrillo, 2006; Washington State Department of Ecology, 2001).

Brazilian Elodea was first seen in the United States on Long Island in 1893. Its first appearance in Europe was in Germany in 1910. In Long Lake, Kitsap County, Washington the plant was first reported in the early 1970s (Washington State Department of Ecology, 2001). Since it's first introduction in the United States it has continued to invade populated areas with some level of human disturbance or

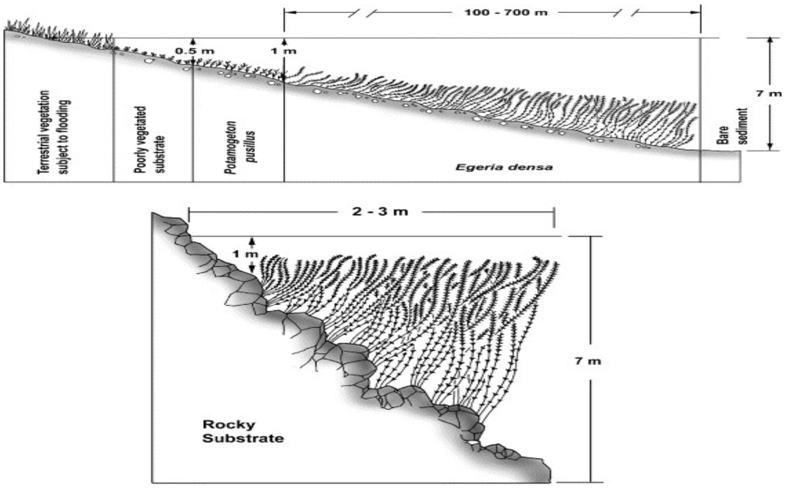

Figure 5: Near shore locations in lakes most frequently inhabited by *E. densa*, note the plant does grow to the surface (Carrillo, 2006).

influence. When the topic of invasive species began to grow in the 1970s the number of papers including *E. densa* has grow from about 3 papers per year to about 8 papers a year since 2000 (Australian New Crops, 2006).

Invasion Process

The primary pathway for *Egeria densa* is the Aquarium trade (Hanson, 2006). On www.petco.com Brazilian Elodea can be bought for $4.99 for a single 10-inch plant. Although the species is not found nor traded in stores in the state of Washington, it can be shipped online. Some biological supply stores will replace the native *Elodea canadensis* for shipments of *E. densa* (Connecticut Valley Biological supply company, 2009). *E. densa* is a popular plant due to it's robust and hardy lifestyle, and bright green verdure (Yarrow et al, 2009). After purchase if it is no longer wanted, it is more common for owners to release the plants into nearby water bodies rather than kill them (Kay and Hoyle, 2001). The escape of plant fragments from the flooding of private ponds is also a possible vector. Recreational boaters who move their boats from lake to lake are also vectors for the propagation of Elodea due to fragments caught in propellers, on trailers or in fishing gear (Washington State Department of Ecology, 2001).

Once in a lake *E. densa* has the ability to spread rapidly. It's ability to spread via fragmentation means that any disturbance that severs a branch from the stem could create a new plant. A study done in Lake Rotorua, New Zealand, showed that in less than six years *E. densa* was able to arrive and spread to 96% of the random test sites, more than any other submerged plant species by 20%. It was noted that 10% of the initial site of entry was covered by *E. densa* and within two years that site was 100% covered in the near shore area (1.5-3m) and diffused outward to 15% coverage at 4.5 m depth. Five years after entry *E. densa* was the most abundant macrophyte present in the 81 km^2 sized lake (Wells and Clayton, 1991). This is a species that can double its population size in one growing season with good temperatures or grow at about 0.4 cm d^{-1} (Tanner et al., 1990).

There are few growing factors that effect the establishment and spread of *E. densa*. Some factors that may prevent the establishment of a species is temperatures outside its optimal range, high turbidity or water flow, seasonal strong storms that would cause the suspension of sediments, and conditions that are optimal for *Hydrilla verticillata* a potential resource competitor (Mony, 2007). Due to the poor root system of the plant *E. densa* is likely to naturally spread along downstream pathways, and is directed by the average wind direction and fetch (Mazzeo, 2003).

Impacts

Egeria densa has shown the ability to drastically alter a native environment; it is even referred to an ecosystem engineer (Yarrow, 2007). For aquarium owners it is a favorite because of its ability to oxygenate the water and survive in most freshwater aquarium conditions (petco.com, 2009). Once released into a water system its ability to propagate rapidly competes for the habitats of many native species as well as other non-native species. Studies show that *E. densa* has been able to out compete *Lagarosiphon major* and *Elodea canadensis,* species within the same order as *E. densa.* The other species are displaced by the blanketing effects of the large *E. densa* canopies and either move to less desirable habitat or die (Wells and Clayton, 1991). In certain conditions *Egeria densa* can out compete other invasive species such as *Hydrilla verticillata* because of its ability to absorb nutrients from the water column (Mony et al., 2007).

This plant has the ability to form large monoculture beds with little biodiversity. It does so by forming removing species below its canopy, and by growth strategy of fragmentation and growth from the root structure. *E. densa* is able to slow flow regimes of small waterways, by doing so it traps suspended particles and nutrients and prevents them from continuing downstream. Studies show higher levels of nitrogen in sediment near to *Egeria densa* beds to support this nutrient sink (Mazzeo, 2007). The plants are able to absorb much of the necessary nutrients from the water thus changing the water composition as well as the sediment composition. In the water column, more dissolved oxygen is reported near to the bottom of the stand and less at the surface, thus changing the stratification. Sediment composition changes due to increased uptake, generally showing lower phosphorous levels (Mazzeo, 2007). With the massive amounts of biomass at some sites, 550 $g*m^{-1}$, if there were a large die-off the decomposition at that site would cause some temporary anoxia if there were little water flow (Washington State Department of Ecology, 2001; Yarrow et al., 2006).

The changes in the surrounding environment made by *E. densa* have effects upon species aside from other macrophytes. The large beds provide protection and a feeding ground for zooplankton species as well as fish, thus promoting their growth. However, by taking much of the light and nutrients out of the water column other phytoplankton species do not have much success (Mazzeo, 2007). Larger fish species migrating through areas with increased amounts of *E. densa* could have a more difficult time passing through the dense habitats (Johnson et al., 2006).

The introduction of this species can also promote the invasion of other non-native biota. A study has shown that submersed small-leaved aquatic plant species sold in the aquarium trade have an average of 3 live non-native animals that get shipped with them (Keller and Lodge, 2007). *Egeria densa* is a detrimental species. The drifting fragments easily clog waterways and electric dams, in New Zealand a power plant was shut down due to *E. densa* clogging the intake valves. The dense mats in shallow waters prevent boat traffic, and it is even reported that a man drowned due to entanglement in the waterweeds (Johnson, 2006).

There are some potential benefits of the Elodea species. It adds oxygen to the water column and provides protection for some juvenile native fish species. It could be harvested and used as a feed to broiler chicks. It was found that when dried it could healthily constitute 5% of the diets of human bred waterfowl (Dillon et al., 1988). Out of 8 submerged aquatic weed species it has the second highest percentage of digestible material and percentage of protein (Boyd and McGinty, 1981).

Costs far outweigh known benefits nonetheless. The cost for control alone in Washington is not small. In the years between 1994 and 2000, $530,300 have been spend on control methods in various lakes in Washington, this is over 15% of the total funds for all invasive aquatic plants (Washington state Department of Ecology, 2001). Large-scale treatments for management have cost up to $3 million (Johnson et al., 2006).

Control Methods

E. densa has relatively few native predators so the idea of biocontrol is fairly limited. It was researched that triploid grass carp has the ability to completely browse until the point of complete eradication for all species in a lake environment. Due to their lack of feeding preference carp stocking would be detrimental for the native plants in the lake as well (Mitchell, 1980). It was however, observed in one study that native species were the first to return to the lake after stocking, and *Egeria* did not return at all the following growing season (Tanner et al., 1990). One study by Bailey (1978) showed that the grass carp have little effect on the native fish populations despite removing most of the macrophyte habitat.

Pathogens as a form of biocontrol have also not been found, however a fungus *Fusarium* sp. has been observed to damage the plant. The effects of this fungus on native species are not yet known, so large-scale projects are not yet underway (Washington State Department of Ecology, 2001).

Herbicides have been popular for eradication purposes. For *Egeria* the plant is weakest at the beginning of spring, therefore this would be the best time to apply any chemicals (Johnson et al., 2006). Diquat a fairly non-toxic chemical that diffuses quickly into a harmless substance is one that has been used for the eradication of many plant species. In a study in a New Zealand lake diquat was used to reduce the macrophyte populations. At the end of the six-year study it was observed that *Egeria* was not declining but increasing in the bed size. It is suggested that this was not because of the promotion form the herbicide but instead the displacement of other competing species (Tanner et al., 1990).

In another study oxytetracycline was tested upon two macrophyte plant species one being *Egeria*. Oxytetracycline has a short half-life of a few hours and is therefore less of a threat to the environment. However, simply adding the chemical was not enough to decrease growth, additional nutrients were also needed to dramatically decrease the health of the plants. The study hypothesizes that this is because of the decrease in light rather than the direct application of the chemical itself therefore high levels of the pollutant would be needed to eradicate the non-native (Hanson et al., 2006).

Fluoridone, manufactured as Sonar, is another common herbicide, extensively used in the past and is projected to be used for the future control of *E. densa*. A study in Washington State on Lake Limerick treated the water with Sonar and after one year the biomass of *E. densa* decreased by 95% (550 to 4.8 $g*m^{-2}$), and 4 years later the biomass was only 11% of the original biomass (61.7 $g*m^{-2}$) (Washington State Department of Ecology, 2001). The cost of the eradication is large. The estimated cost of the treatment of one acre with Sonar is approximately $1,000, the total area covered by *E. densa* in California is nearly 5,000 acres. A project of that magnitude would cost $5 million. (Johnson et al., 2006). No studies showed the effects of these applications on other northwest native species.

A study was conducted on the effects of agricultural herbicide run-off as a potential agent for decreasing beds of *Egeria*. It was found that high levels (1000 ppb) of atrazine prevented 92% of *Elodea* growth, and even lower levels of Metribuzin (100 ppb), prevented 90% of *Egeria* growth. These could be potential herbicides used in lakes however the half lives of these two chemicals are on the order of weeks, and could act more as a pollutants than problem solvers (Fourney and Davis, 1981).

The spread of pesticides and herbicides is a controversial issue and in a case of *San Francisco Baykeeper, Inc., Bill Jennings* v. *Carlton D. Moore* (2001), the plaintiff claimed the usage of various herbicides against *E. densa* in a freshwater system was a violation of the Clean Water Act. The motion was denied, however future cases could present themselves with the development and usage of new chemical herbicides (*San Francisco Baykeeper, Inc., Bill Jennings* v. *Carlton D. Moore*, 2001). *E. densa* is particularly resistant against most herbicides and because of their hardy and robust characteristics large quantities could be necessary for removal (Meacham, 2001).

Some communities have invented mechanisms for pulling out the weeds with machines. This could however, cause much fragmentation and therefore create more individuals rather than ameliorate the situation. Manual pulling of the weeds has also be done, however the costs and time needed for complete eradication make this an unlikely solution for established populations. Drawing down the lakes is another possibility for removal because *E. densa* is *not* as hardy when left out of the water for more than 5 hours (Yarrow, 2007). It was observed that multiple drawdowns in colder temperatures were most successful for larger decreases in *E. densa* populations (Goldsby and Sanders, 1977). Using fabrics or tarps as benthic barriers is another successful way to eliminate the non-native macrophyte (Eichler et al., 1995).

Management Objectives and Current Research

Management objectives for both California and Washington states include increases in surveying for early detection, and with this education for the public. Identification posters are available at various online sites so the general public can identify and alert proper authorities of possible invasions. Both states are aware of the improbability of complete eradication and most plans are for the prevention of the establishment, limitation of the spread, and the decreasing the amounts of damage (Johnson, 2006; Meacham, 2001). Currently a good survey of King County lakes in Washington State is looking for new invasions as well as lake conditions that may control the establishment and spread of this invasive species. California intends to use 40% of its budget for *Egeria* removal to go toward "monitoring, compliance and surveillance costs" (Johnson et al., 2006).

Some other solutions include Diquat and Sonar as two herbicides most likely to be used in the management strategies of California and Washington. More restrictions from online sources should be implemented to prevent further spread across states boundaries. Native alternatives should also be readily offered and available for shipment so as to prevent the further spread of *Egeria densa*, Brazilian waterweed (Kay and Hoyle, 2001; Connecticut Valley Biological Supply, 2009).

Literature Cited

Bailey, W. M. 1978. A comparison of fish populations before and after extensive grass carp stocking. *Transaction of the American Fisheries Society*. 107: 181-206.

Barko, J. W., R. M. Smart. 1981. Comparative influences of light and temperature on the growth and metabolism of selected submersed freshwater macrophytes. *Ecological Society of America*. 51:219-236.

Bini, L. M., S. M. Thomaz. 2005. Prediction of *Egeria najas* and *Egeria densa* occurance in a large subtropical reservoir (Itaipu Reservoir, Brazil-Paraguay). *Aquatic Botany*. 83:227-238.

Boyd, C. E., P. S. McGinty. 1981. Percentage digestible dry matter and crude protein in dried aquatic weeds. *Economic Botany*. 35:296-299.

Carrillo, Y., A. Guarin, G. Guillot. 2006. Biomass distribution, growth and decay of *Egeria densa* in a tropical high-mountain reservoir (NEUSA, Columbia). *Aquatic Botany*. 85:7-15.

Dillon, C. R., D. V. Maurice, J. E. Jones. 1988. Chemical composition of *Egeria densa*. *Journal of Aquatic and Plant Management*. 26: 44-45.

Eichler, L. W., R. T. Bombard, J. W. Sutherland, C. W. Boylen. 1995. Recolonization of the littoral zone by macrophytes following the removal of benthic barrier material. *Journal of Aquatic Plant management.* 33:51-54.

Fourney, D. R. and D. E. Davis. 1981. Effects of low concentrations of herbicides on submersed aquatic plants. *Weed Science*. 29: 677-685.

Goldsby, M. V., and D. R. Sanders. 1977. Effects of consecutive water fluctuations on the submersed vegetation of Black Lake, Louisiana. *Journal of Aquatic Plant Management*. 15: 23-8.

Hanson, M. L., C. W. Knapp, D. W. Graham. 2006. Field assessment of oxytetracycline exposure to the freshwater macrophytes *Egeria densa* Planch. and *Ceratophyllum demersum* L. *Environmental Pollution*. 141: 434-442.

Haynes, R. R. 1988. Reproductive Biology of Selected Aquatic Plants. *Annals of the Missouri Botanical Garden*. 75: 805-810.

Johnson, D., M. Carlock, T. Artz. 2006. *Egeria densa* control program second addendum to 2001 environmental impact report with five-year program review and future operations plan. The state of California Department of boating and waterways.

Kay, S.H. and S. T. Hoyle. 2001. Mail Order, the Internet, and Invasive Aquatic Weeds. *Journal of Aquatic Plant Management.* 39: 88-91.

Keller, R. P. and D. M. Lodge. 2007. Species invasions from commerce in live aquatic organisms: problems and solutions. *BioScience*. 57:428-436.

Mazzeo, N., L. Rodriguez-Gallego, C. Kruk, M. Meerhoff, J. Gorga, G. Lacerot, F. Quintans, M. Loureiro, D. Larrea, F. Garcia-Rodriguez. 2003. Effects of *Egeria densa* Planch. beds on a shallow lake without piscivorous fish. *Hydrobiologia*. 506-509: 591-602.

Meacham, P. 2001. Washington State Aquatic nuisance species management plan. The Washington Aquatic nuisance species coordinating committee.

Mitchell, C. P. 1980. Control of water weeds by grass carp in two small lakes. *New Zealand Journal of Marine and Freshwater Research*. 14:381-390.

Mony, C., T. J. Koschnick, W. T. Haller, S. Miller. 2007. Competition between two invasive Hydrocharitaceae (*Hydrilla verticillata* (L.f.) (royle) and *Egeria densa* (Planch)) as influenced by sediment fertility and season. *Aquatic botany*. 86: 236-242.

Osborne, J. A. and N. M. Sassic. 1981. The size of grass carp as a factor in the control of hydrilla. *Aquatic Botany*. 11:129-136.

Pelicice, F. M., A. A. Agostinho, S. M. Tomaz. 2005. Fish assemblages associated with *egeria* in a tropical reservoir: investigating the effects of plant biomass and diel period. *Acta Oecologica*. 27: 9-16.

San Francisco Baykeeper, Inc., Bill Jennings v. *Carlton D. Moore*. January 19, 2001. 180 F. Supp. 2d 1116.

Tanner, C., J. Clayton, B. Coffey. 1990. Submerged-vegetaion changes in lake Rotoria (Hamilton, New Zealand) related to herbicide treatment and invasion by *Egeria densa*. *New Zealand Journal of Marine and Freshwater Research*. 24:45-57.

- R. D. S. Wells, C. P. Mitchell. 1990. Re-establishment of native macrophytes in lake Parkinson following weed control by grass carp. *New Zealand journal of Marine and Freshwater Research*. 24: 181-186.

Washington State Department of Ecology. 2001. An aquatic plant identification manual for Washington's Freshwater Plants. Department of Printing Publication.

Wells, R. D. S., and J. S. Clayton. 1991. Submerged vegetation and spread of *Egeria densa* Planchon in Lake Rotorua, central North Island, New Zealand. *New Zealand Journal of Marine and Freshwater Research*. 25: 63-70.

Yarrow, M., V. H. Marin, M. Finlayson, A. Tironi, L. E. Delgado, F. Fischer. 2009. The ecology of *Egeria densa* Planchon (Liliopsida: Alismatales): A wetland ecosystem engineer? *Revista Chilena de Historia Natural*. 82:299-313.

Other Key Sources

Department of Ecology State of Washington: http://www.ecy.wa.gov/programs/wq/plants/weeds/aqua002.html
Wisconsin Department of Natural Resources: http://dnr.wi.gov/invasives/classification/pdfs/LR_Egeria_densa.pdf
US Department of Agriculture, Natural Resources Conservation Service: http://plants.usda.gov/java/nameSearch
Petco, where the pets go: http://www.petco.com/product/102912/Egeria-densa.aspx
Connecticut Valley biological Supply Company http://www.connecticutvalleybiological.com/elodea-densa-brazilian-elodea-100-p-11654.html
Australian New Crops: http://www.newcrops.uq.edu.au/listing/species_pages_E/Egeria_densa.htm

Regional Contacts

Washington Department of Ecology: Aquatic Weeds
Kathy Hamel
PO Box 47600
Olympia, WA 98504
(360) 407-6562

Jenifer Parsons
PO Box 47600
Olympia, WA 98504
(509) 457-7136

Portland State University: Center for Lakes and Resevoirs
Toni Pennington
toni@pdx.edu
PO Box 751-ESR
Portland, OR 97207
Ph: (503) 725-9076