GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: ***Egeria densa***

Egeria densa 简体中文 正體中文

System: Terrestrial

Kingdom	Phylum	Class	Order	Family
Plantae	Magnoliophyta	Liliopsida	Hydrocharitales	Hydrocharitaceae

Common name Brazilian-waterweed (English), Brazilian waterweed (English), dense waterweed (English), South American waterweed (English), leafy elodea (English), egeria (English), common waterweed (English), Brazilian elodea (English)

Synonym
Anacharis densa , (Planch.) Victorin
Elodea densa , (Planch.) Caspary
Philotria densa , (Planch.) Small & St. John

Similar species *Hydrilla verticillata, Elodea canadensis*

Summary Egeria densa is a submersed, freshwater perennial herb that forms dense monospecific stands that restrict water movement, trap sediment, and cause fluctuations in water quality. It has also affected the status of certain threatened species. It has been introduced worldwide through the aquarium trade, and even in its native range can become a nuisance species causing local economic impacts. Chemical control is the most effective option for management of E. densa. Mechanical control is not recommended because fragments of the plant left behind can readily re-colonize and move downstream. The introduction of grass carp offers biological control of this species, but care must be taken because carp can introduce their own negative effects on the environment.

view this species on IUCN Red List

Species Description
The leaves and stems of *E. densa* generally are a bright green, short internodes frequently give the plant a very leafy appearance. Leaves which are are minutely serrated and linear, are 1-3cm long, up to 5mm broad, and found in whorls of four to eight. The lowest leaves are opposite or in whorls of 3, while the middle and upper leaves are in whorls of 4 to 8. Stems are erect, cylindrical, simple or branched, and grow until they reach the surface of the water where they form dense mats. The 18-25mm white flowers have three petals, are dioecious and float on or rise above the water's surface on thread-like hypanthiums produced from apical double nodes. White or pale, slender roots are unbranched. Adventitious roots are freely produced from double nodes on the stem (The Washington State Department of Ecology, 2003).

Notes
The Washington State Department of Ecology (2003) observes that, *Elodea canadensis* an attractive aquarium plant, could be used as a good substitute for *E. densa* since it is native to Washington's lakes, ponds, and rivers. They however point out due to *Elodea canadensis* availability in the aquarium trade, it has been introduced to several countries where it is not native, and is now considered a noxious weed in those regions (parts of Europe, Australia, Africa, Asia, and New Zealand).

Lifecycle Stages
In North America the Washington State Department of Ecology (2003) states that, \"*E. densa* initiate growth when water temperatures reach 10 degrees centigrade. Getsinger describes the life cycle of *Egeria densa* in Lake Marion, South Carolina as follows: Two major growth flushes occur in spring and fall. Each of these flushes are followed by periods of senescence, with a loss of biomass through sloughing and decay of tips and branches. Flowers are produced in late spring and again in the fall. The intensity of flowering varies from year to year. During the summer, profuse branching forms a canopy. The branches form dense, tangled mats on the water's surface.\" In Japan the following Life cycle stages were noted in a scientific study by Haramoto and Ikusima (1998): \"The seasonal activity of photosynthesis and respiration was measured in March, August and December. The optimum temperature of net photosynthesis of the summer-type plants reached a high 35°C similar to that of the C4 plant. The compensation for light intensity at 35°C was 340 lux. Each photosynthesis-temperature curve suggested that Egeria had the ability to adapt to the seasonal changes in temperature in the natural habitat. The maximum starch concentrations reached 25.4% in the leaf and 22.6% in the stem in December. The shortage in the balance of organic matter for over-wintering was found to be maintained by stored starch in the leaf and the stem.\"

Uses
E. densa has been introduced worldwide through the aquarium trade. *E. densa* until 1996 was commonly sold in Washington pet stores under the name 'anacharis' as an aquarium species. *E. densa* was firts offered for sale in the United States in 1915, where it was recommended as a good \"oxygenator\" plant (The Washington State Department of Ecology, 2003).
Lara *et al.* (2002) states that, \"Among the higher aquatic plants, *E. densa* has been the preferred material for a number of different studies in plant physiology. One of the main reasons is that its leaves contain a single longitudinal vascular bundle and the blade consists of two layers of cells only, allowing studies of the whole undamaged organ in a natural environment. In this plant, heterogeneity is reduced to a minimum; all leaf cells are in direct contact with the external medium and at the same developmental stage and thus in similar physiological condition. These properties, together with the leaf polarity displayed by *E. densa*, represent an advantage for different kinds of research and make this species one of the model organisms of the plant kingdom for experiments, such as electro-physiology.\"

Habitat Description
Pierini and Thomaz (2004) state that, \"*E. densa* is primarily invasive in temperate environments.\" The Washington State Department of Ecology (2003) states that, \"*E. densa* is a submersed, freshwater perennial herb, generally rooted on the bottom in depths of up to 20 feet or drifting. It is found in both still and flowing waters, in lakes, ponds, pools, ditches, and quiet streams.\"

Reproduction
The Washington State Department of Ecology (2003) states that, \"The absence of sexual reproduction in introduced populations of *E. densa* emphasizes the importance of the vegetative growth phase of the plant. Specialized nodal regions described as double nodes occur at intervals of 6 to 12 nodes along a shoot. A double node consists of 2 single nodes separated by a greatly shortened internode. Double nodes produce lateral buds, branches, and adventitious roots. Only shoot fragments of *E. densa*, which contain double node regions, can develop into new plants. The plant fragments readily and each fragment containing a double node has the potential to develop into a new plant. Plant root crowns also develop from double nodes along an old shoot. When a shoot sinks to the bottom during fall and winter senescence, a new root crown may develop at one or several double nodes along the new shoot. *Egeria densa* lacks specialized storage organs such as rhizomes or tubers and stores carbohydrates in stem tissues.\"

Nutrition
In Japan the following nutritional and environmental requirements were noted in a scientific study by Haramoto and Ikusima (1998): \"The seasonal activity of photosynthesis and respiration was measured in March, August and December. The optimum temperature of net photosynthesis of the summer-type plants reached a high 35°C similar to that of the C4 plant. The compensation for light intensity at 35°C was 340 lux. Each photosynthesis-temperature curve suggested that *E. densa* had the ability to adapt to the seasonal changes in temperature in the natural habitat. The maximum starch concentrations reached 25.4% in the leaf and 22.6% in the stem in December. The shortage in the balance of organic matter for over-wintering was found to be maintained by stored starch in the leaf and the stem.\"

General Impacts
Barreto *et al.* (2000) state that, \"In southeast Brazil *E. densa*, together with *E. najas*, causes great annual losses to the hydroelectric companies. Interruptions of electricity generation and damage to grids and equipment are common in reservoirs belonging to CESP in São Paulo.\" The Washington State Department of Ecology (2003) states that, \"*E. densa* forms dense mono-specific stands that restrict water movement, trap sediment, and cause fluctuations in water quality. Dense beds interfere with recreational uses of a water body by interfering with navigation, fishing, swimming, and water skiing.\" Champion and Tanner (2000) state that in New Zealand, \"*E. densa* exhibited the ability to rapidly recolonise de-vegetated areas following floods in the Whakapipi Stream and may be considered to be 'adversity selected' (Whittaker & Goodman, 1979, in Champion and Tanner 2000).\"

Management Info
A Risk assessment of *Egeria densa* for Australia was prepared by Pacific Island Ecosystems at Risk (PIER) using the Australian risk assessment system (Pheloung, 1995). The result is a score of 22 and a recommendation of: reject the plant for import (Australia) or species likely to be a pest (Pacific).
For details on chemical, physical, biological control options, please see *management information*.

Principal source: Washington State Department of Ecology, 2003 Technical Information about *Egeria densa* (Brazilian elodea)

Compiler: National Biological Information Infrastructure (NBII) & IUCN/SSC Invasive Species Specialist Group (ISSG) with support from the Terrestrial and Freshwater Biodiversity Information System (TFBIS) Programme (Copyright statement)

Review: Robin W. Scribailo Ph.D. Aquatic Botanist Professor of Biological Sciences Director of the Biological Sciences Field Station\ Director of the Aquatic Plant Herbarium Biological Sciences, Purdue University North Central. USA

Pubblication date: 2006-04-11

ALIEN RANGE

[3] AUSTRALIA
[1] DENMARK
[2] FRANCE
[1] GERMANY
[1] MEDITERRANEAN AREA
[1] PUERTO RICO
[1] SWAZILAND
[1] CHILE
[1] EUROPE
[1] FRENCH POLYNESIA
[2] JAPAN
[14] NEW ZEALAND
[1] SOUTH AFRICA
[36] UNITED STATES

BIBLIOGRAPHY
44 references found for **Egeria densa**

Managment information

Barreto, R., R. Charudattan, A. Pomella, & R. Hanada. 2000. Biological control of neotropical aquatic weeds with fungi. Crop Protection 19:697-703.
Summary: Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.
Champion, P. Clayton, J. and Rowe, D. 2002. Alien Invaders Lake Managers Handbook. Ministry for the Environment.
Summary: Available from: http://www.mfe.govt.nz/publications/water/lm-alien-invaders-jun02.pdf [Accessed 3 February 2005]
Champion, P.D.; Clayton, J.S. 2000. Border control for potential aquatic weeds. Stage 1. Weed risk model. Science for Conservation 141. .
Summary: This report is the first stage in a three-stage development of a Border Control Programme for aquatic plants that have the potential to become ecological weeds in New Zealand.
Available from: http://www.doc.govt.nz/upload/documents/science-and-technical/sfc141.pdf [Accessed 13 June 2007]
Champion, P.D.; Clayton, J.S. 2001. Border control for potential aquatic weeds. Stage 2. Weed risk assessment. Science for Conservation 185. 30 p.
Summary: This report is the second stage in the development of a Border Control Programme for aquatic plants that have the potential to become ecological weeds in New Zealand. Importers and traders in aquatic plants were surveyed to identify the plant species known or likely to be present in New Zealand. The Aquatic Plant Weed Risk Assessment Model was used to help assess the level of risk posed by these species. The report presents evidence of the various entry pathways and considers the impact that new invasive aquatic weed species may have on vulnerable native aquatic species and communities.
Available from: http://www.doc.govt.nz/upload/documents/science-and-technical/SFC185.pdf [Accessed 13 June 2007]
Clunie, P., Stuart, I., Jones, M., Crowther, D., Schreiber, S., McKay, S., O Connor, J., McLaren, D., Weiss, J., Gunasekera, L., Roberts, J., 2002. A Risk Assessment of the Impacts of Pest Species in the Riverine Environment in the Murray-Darling Basin
Collins, J.N, May M, Grosso C. 2003. Brazilian waterweed *Egeria densa*. Practical Guidebook to the Control of Invasive Aquatic and Wetland Plants of the San Francisco Bay - Delta Region.
Summary: Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.
Available from: http://legacy.sfei.org/nis/waterweed.html [Accessed 22 May 2010].
The Guidebook is available from: http://legacy.sfei.org/nis/index.html
Dutartre, A., J. Haury, and A. Jigorel. 1999. Succession of *Egeria densa* in a drinking water reservoir in Morbihan (France). Hydrobiologia 415: 243-247.
Summary: A scientific study conducted in France on a drinking water reservoir with detailed management information regarding species.
European and Mediterranean Plant Protection Organization (EPPO), 2005. Reporting Service 2005, No. 9.
Summary: The EPPO Reporting Service is a monthly information report on events of phytosanitary concern. It focuses on new geographical records, new host plants, new pests (including invasive alien plants), pests to be added to the EPPO Alert List, detection and identification methods etc. The EPPO Reporting Service is published in English and French.
Available from: http://archives.eppo.org/EPPOReporting/2005/Rse-0509.pdf [Accessed 28 November 2005]
Hawkesbury-Napean River Management Forum., 2002. Independent Expert Panel On Environmental Flows For The Hawkesbury Nepean, Shoalhaven And Woronora Catchments. Status of the Health of the Hawkesbury Nepean River
Kay, S. H and Hoyle, S. T, 2001. Mail Order, the Internet, and Invasive Aquatic Weeds. J. Aquat. Plant Manage. 39: 88-91
Lara, M. V., P. Casati, & C. Andrea. 2002. CO2-concentrating mechanisms in *Egeria densa*, a submersed aquatic plant. Physiologia Plantarum 115:487-495.
Summary: Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.
Mendes, D.; Pitelli, R.A.; Coelho, L., 2004. Effect of herbicide concentrations on biological aspects of *Fusarium* sp. (isolation FCAV#940). Planta daninha vol.22 no.1 Vi osa Jan./Mar. 2004
Mueller, Karl W., 1997. Silver lake survey: The forage fish community after removal of aquatic vegetation by grass carp.
Mueller K. W. and Downen, M. R. 2000. 1997 Black Lake Survey: A coastal warmwater fish community before the introduction of grass carp. Warmwater Enhancement Program Washington Department of Fish and Wildlife
National Pest Plant Accord, 2001. Biosecurity New Zealand.
Summary: The National Pest Plant Accord is a cooperative agreement between regional councils and government departments with biosecurity responsibilities. Under the accord, regional councils will undertake surveillance to prevent the commercial sale and/or distribution of an agreed list of pest plants.
Available from: http://www.biosecurity.govt.nz/pests-diseases/plants/accord.htm [Accessed 11 August 2005]
Pierini, S. A., & S. M. Thomaz. 2004. Effects of inorganic carbon source on photosynthetic rates of *Egeria najas* Planchon and *Egeria densa* Planchon (Hydrocharitaceae). Aquatic Botany 78:135-146.
Summary: Information on description, habitat, history, and growth of species.
Royal New Zealand Institute of Horticulture (RNZIH), 2005. Egeria *Egeria densa*
Summary: Available from: http://www.rnzih.org.nz/pages/nppa_035.pdf [Accessed 1 October 2005]
Swaziland s Alien Plants Database., Undated. *Egeria densa*
Summary: A database of Swaziland s alien plant species.
Tanner, C. C., Clayton, J. S. Coffey, B. T., 1990. Submerged-vegetation changes in Lake Rotoroa (Hamilton, New Zealand) related to herbicide treatment and invasion by *Egeria densa*. New Zealand Journal of Marine and Freshwater Research, 1990, Vol. 24: 45-57
Taranaki Regional Council. 2003. Oxygen weed (*Lagarosiphon major*, *Egeria densa*). The Pest Plant Management Section.
Tasman District Council (TDC) 2001. Tasman-Nelson Regional Pest Management Strategy

Washington State Department of Ecology. 2003. Technical Information about *Egeria densa* (Brazilian Elodea). Water Quality Program: Non-Native Freshwater Plants.
Summary: Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.
Available from: http://www.ecy.wa.gov/programs/wq/plants/weeds/aqua002.html [Accessed 07 January 2004]

General information
Bini, L. M. S. M. Thomaz, K. J. Murphy, and A. F. M. Camargo. 1999. Aquatic macrophyte distribution in relation to water and sediment conditions in the Itaipu Reservoir, Brazil. Hydrobiologia 415: 147-154.
Summary: An article containing distribution information on species in Brazil.
Champion, P. D., and C. C. Tanner. 2000. Seasonality of macrophytes and interaction with flow in a New Zealand lowland stream. Hydrobiologia 441: 1-12.
Summary: Scientific study containing information regarding general impacts of species.
Environment Waikato Technical Report 2001/12. The Freshwater Macroinvertebrate Communities of the Waikato, Waihou and Waipa Rivers.
Florence J., Chevillotte H., Ollier C.& Meyer J.-Y. 2007. *Egeria densa* Base de donn&#65533;es botaniques Nadeaud de l Herbier de la Polyn&#65533;sie fran&#65533;aise (PAP).
Summary: La base de donn&#65533;es Nadeaud a pour but de g&#65533;rer l Herbier de la Polyn&#65533;sie fran&#65533;aise, de fournir des informations sur la taxonomie des plantes vasculaires, de produire des listes de plantes sur des crit&#65533;res de distribution ou de conservation associ&#65533;es &#65533; des images, des informations sur les usages et les noms vernaculaires et d&#65533;aider la prise de d&#65533;cision, principalement en mati&#65533;re de conservation.
Available from: http://www.herbier-tahiti.pf/Selection_Taxonomie.php?id_tax=5052 [Accessed 26 March 2008]
Freshwater Biodata Information System New Zealand (FBIS), 2005
Summary: The Freshwater Biodata Information System (FBIS) contains fish, algae, aquatic plant and invertebrate data and metadata gathered from New Zealand s freshwater streams, rivers and lakes. FBIS provides different ways to search for biodata: choose a predefined search from a list of common searches; use the map view to draw a box on a map and search for biodata; or create your own search for maximum search flexibility. FBIS is offered as a nationally available resource for the New Zealand public, institutions and companies who need access to a well-maintained long-term data repository.
Available from: https://secure.niwa.co.nz/fbis/validate.do?search=common [Accessed 5 August 2005]
Gantes, H. P., A. S. Caro. 2001. Environmental heterogeneity and spatial distribution of macrophytes in plain streams. Aquatic Botany 70: 225-236.
Summary: An article containing distribution information on species.
Getsinger, K. D., and C. R. Dillon. 1984. Quiescence, growth and senescence of *Egeria densa* in Lake Marion. Aquatic Botany 20 (3-4): 329-338.
Summary: An article containing distribution information on species.
Graca, M. A. S., A. Rodrigues-Capitulo, C. Ocon, and N. Gomez. 2002. *In situ* tests for water quality assessment: a case study in Pampean rivers. Water Research 36: 4033 -4040.
Summary: An article containing distribution information on species.
Grimaldo, L. F., Miller, R. E., Peregrin, C. M., and Hymanson, Z. P., 2004. Spatial and Temporal Distribution of Native and Alien Ichthyoplankton in Three Habitat Types of the Sacramento&#65533;San Joaquin Delta. American Fisheries Society Symposium 39:81&#65533;96,
Growns, I., and P. C. Gehrke. 2003. A comparison of fish assemblages associated with different riparian vegetation types in the Hawkesbury-Nepean River system. Fisheries Management and Ecology 10: 209 -220.
Summary: An article containing distribution information on species.
Hamabata, E., and Y. Kobayashi. 2002. Present status of submerged macrophyte growth in Lake Biwa: Recent recovery following a summer decline in the water level. Lakes & Reservoirs: Research and Management 7: 331-338.
Summary: An article containing distribution information on species.
Haramotoa, T., and I. Ikusima. 1988. Life cycle of *Egeria densa* Planch., an aquatic plant naturalized in Japan. Aquatic Botany 30(4): 389-403.
Summary: An article containing distribution, lifecycle, and nutritional information on species.
ITIS (Integrated Taxonomic Information System), 2002. Online Database *Egeria densa*.
Summary: An online database that provides taxonomic information, common names, synonyms and geographical jurisdiction of a species. In addition links are provided to retrieve biological records and collection information from the Global Biodiversity Information Facility (GBIF) Data Portal and bioscience articles from BioOne journals.
Available from: http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=38972 [Accessed March 2005]
Lake, M. D., B. J. Hicks, R. D. S. Wells, and T. M. Dugdale. 2002. Consumption of submerged aquatic macrophytes by rudd (*Scardinius erythrophthalmus* L.) in New Zealand. Hydrobiologia 470: 13-22.
Summary: An article containing habitat and distribution information on species.
Macdonald, I.A.W., J.K. Reaser, C. Bright, L.E. Neville, G.W. Howard, S.J. Murphy & G. Preston (eds.). 2003. Invasive alien species in southern Africa: national reports & directory of resources. Global Invasive Species Programme, Cape Town, South Africa.
Mazzeo, N., L. Rodriguez-Gallego, C. Kruk, M. Meerhoff, J. Gorga, G. Lacerot, F. Quintans, M. Loureiro, D. Larrea, and F. Garcia-Rodriguez. 2003. Effects of *Egeria densa* Planch. beds on a shallow lake without piscivorous fish. Hydrobiologia 506-509: 591-602.
Summary: An article containing location specific impact and distribution information on species.
Roberts, D. E., Church, A. G and Cummins, S. P., 1999. Invasion of Egeria into the Hawkesbury-Nepean River, Australia. J. Aquat. Plant Manage. 37: 31-34
Roy, B; Popay, I; Champion, P; James, T & Rahman, A., 2004. An Illustrated Guide to Common Weeds of New Zealand 2nd Edition. *Egeria densa* Egeria. New Zealand Plant Protection Society
Summary: Available from: http://www.rnzih.org.nz/pages/egeriadensa.htm [Accessed May 10 2005]

Tanner, C. C., Clayton, J. S and Harper, L. M., 1986. Observations on aquatic macrophytes in 26 northern New Zealand lakes New Zealand Journal of Botany, Vol. 24: 539-551
Summary: Available from: http://www.rsnz.org/publish/nzjb/1986/35.pdf [Accessed December 14 2004]
USDA-GRIN (Germplasm Resources Information Network). 2003. *Egeria densa*. National Genetic Resources Program [Online Database] National Germplasm Resources Laboratory, Beltsville, Maryland.
Summary: Information on common names, synonyms, and the distributional range of species.
Available from: http://www.ars-grin.gov/cgi-bin/npgs/html/tax_search.pl?Egeria+densa+ [Accessed 07 January 2004]
USDA-NRCS (Natural Resource Conservation Service). 2002. *Egeria densa*. The PLANTS Database Version 3.5 [Online Database] National Plant Data Center, Baton Rouge, LA.
Summary: Available from: http://plants.usda.gov/java/nameSearch?keywordquery=Egeria+densa&mode=sciname [Accessed 07 January 2006]
Wells, R. D. S., M. D. Winton, and J. S. Clayton. 1997. Successive macrophyte invasions within the submerged flora of Lake Tarawera, Central North Island, New Zealand. New Zealand Journal of Marine and Freshwater Research 31(4): 449-459.
Summary: An article containing distribution information on species.