

*Lagarosiphon major*  [简体中文](#) [正體中文](#)

**System:** Freshwater

Kingdom	Phylum	Class	Order	Family
Plantae	Magnoliophyta	Liliopsida	Hydrocharitales	Hydrocharitaceae

<b>Common name</b>	African elodea (English), oxygen weed (English), submerged onocotyledon (English), Lagarosiphon (English), curly waterweed (English), South African oxygen weed (English)
<b>Synonym</b>	<i>Elodea crispa</i>
<b>Similar species</b>	<i>Hydrilla verticillata</i> , <i>Egeria densa</i> , <i>Elodea canadensis</i>
<b>Summary</b>	Lagarosiphon major is a rhizomatous, perennial, submerged aquatic plant. It can inhabit freshwater lakes, dams and slow-moving streams. Lagarosiphon major can form dense floating mats in deep-water reservoirs and other water bodies and it can block the intakes of hydro-electric systems. Dense growth of Lagarosiphon major can block light penetration into waterways, eliminating growth of native water plants and affecting associated populations of aquatic invertebrates. Lagarosiphon major can also restrict the passage of boats and limit recreational activities like swimming and angling. Storms can tear weed mats loose and deposit large masses of rotting vegetation on beaches, spoiling their amenity value.



[view this species on IUCN Red List](#)

## Species Description

*L. major* is a rhizomatous, perennial, submerged aquatic plant. The National Heritage Trust (2003) state that, "L. major reaches its maximum growth in clear water up to a depth of 6.5m, but may only grow to 1 metre in murky water. It has numerous threadlike roots, which are 'adventitious' (branching from the stem) and, along with rhizomes (horizontal stems in the sediment), anchor it to the bottom. Stems, which can reach the surface, are brittle and sparsely branched, 3-5mm in diameter and curved towards the base (J-shaped). The leaves are 5-20mm long and 2-3mm wide, and occur in alternate spirals along the stem. They generally have tapered tips curving downwards towards the stem, except in low alkalinity water where they are straight. The three-petalled female flowers are very small, clear-white on the surface, and grow on very thin white to almost translucent filament-like stalks. Neither the male flower, which floats freely to the surface, nor fruit or seeds have been recorded in Australia or outside of its native range."

## Notes

The National Heritage Trust (2003) states that, "A native of southern Africa, *L. major* is found in high mountain streams and ponds. It has spread throughout the world as an aquarium plant and is also known as an 'oxygen plant'. Note, however, that dense infestations can actually consume more oxygen than they produce, and reduce water quality and available oxygen."

## Uses

Davies *et al.* (2003) demonstrated that, "*L. major* and other aquatic species grown in small outdoor tanks can be used successfully to assess the effects of crop-protection products on non-target aquatic flora." McGregor and Gourlay (2002) state that, "*L. major* has some beneficial attributes. In some freshwaters, this species and some other exotic species are the only aquatic plants that can tolerate particular conditions, and removal of these plants can further degrade the habitats. It also provides habitat for aquatic fauna, and its leaf surfaces support periphyton. Where stands of the plant grow, sedimentation is increased and while this may be detrimental in some areas, elsewhere it is a benefit."

Chapman and Coffey (1971) reviewed the possible utilization by harvesting for stock food in New Zealand lakes. Though harvesting was considered practicable the use of the plants as fodder was thought to be unsuitable because of the content of arsenic accumulated by the plants from the thermal waters that enter the lakes. Arsenic in amounts of 35–75 ppm dry weight are common, and extreme values up to 2 000 ppm have been recorded. It is possible in other countries that the use of plants as fodder could be practical.

## Habitat Description

The National Heritage Trust (2003) states that, "*L. major* grows best in clear, still or slow-moving fresh water with silty or sandy bottoms. It prefers the cooler waters of the temperate zone, with optimum temperatures of 20–23°C and a maximum temperature of around 25°C. It can live in high and low nutrient levels and grows best under conditions of high light intensity. It also tolerates relatively high pH (ie alkaline conditions). Growth of *L. major* is greatest in sheltered areas protected from wind, waves and currents." Csurhes and Edwards (1998) state that, "*L. major* inhabits freshwater lakes, dams and slow-moving streams."

## Reproduction

Strikland *et al.* (2000) reports that, "*L. major* is only known to produce seed in its native range. It can only be spread by vegetative fragments drifting downstream, or by transfer from place to place by becoming fouled on various watercraft and trailers."

Since the species is dioecious (sexes on different plants) both must be present for sexual reproduction. Only female plants are known outside of the native range of this species. All reproduction in introduced regions is therefore asexual primarily by fragmentation or local growth by rhizomatous spread. (Symoens and Triest 1983).

## Nutrition

Rattray (1994) found that early shoot growth by *L. major* is more rapid under oligotrophic and eutrophic conditions. (A **eutrophic** lake or river is characterised by high productivity and biomass. It is rich in dissolved nutrients, often shallow and seasonally deficient in oxygen. This fertilization can be a natural process or one brought on by human activity, the latter often having a negative impact on the ecosystem. A water body is termed **mesotrophic** if its production is considered moderate. The term **oligotrophic** describes a lake or river with low productivity, deficient in plant nutrients, rich in oxygen throughout its depth and with good water clarity).

## General Impacts

In New Zealand, the plant has blocked intakes of hydro-electric systems and has formed dense floating mats in deep-water reservoirs and other water bodies. *L. major* has the potential to become a troublesome weed of lakes and slow-moving streams throughout temperate and sub-tropical regions of Australia. Under favourable conditions, dense growth of the plant can block light penetration into waterways, eliminating growth of native water plants and affecting associated populations of aquatic invertebrates and vertebrates. Once widespread, control would be extremely difficult (as is the case for most submerged aquatics) (Csurhes and Edwards, 1998). James *et al.* (1999) state that, "*L. major* creates progressively stressful conditions of high pH and low CO<sub>2</sub> content. *L. major* may be successful in out-competing *Elodea* spp. as a result of its ability to photosynthesize and consequently grow, particularly under very stressful conditions of high pH and low free CO<sub>2</sub>, perhaps through more efficient bicarbonate utilization than the other species. There is some indication that the competitive success of *L. major* may be a consequence of greater toleration to pH stress. McGregor and Gourlay (2002) state that, "*L. major* replaces native vegetation; dense infestations restrict the passage of boats and limit recreational activities like swimming and angling; storms can tear loose the weed and deposit large masses of rotting vegetation on beaches, spoiling their amenity value. Rattray (1994) states that, "*L. major* has successfully out-competed native species wherever it has colonized." James *et al.* (1999) report that, "*L. major* has been reported to be actively displacing *E. nuttallii* and appears to be competitively superior to *Elodea* spp. in at least some habitats."

## Management Info

McGregor and Gourlay (2002) report that, "The main, current control methods for this species include the application of herbicide (usually Diquat), mechanical and suction dredging and weed matting, but all these have substantial disadvantages; particularly their cost, their failure to give long-term control and, for some, the question of adverse environmental effects, whether actual or perceived."

**Chemical:** Hofstra and Clayton (2001) report that, "The aquatic herbicide diquat is the only product registered in New Zealand for controlling the submerged weeds, including lagarosiphon (*L. major*)." The authors claim that, "However, diquat can be ineffective under some environmental conditions and it does not control certain submerged weeds." The authors studied three other herbicides (endothall, triclopyr, and dichlobenil), and found that, "Endothall killed coontail, lagarosiphon and hydrilla and some species of *Myriophyllum* and *Potamogeton* but not egeria or species of *Chara* or *Nitella*. Only transient growth effects were observed in target plants treated with triclopyr and dichlobenil."

Davies *et al.* (2003) investigated the use of Sulfosulfuron, which is a selective, post-emergence, sulfonylurea herbicide intended for use in winter wheat. The authors found though that, "Treatment with sulfosulfuron at any concentration stimulated biomass accumulation." This product should not be used as a treatment method.

**Biological:** Lake *et al.* (2002) state that, "Selective feeding by rudd may also be significant in lakes that have been invaded by exotic oxygen weeds in New Zealand (e.g. *Egeria densa*, *Elodea canadensis*, and *Lagarosiphon major*) by facilitating their monospecific habit through suppression or exclusion of more desirable species."

McGregor and Gourlay (2002) report that, "The nematode *Aphelenchoides fragariae* has been recorded attacking the apical tips of *L. major* causing shoot dwarfing. *Nymphula nitens* feeds on many aquatic weeds and might be a potential biological control agent, but it also feeds upon native aquatics. Biological control offers the prospect of re-establishing native macrophyte communities in infected waters, however biological control and the removal of *L. major* may only result in the replacements of one exotic species for another." Chapman and Coffey (1971) review the introduction and spread of *L. major* in New Zealand. The possibility of the use of grass carp was investigated for control so a few fish were imported from Malaysia. Trials showed that carp would eat the problem weeds.

**Principal source:** McGregor and Gourlay, 2002 Assessing the prospects for biological control of lagarosiphon (*Lagarosiphon major* (Hydrocharitaceae))

National Heritage Trust, 2003 Lagarosiphon (*Lagarosiphon major*)

**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

**Publication date:** 2006-04-11

## ALIEN RANGE

[5] AUSTRALIA

[1] FRANCE

[2] ITALY

[21] NEW ZEALAND

[1] SWITZERLAND

[1] EUROPE

[1] IRELAND

[1] MEDITERRANEAN AREA

[1] REUNION

[3] UNITED KINGDOM

## BIBLIOGRAPHY

39 references found for *Lagarosiphon major*

### Management information

[Alien Plants in Ireland, 2007. \*Lagarosiphon major\*](#)

**Summary:** The database of alien plants in Ireland contains detailed information on 715 alien plant taxa currently occurring in (semi-) natural habitats in Ireland (both the Republic and Northern-Ireland). This database was developed in 2006 at the School of Natural Sciences, Trinity College Dublin, as part of the BioChange project, funded by the Environmental Protection Agency (EPA), Ireland.

Available from: <http://www.biochange.ie/alienplants/index.php> [Accessed April 26 2007]

This page available from: [http://www.biochange.ie/alienplants/result\\_species.php?species=918&volg=i&lang=latin&p=i](http://www.biochange.ie/alienplants/result_species.php?species=918&volg=i&lang=latin&p=i) [Accessed 26 April 2007]

Bowmer, K. H., S.W. L. Jacobs, and G. R. Sainty. 1995. Identification, Biology and Management of *Elodea canadensis*, Hydrocharitaceae. *Aquat. Plant Manage.* 33: 13-19.

[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]

Chapman, V.J. and B.J. Coffey., 1971. Experiments with grass carp in controlling exotic Macrophytes in New Zealand. *Hydrobiologia*, Bucharest, 12:313-23

Csurhes, S., and R. Edwards., 1998. National Weeds Program, Potential Environmental Weeds in Australia, Candidate Species for Preventative Control. The Director of the National Parks and Wildlife, Australia.

Davies, J., J. L. Honegger, F. G. Tencalla, G. Meregalli, P. Brian., J. R. Newman, and H. F. Pitchford. 2003. Herbicide risk assessment for non-target aquatic plants: Sulfosulfuron: A case study. *Pest Management Science.* 2003; 59(2): 231-237.

[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/EPPORreporting/2005/Rse-0509.pdf> [Accessed 28 November 2005]

Hofstra, D. E., and J. S. Clayton. 2001. Evaluation of selected herbicides for the control of exotic submerged weeds in New Zealand: I. The use of endothall, triclopyr and dichlobenil. *Journal of Aquatic Plant Management.* 2001; 39: 20-24.

Howard-Williams, C., A. M. Schwarz, and V. Reid. 1996. Patterns of aquatic weed regrowth following mechanical harvesting in New Zealand hydro-lakes. *Hydrobiologia.* 1996; 340(1-3): 229-234.

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, 2002.

McGregor, P. G., and H. Gourlay. 2002. Assessing the prospects for biological control of lagarosiphon (*Lagarosiphon major* (Hydrocharitaceae)). DOC SCIENCE INTERNAL SERIES 57, New Zealand Department of Conservation.

National Heritage Trust. 2003. *Lagarosiphon - Lagarosiphon major*. Weed Management Guide.

[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]

[Royal New Zealand Institute of Horticulture \(RNZIH\), 2005. Lagarosiphon Lagarosiphon major](#)

**Summary:** Available from: [http://www.rnzih.org.nz/pages/nppa\\_053.pdf](http://www.rnzih.org.nz/pages/nppa_053.pdf) [Accessed 1 October 2005]

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

## General information

Airo, S., and R. Sconfietti. 1995. *In situ* experiments on productivity of aquatic macrophytes in a pond. *Rivista-di-Irobiologia*. 1995; 34(1-3): 147-156.

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.

Coffey, B. T., and J. S. Clayton. 1987. Submerged Macrophytes of Lake Pupuke Takapuna New Zealand. *New-Zealand Journal of Marine and Freshwater Research*. 1987; 21(2): 193-198.

[CONABIO. 2008. Sistema de informaci3n sobre especies invasoras en M3xico. Especies invasoras - Plantas. Comisi3n Nacional para el Conocimiento y Uso de la Biodiversidad. Fecha de acceso.](#)

**Summary:** English:

The species list sheet for the Mexican information system on invasive species currently provides information related to Scientific names, family, group and common names, as well as habitat, status of invasion in Mexico, pathways of introduction and links to other specialised websites. Some of the higher risk species already have a direct link to the alert page. It is important to notice that these lists are constantly being updated, please refer to the main page (<http://www.conabio.gob.mx/invasoras/index.php/Portada>), under the section Novedades for information on updates.

Invasive species - Plants is available from: [http://www.conabio.gob.mx/invasoras/index.php/Especies\\_invasoras\\_-\\_Plantas](http://www.conabio.gob.mx/invasoras/index.php/Especies_invasoras_-_Plantas) [Accessed 30 July 2008]

Spanish:

La lista de especies del Sistema de informaci3n sobre especies invasoras de m3xico cuenta actualmente con informaci3n acerca de nombre cient3fico, familia, grupo y nombre com3n, as3 como h3bitat, estado de la invasi3n en M3xico, rutas de introducci3n y ligas a otros sitios especializados. Algunas de las especies de mayor riesgo ya tienen una liga directa a la p3gina de alertas. Es importante resaltar que estas listas se encuentran en constante proceso de actualizaci3n, por favor consulte la portada (<http://www.conabio.gob.mx/invasoras/index.php/Portada>), en la secci3n novedades, para conocer los cambios.

Especies invasoras - Plantas is available from: [http://www.conabio.gob.mx/invasoras/index.php/Especies\\_invasoras\\_-\\_Plantas](http://www.conabio.gob.mx/invasoras/index.php/Especies_invasoras_-_Plantas) [Accessed 30 July 2008]

[Conservatoire Botanique National De Mascarin \(BOULLET V. coord.\) 2007. - Lagarosiphon major Index de la flore vasculaire de la R3union \(Trach3ophytes\) : statuts, menaces et protections. - Version 2007.1 \(mise 3 jour 12 juin 2007\).](#)

**Summary:** Base de donn3es sur la flore de la R3union. De nombreuses informations tr3s utiles.

Available from: <http://flore.cbnm.org/index2.php?page=taxon&num=9523147e5a6707baf674941812ee5c94> [Accessed 1 April 2008]

Cook, C.D.K. 2004. Aquatic and Wetland Plants of Southern Africa. Backhuys Publishers, The Netherlands.

Egloff, F. 1975. New and Noteworthy Species of Swiss Flora. *Bulletin de la Societe Botanique Suisse*. 1975; 84 (4): 333-342.

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]

[ITIS \(Integrated Taxonomic Information System\). 2005. Online Database Lagarosiphon major.](#)

**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=565981](http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=565981) [Accessed March 2005]

James, C. S., J. W. Eaton, and K. Hardwick. 1999. Competition between three submerged macrophytes, *Elodea canadensis* Michx, *Elodea nuttallii* (Planch.) St John and *Lagarosiphon major* (Ridl.) Moss. *Hydrobiologia* 415: 35-40, 1999.

Ratray, M. R. 1995. The relationship between P, Fe and Mn uptakes by submersed rooted angiosperms. *Hydrobiologia*. 1995; 308(2): 117-120.

Ratray, M. R., C. Howard-Williams, and J. M. Brown. 1994. Rates of early growth of propagules of *Lagarosiphon major* and *Myriophyllum triphyllum* in lakes of differing trophic status. *New Zealand Journal of Marine and Freshwater Research*. 1994; 28 (3): 235-241.

Riis, T., B. J. Biggs, and M. Flanagan. 2003. Seasonal changes in macrophyte biomass in South Island lowland streams, New Zealand. *New Zealand Journal of Marine and Freshwater Research*. 2003; 37(2): 381-388.

Roy, B; Popay, I; Champion, P; James, T & Rahman, A., 2004. An Illustrated Guide to Common Weeds of New Zealand 2nd Edition. *Lagarosiphon major* oxygen weed. New Zealand Plant Protection Society

**Summary:** Available from: <http://www.rnzih.org.nz/pages/lagarosiphonmajor.htm> [Accessed May 10 2005]

State of Queensland. 2004. *Lagarosiphon major* Description. The State of Queensland (Department of Natural Resources and Mines) 2004.

Strickland, R., J. Harding, and L. Shearer. 2000. The Biology of Lake Dunstan. Cawthron Report No. 563; Contact Energy Limited.

Symoens, L. and S. Triest 1983 Monograph of the African genus *Lagarosiphon*. Bull. Jard. Bot. Nat. Belg. 53:441-488.

University of Florida. 2001. *Lagarosiphon major* (Ridley) Moss. Non-Native Invasive Aquatic Plants in the United States. Center for Aquatic and Invasive Plants, University of Florida and Sea Grant.

**Summary:** Available from: <http://aquat1.ifas.ufl.edu/seagrant/lagmaj2.html> [Accessed 17 January 2005]

USDA-GRIN (Germplasm Resources Information Network). 2005. *Lagarosiphon major*. National Genetic Resources Program [Online Database] National Germplasm Resources Laboratory, Beltsville, Maryland.

**Summary:** Available from: [http://www.ars-grin.gov/cgi-bin/npgs/html/tax\\_search.pl?Lagarosiphon+major](http://www.ars-grin.gov/cgi-bin/npgs/html/tax_search.pl?Lagarosiphon+major) [Accessed 17 January 2005]

USDA-NRCS (Natural Resource Conservation Service). 2005. *Lagarosiphon major*. The PLANTS Database Version 3.5 [Online Database] National Plant Data Center, Baton Rouge, LA.

**Summary:** Available from: <http://plants.usda.gov/java/nameSearch?mode=Scientific+Name&keywordquery=Lagarosiphon+major> [Accessed 17 January 2006]

Wells, R. D., M. D. De-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. 1997; 31(4): 449-459.