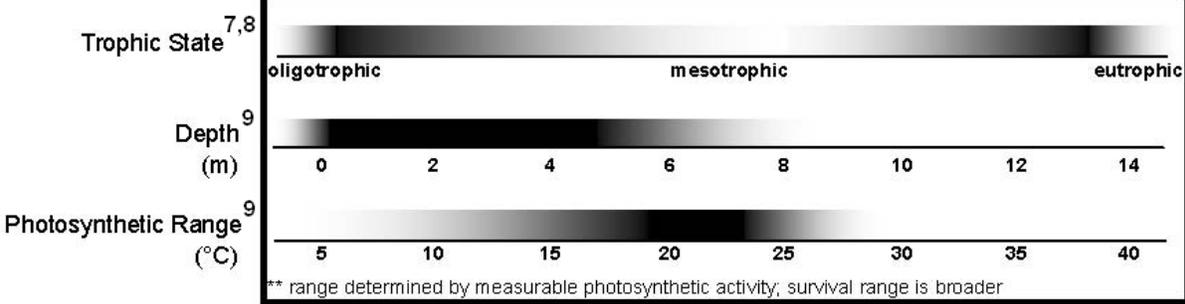


Aquatic Plant Oxygen-Weed; African Elodea; African Waterweed

**I. Current Status and Distribution** *Lagarosiphon major*

a. Range	Global/Continental	Wisconsin
<b>Native Range</b> High mountain streams and ponds of Southern Africa <sup>1,9</sup>	Cultivated, not yet reported in the U.S. <sup>2</sup>	Not recorded in Wisconsin
<b>Abundance/Range</b> Widespread: Locally Abundant:  Sparse:	New Zealand and parts of Europe <sup>3</sup> Lakes, dams, slow-moving streams, wetlands <sup>4</sup> Australia <sup>3</sup> ; fast-flowing water <sup>5</sup>	Not applicable Not applicable Not applicable
<b>Range Expansion</b> Date Introduced:  Rate of Spread:	United Kingdom, 1944 <sup>5</sup> ; New Zealand, 1950s <sup>6</sup> May totally fill the volume of a large shallow lake <sup>6</sup>	Not applicable  Not applicable
<b>Density</b> Risk of Monoculture: Facilitated By:	High Undocumented	Undocumented Undocumented
<b>b. Habitat</b>	Lakes, ponds, reservoirs, slow-moving streams, wetlands <sup>4</sup> , canals <sup>5</sup>	
<b>Tolerance</b>	Chart of tolerances: Increasingly dark color indicates increasingly optimal range	



**Preferences** Nutrient rich waters<sup>1</sup>; clear, still, or slow-moving water with silty or sandy bottoms<sup>9</sup>; high light intensity<sup>9</sup>; sheltered areas protected from wind, waves, and currents<sup>9</sup>

**c. Regulation**

Noxious/Regulated <sup>2</sup> :	Federal Noxious Weed List; AL, CA, FL, MA, NC, OR, SC, TX, VT, WA
Minnesota Regulations:	<i>Prohibited</i> ; One may not possess, import, purchase, propagate, or transport
Michigan Regulations:	<i>Prohibited</i> ; One may not knowingly possess or introduce
Washington Regulations:	<i>Priority Species of Concern</i> ; State Wetland and Aquatic or Noxious Weed Quarantine List

**II. Establishment Potential and Life History Traits**

<b>a. Life History</b>	Herbaceous, rhizomatous, dioecious, submerged perennial <sup>4</sup>
<b>Fecundity</b>	High

<b>Reproduction</b>	Asexual; Sexual (only female plants have been found outside its native range) <sup>10</sup>
Importance of Seeds:	No seeds (or fruit) produced outside of native range <sup>9</sup>
Vegetative:	Only reproduces vegetatively outside its native range
<b>Hybridization</b>	Undocumented
<b>Overwintering</b>	
Winter Tolerance:	Winter hardy <sup>6</sup> ; overwinters in United Kingdom <sup>5</sup>
Phenology:	Breaks dormancy in spring and grows from rhizomes and shoots <sup>9</sup>
<b>b. Establishment</b>	
<b>Climate</b>	
Weather:	Prefers the cooler waters of the temperate zone <sup>9</sup>
Wisconsin-Adapted:	Yes
Climate Change:	Simulated warming increased growth rate and community abundance of <i>L. major</i> <sup>11</sup>
<b>Taxonomic Similarity</b>	
Wisconsin Natives:	Medium; family Hydrocharitaceae <sup>2</sup>
Other US Exotics:	Medium; family Hydrocharitaceae <sup>2</sup>
<b>Competition</b>	
Natural Predators:	Undoubtedly exist, but undocumented <sup>3</sup>
Natural Pathogens:	Undocumented <sup>3</sup>
Competitive Strategy:	Dense mats up to 3 feet thick shade out native aquatic vegetation <sup>7</sup> ; can grow under both high and low nutrient levels <sup>9</sup> ; low light compensation point <sup>6</sup> ; can create stressful conditions for other organisms (high pH, low CO <sub>2</sub> , high dissolved oxygen) <sup>12</sup>
Known Interactions:	May be successful in out-competing <i>Elodea</i> spp. <sup>12</sup> , <i>Myriophyllum</i> spp., and <i>Potamogeton</i> spp. <sup>7</sup>
<b>Reproduction</b>	
Rate of Spread:	High
Adaptive Strategies:	Undocumented
<b>Timeframe</b>	Within 2 years of first record, <i>L. major</i> largely replaced <i>E. canadensis</i> in a harbor <sup>6</sup> ; within 13 years, <i>L. major</i> occupied almost all of a lake's 161 km-long littoral zone <sup>6</sup>
<b>c. Dispersal</b>	
Intentional:	Spread primarily through the aquarium trade <sup>9</sup> (where it is often called <i>Elodea crista</i> ) <sup>13</sup>
Unintentional:	Wind and water currents, boating, fishing, harvesters, seaplanes, and possibly birds <sup>3</sup>
Propagule Pressure:	Medium; fragments easily introduced, but source population not near Wisconsin



Figure 1: Courtesy of Rohan Wells; National Institute of Water and Atmospheric Research, Bugwood.org<sup>14</sup>  
 Figure 2: Courtesy of Vic Ramey, University of Florida<sup>15</sup>

### III. Damage Potential

#### a. Ecosystem Impacts

<b>Composition</b>	Dense mats inhibit light penetration to native submerged aquatic vegetation and associated aquatic invertebrates <sup>4</sup> ; major changes in lake productivity, species composition, and food web dynamics <sup>16</sup> ; fish community changes; decreased feeding rates in <i>L. major</i> beds <sup>16</sup>
<b>Structure</b>	Forms dense floating mats <sup>4</sup> ; <i>L. major</i> beds had 3x higher biomass, 2x higher surface area and were 3x taller than native beds <sup>16</sup>
<b>Function</b>	Decreased light penetration
<b>Allelopathic Effects</b>	Yes; can create stressful conditions for other organisms (high pH and low CO <sub>2</sub> ) <sup>12</sup>
<b>Keystone Species</b>	Undocumented
<b>Ecosystem Engineer</b>	Yes; dense canopy decreases light penetration <sup>4</sup>
<b>Sustainability</b>	Undocumented
<b>Biodiversity</b>	Decreases <sup>9</sup>
<b>Biotic Effects</b>	Impacts native species at multiple trophic levels
<b>Abiotic Effects</b>	Increased sedimentation <sup>3</sup> ; increased pH; lower free CO <sub>2</sub> ; increased dissolved oxygen <sup>12</sup>
<b>Benefits</b>	Habitat for some aquatic fauna <sup>3</sup> and invertebrates <sup>16</sup> ; food source for some herbivorous birds <sup>1</sup> ; supports periphyton <sup>3</sup> and epiphyton <sup>16</sup>

#### b. Socio-Economic Effects

<b>Benefits</b>	Potential use a fodder <sup>4</sup>
<b>Caveats</b>	Risk of release and population expansion outweighs benefits of use; high levels on arsenic found in some plant tissue
<b>Impacts of Restriction</b>	Increase in monitoring, education, and research costs
<b>Negatives</b>	Blocks hydroelectric system intakes <sup>4</sup> ; dense populations can inhibit recreational activities (boating, swimming, angling, etc.) <sup>3,4</sup> ; large mats of rotting vegetation on beaches negatively affects aesthetics and amenity value <sup>3,4</sup>
<b>Expectations</b>	More negative impacts can be expected in shallow, slow moving systems

<b>Cost of Impacts</b>	Decreased recreational and aesthetic value; decline in ecological integrity; increased research expenses
<b>“Eradication” Cost</b>	Quite expensive
<b>IV. Control and Prevention</b>	
<b>a. Detection</b>	
Crypsis:	High; confused with <i>Elodea canadensis</i> , <i>E. nuttallii</i> <sup>6</sup> , <i>Egeria densa</i> , and <i>Hydrilla verticillata</i> <sup>4</sup>
Benefits of Early Response:	High; small infestations can be more easily eradicated than larger ones <sup>4</sup>
<b>b. Control</b>	
<b>Management Goal 1</b>	Nuisance relief
Tool:	Chemical herbicide (usually diquat) <sup>3</sup>
Caveat:	Non-target species may be negatively impacted; not effective in turbid waters <sup>6</sup>
Cost:	Expensive
Efficacy, Time Frame:	Only minimal effects; spring treatment preferred <sup>5</sup>
Tool:	Mechanical harvesting
Caveat:	Harvesting causes fragmentation which increases distribution and density; non-target impacts on native species
Cost:	Expensive
Efficacy, Time Frame:	If cut mid-summer, the <i>L. major</i> population will return by fall <sup>6</sup>
Tool:	Triploid grass carp
Caveat:	Non-selective grazers; stocking is illegal due to occasional fertility
Cost:	Undocumented
Efficacy, Time Frame:	Fish have a low to moderate preference for <i>L. major</i> <sup>5,6</sup>
Tool:	<i>Aphlenchoides fragariae</i> (nematode) <sup>3</sup>
Caveat:	Non-target plant species are negatively impacted
Cost:	Undocumented
Efficacy, Time Frame:	Nematode causes shoot dwarfing in similar species ( <i>L. cordofanus</i> )

<sup>1</sup> US Forest Service, Pacific Island Ecosystems at Risk (PIER). 2010. *Lagarosiphon major* (Ridl.) Moss, Hydrocharitaceae. Retrieved December 23, 2010 from:

[http://www.hear.org/pier/species/lagarosiphon\\_major.htm](http://www.hear.org/pier/species/lagarosiphon_major.htm)

<sup>2</sup> United States Department of Agriculture, Natural Resource Conservation Service. 2010. The PLANTS Database. National Plant Data Center, Baton Rouge, LA, USA. Retrieved December 23, 2010 from: <http://plants.usda.gov/java/profile?symbol=LAMA15>

<sup>3</sup> 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.

<sup>4</sup> Global Invasive Species Database. 2006. *Lagarosiphon major*. Retrieved December 23, 2010 from: <http://www.issg.org/database/species/ecology.asp?fr=1&si=403&sts=>

<sup>5</sup> National Environmental Research Council Centre for Ecology and Hydrology. 2004. Information Sheet: *Lagarosiphon major*, Curly water thyme, Curly waterweed. Retrieved

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