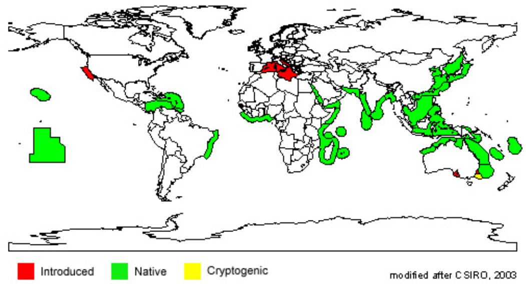
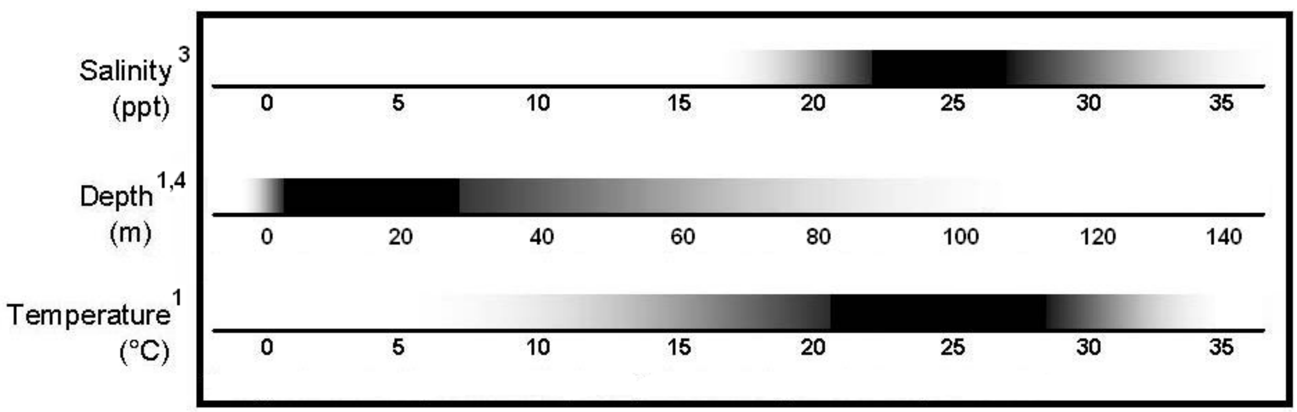
Macroalga	Killer Algae; Aquarium-Mediterranean Strain
I. Current Status and Distribution	***Caulerpa taxifolia***

a. Range	**Global/Continental**	**Wisconsin**
Native Range Caribbean, Australia, Brazil, Ceylon, Indonesia, Philippines, Tanzania, Vietnam[1]	 *Figure 1: Global Distribution Map*[2]	Not recorded in Wisconsin
Abundance/Range		
Widespread:	Tropical marine coastal environments	Not applicable
Locally Abundant:	Unknown	Not applicable
Sparse:	Mortality with salinity less than 20ppt[3]	Not applicable
Range Expansion		
Date Introduced:	First observed in the Mediterranean Sea in 1984, and in California waters in 2000[1]	Not applicable
Rate of Spread:	High	Not applicable
Density		
Risk of Monoculture:	High, though not a problem in its native range[1]	Not applicable
Facilitated By:	Unknown	Not applicable

b. Habitat	Marine coastal environments
Tolerance	Chart of tolerances: Increasingly dark color indicates increasingly optimal range



Preferences	High salinity[3]
c. Regulation	
Noxious/Regulated[5]:	Federal Noxious Weed List; AL, MA, NC, OR, SC, VT
Minnesota Regulations:	*Prohibited;* One may not possess, import, purchase, propagate, or transport
Michigan Regulations:	*Not regulated*
Washington Regulations:	*Not regulated*

II. Establishment Potential and Life History Traits	
a. Life History	Marine green siphonalean alga[1]
Fecundity	Undocumented
Reproduction	Asexual[1]
Importance of Spores:	Not applicable
Vegetative:	Only known to reproduce by fragmentation[1]
Hybridization	Undocumented
Overwintering	
Winter Tolerance:	Species has gained a tolerance of colder temperatures[6]
Phenology:	Growth is highest in summer and fall[1]; toxicity is highest in July-November and lowest in March-April[1]
b. Establishment	
Climate	
Weather:	Undocumented
Wisconsin-Adapted:	No
Climate Change:	Undocumented
Taxonomic Similarity	
Wisconsin Natives:	Low
Other US Exotics:	Low
Competition	
Natural Predators:	Produces substances that are toxic to marine herbivores[1]
Natural Pathogens:	Undocumented
Competitive Strategy:	High growth rate; low light compensation point; total substrate occupation[1]; able to survive severe nutrient limitation[7]
Known Interactions:	Outcompetes native seaweeds and seagrasses[1]
Reproduction	
Rate of Spread:	High
Adaptive Strategies:	Stoloniferous; produces 5,100 to 14,000 fronds/m^2[(8)]; fragments as small as 10mm can produce a new plant[6]
Timeframe	In the Mediterranean, from 1m^2 to 2000 hectares within 10 years[1]
c. Dispersal	
Intentional:	Used for decoration in aquaria[1]
Unintentional:	Cleaning anchors and fishing nets; wind and water currents[1]
Propagule Pressure:	Low; fragments easily accidentally introduced, but source populations not near Wisconsin

Figure 2: Courtesy of Rachel Woodfield, Merkel & Associates, Inc., Bugwood.org [9]
Figure 3: Courtesy of Lynn Hodgson, University of Hawaii[10]

III. Damage Potential	
a. Ecosystem Impacts	
Composition	Outcompetes native seaweeds and seagrasses[1]; reduces the numbers of individuals of Mollusca, Amphipoda and Polychaeta[11]
Structure	Can fill the water column with hundreds of tons biomass per hectare[1]; increased sedimentation[1]
Function	Undocumented
Allelopathic Effects	Protected from herbivores due to toxicity[1]
Keystone Species	Undocumented
Ecosystem Engineer	Causing a "major ecological event" in the Mediterranean[4]
Sustainability	Undocumented
Biodiversity	Decreases[11]
Biotic Effects	Outcompetes and displaces native species
Abiotic Effects	Undocumented
Benefits	Undocumented
b. Socio-Economic Effects	
Benefits Caveats	Used for decoration in aquaria Risk of release and population expansion outweighs benefits of use
Impacts of Restriction	Increase in monitoring, education, and research costs
Negatives	Poor fishing and reduced tourism in many coastal communities[6]
Expectations	Undocumented
Cost of Impacts	Undocumented
"Eradication" Cost	Undocumented
IV. Control and Prevention	
a. Detection	
Crypsis: Benefits of Early Response:	Undocumented New colonies usually appear between 2-10m deep[12]
b. Control	Undocumented
Management Goal 1 Tool: Caveat: Cost: Efficacy, Time Frame: Tool: Caveat: Cost: Efficacy, Time Frame:	Nuisance relief Tarps and liquid chlorine[1] Chlorine kills non-target plants and animals Undocumented Treatments described as effective; will follow up with additional treatment and monitoring Hand pulling Labor intensive Undocumented Only feasible for small, isolated populations

[1] Ramey, V. 2001. University of Florida and Sea Grant Center for Aquatic and Invasive Plants. Non-Native Invasive Aquatic Plants in the United States. Retrieved December 21, 2010 from: http://plants.ifas.ufl.edu/node/89

[2] National Introduced Marine Pest Information System (NIMPIS). 2002. *Caulerpa taxifolia*. Retrieved December 21, 2010 from: http://crimp.marine.csiro.au/nimpis

[3] West, E.J. and R.J. West. 2007. Growth and survival of the invasive alga, *Caulerpa taxifolia*, in different salinities and temperatures: implications for coastal lake management. Developments in Hydrobiology 192:87-94.

[4] Boudouresque, C.F., A. Meinesz, M.A. Ribera and E. Ballesteros. 1995. Spread of the green alga *Caulerpa taxifolia* (Caulerpales, Chlorophyta) in the Mediterranean: possible consequences of a major ecological event. Scientia Marina 59(Suppl. 1):21-29.

[5] United States Department of Agriculture, Natural Resource Conservation Service. 2010. The PLANTS Database. National Plant Data Center, Baton Rouge, LA, USA. Retrieved November 16, 2010 from: http://plants.usda.gov/java/profile?symbol=CATA5

[6] Jacoby, C. and L. Walters. 2004. Can we stop "killer algae" from invading Florida? Florida Sea Grant College Program, University of Florida. Retrieved November 16, 2010 from: http://plants.ifas.ufl.edu/misc/pdfs/cautax.pdf

[7] Delgado, O., C Rodríguez-Prieto, E. Gacia and E. Ballesteros. 1996. Lack of severe nutrient limitation in *Caulerpa taxifolia* (Vahl) C Agardh, an introduced seaweed spreading over the oligotrophic northwestern Mediterranean. Botanica Marina 39(1):61-67.

[8] Meinesz, A., L. Benichou, J. Blachier, T. Komatsu, R. Lemée, H. Molenaar and X. Mari. 1995. Variations in the structure, morphology and biomass of *Caulerpa taxifolia* in the Mediterranean Sea. Botanica Marina 38:499-508.

[9] Woodfield, R. Mediterranean clone of caulerpa. *Caulerpa taxifolia.* Merkel & Associates, Inc., Bugwood.org

[10] Hodgson, L. 2007. Invasive Marine Algae *Caulerpa taxifolia* University of Hawaii. Retrieved December 21, 2010 from: http://www.hawaii.edu/reefalgae/invasive_algae/chloro/Caulerpa_taxif_lynn.JPG

[11] Bellan-Santini, D., P.M. Arnaud, G. Bellan and M. Verlaque. 1996. The influence of the introduced tropical alga *Caulerpa taxifolia*, on the biodiversity of the Mediterranean marine biota. Journal of the Marine Biological Association of the United Kingdom 76:235-237.

[12] Meinesz, A., J. de Vaugelas, B. Hesse and X. Mari. 1993. Spread of the introduced tropical green alga *Caulerpa taxifolia* in northern Mediterranean waters. Journal of Applied Phycology 5:141-147.