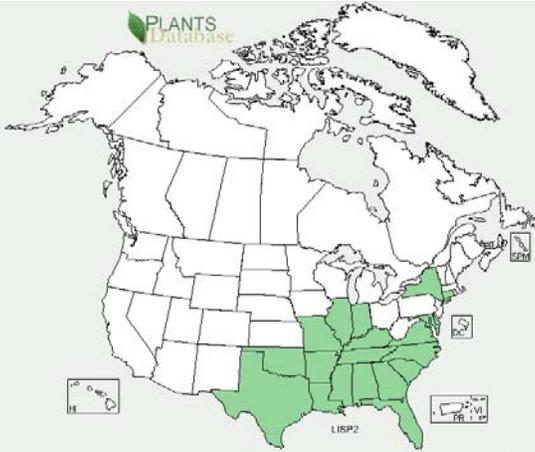
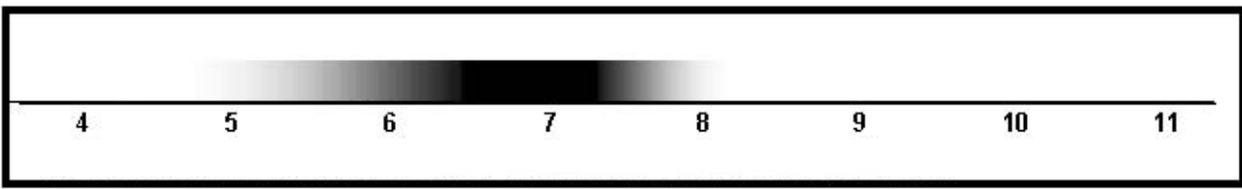


Aquatic Plant		Frog's-bit; American Spongeplant
<b>I. Current Status and Distribution</b>		<i>Limnobium spongia</i>
<b>a. Range</b>	<b>Global/Continental</b>	<b>Wisconsin</b>
<b>Native Range</b> Southeastern United States <sup>1</sup>	 <p>Figure 1: U.S and Canada Distribution Map<sup>2</sup></p>	Not recorded in Wisconsin
<b>Abundance/Range</b> Widespread: Locally Abundant: Sparse:	Southern United States (native) <sup>1</sup> Small pond in Mansfield, Connecticut <sup>3</sup> Threatened in Kentucky; endangered in Maryland <sup>2</sup>	Not applicable Not applicable Not applicable
<b>Range Expansion</b> Date Introduced:  Rate of Spread:	New York population vouchered in 1828, disappeared by 1895 <sup>3</sup> ; Connecticut population was probably introduced from New York by waterfowl <sup>3</sup> ; Indiana population has no vouchers <sup>3</sup> Quickly fills newly colonized sites <sup>4</sup> ; considered a nuisance even in its native range <sup>4</sup>	Not applicable  Not applicable
<b>Density</b> Risk of Monoculture: Facilitated By:	High Undocumented	Unknown Unknown
<b>b. Habitat</b>	Slow-moving water of streams, bayous, lakes, wetlands, or stranded along shore <sup>5</sup> ; marshes <sup>6</sup>	
<b>Tolerance</b>	Chart of tolerances: Increasingly dark color indicates increasingly optimal range	
		
<b>Preferences</b>	Alkaline, hard water, nutrient-rich conditions <sup>3</sup> ; partial shade; in wet, sandy loam or still water <sup>9</sup>	

<b>c. Regulation</b>	
Noxious/Regulated <sup>2,10</sup> :	CA, Puerto Rico
Minnesota Regulations:	<i>Not regulated</i>
Michigan Regulations:	<i>Not regulated</i>
Washington Regulations:	<i>Not regulated</i>
<b>II. Establishment Potential and Life History Traits</b>	
<b>a. Life History</b>	Floating (or rooted), stoloniferous, perennial, monocotyledonous aquatic herb <sup>4,6,9</sup>
<b>Fecundity</b>	High
<b>Reproduction</b>	Sexual <sup>3</sup> ; Asexual <sup>3</sup>
Importance of Seeds:	Able to reproduce by seed <sup>3</sup>
Vegetative:	Able to reproduce vegetatively <sup>3</sup>
<b>Hybridization</b>	Undocumented
<b>Overwintering</b>	
Winter Tolerance:	Overwinters as green plants where temperatures remain above 0°C <sup>(3)</sup>
Phenology:	In northern locations (e.g. New York) it will form small winter buds or seeds <sup>3</sup> ; flowers summer to fall <sup>5</sup>
<b>b. Establishment</b>	
<b>Climate</b>	
Weather:	Tropical affinities <sup>3</sup> , but has shown ability to survive in temperate conditions
Wisconsin-Adapted:	Uncertain
Climate Change:	Likely to facilitate growth and distribution
<b>Taxonomic Similarity</b>	
Wisconsin Natives:	Medium; family Hydrocharitaceae
Other US Exotics:	High; similar to <i>Limnobium laevigatum</i> and <i>Hydrocharis morsus-ranae</i> <sup>4</sup>
<b>Competition</b>	
Natural Predators:	Golden eye, green wing teal, mallard, old squaw, pintail, ring-necked, and wood ducks consume seeds <sup>3</sup>
Natural Pathogens:	<i>Cercospora limnobia</i> (fungus) <sup>11</sup>
Competitive Strategy:	Reproduces rapidly by both seeds and stolons, quickly filling newly colonized sites <sup>4</sup>
Known Interactions:	Undocumented
<b>Reproduction</b>	
Rate of Spread:	Seedlings grow rapidly <sup>4</sup> ; populations spread rapidly and widely <sup>4</sup>
Adaptive Strategies:	Spinules of seeds aid in transportation <sup>4</sup>
<b>Timeframe</b>	Undocumented
<b>c. Dispersal</b>	
Intentional:	Water garden, aquarium trade <sup>3,4</sup>
Unintentional:	Waterfowl <sup>3</sup> ; seeds attach readily to watercrafts <sup>4</sup> ; probably wind-pollinated <sup>4</sup>
Propagule Pressure:	High; fragments easily accidentally introduced; source population near Wisconsin



Figures 2 and 3: Courtesy of Ann Murray, University of Florida<sup>1</sup>

### III. Damage Potential

#### a. Ecosystem Impacts

<b>Composition</b>	Negatively affects water quality <sup>6</sup> ; negatively affects fish and wildlife habitat <sup>6</sup>
<b>Structure</b>	Can form dense floating mats <sup>1,4,6</sup> ; can also root in mud or on wetland edges <sup>4</sup>
<b>Function</b>	Undocumented
<b>Allelopathic Effects</b>	Undocumented
<b>Keystone Species</b>	Undocumented
<b>Ecosystem Engineer</b>	Undocumented
<b>Sustainability</b>	Undocumented
<b>Biodiversity</b>	Undocumented
<b>Biotic Effects</b>	Undocumented
<b>Abiotic Effects</b>	Undocumented
<b>Benefits</b>	Undocumented

#### b. Socio-Economic Effects

<b>Benefits</b>	Undocumented
Caveats	Not applicable
<b>Impacts of Restriction</b>	Increase in monitoring, education, and research costs
<b>Negatives</b>	Can hinder navigation (St. John's River, Florida) <sup>3</sup> ; can affect recreational usage <sup>6</sup>
<b>Expectations</b>	More negative impacts can be expected in nutrient-rich, hard water and alkaline systems <sup>3</sup>
<b>Cost of Impacts</b>	Decreased recreational and aesthetic value; decline in ecological integrity; increased research expenses
<b>“Eradication” Cost</b>	Expensive

### IV. Control and Prevention

#### a. Detection

Crypsis:	High; may be confused with <i>Eichhornia crassipes</i> <sup>1,6</sup> , <i>Limnobium laevigatum</i> , and <i>Hydrocharis morsus-ranae</i> <sup>4</sup>
Benefits of Early Response:	Undocumented

<b>b. Control</b>	
<b>Management Goal 1</b>	Nuisance control
Tool:	<i>Neohydronomus affinis</i> (weevil) <sup>12</sup>
Caveat:	Native to Central and South America; not specific to <i>L. spongia</i>
Cost:	Expensive
Efficacy, Time Frame:	Long term research needed to analyze potential risks
Tool:	<i>Cercospora limnobii</i> (fungus) <sup>11</sup>
Caveat:	No long term studies have been done to determine efficacy of control
Cost:	Undocumented
Efficacy, Time Frame:	Further research needed to determine the control potential of <i>C. limnobii</i>
Tool:	Hybrid grass carp (male <i>Ctenopharyngodon idella</i> X female <i>Cyprinus carpio</i> ) <sup>13</sup>
Caveat:	Negative effects on other organisms; stocking is illegal due to occasional fertility
Cost:	Undocumented
Efficacy, Time Frame:	Only displays a moderate preference for <i>L. spongia</i> <sup>13</sup>
Tool:	Aquatic herbicides (diquat, triclopyr, and 2,4-D) <sup>6</sup>
Caveat:	Non-target species are negatively impacted
Cost:	Undocumented
Efficacy, Time Frame:	Excellent control with diquat and triclopyr, good control with 2,4-D <sup>6</sup>

<sup>1</sup> University of Florida, Center for Aquatic and Invasive Plants. *Limnobium spongia*. Retrieved December 23, 2010 from: <http://plants.ifas.ufl.edu/node/233>

<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=LISP2>

<sup>3</sup> Les, D.H. and L.J. Mehrhoff. 1999. Introduction of nonindigenous aquatic vascular plants in southern New England: a historical perspective. *Biological Invasions* 1:281-300.

<sup>4</sup> Hrusa, F. California Department of Food and Agriculture. *Limnobium spongia* L. sensu lato (Hydrocharitaceae). Retrieved December 23, 2010 from: [http://www.cdfa.ca.gov/phpps/PPD/botany/research\\_recent.html](http://www.cdfa.ca.gov/phpps/PPD/botany/research_recent.html)

<sup>5</sup> Flora of North America. *Limnobium spongia*. Retrieved December 23, 2010 from: [http://www.efloras.org/florataxon.aspx?flora\\_id=1&taxon\\_id=222000213](http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=222000213)

<sup>6</sup> Madsen, J.D., C.S. Owens and K.D. Getsinger. 1998. Evaluation of four herbicides for management of American frogbit (*Limnobium spongia*). *Journal of Aquatic Plant Management* 36:148-150.

<sup>7</sup> Tullock, J.H. 2007. *Freshwater Aquarium Models: Recipes for Creating Beautiful Aquariums That Thrive*. Wiley Publishing, Inc. Hoboken, New Jersey. 304 p.

<sup>8</sup> Plant Database. 2010. *Limnobium spongia*. Retrieved December 23, 2010 from: [http://plantdatabase.net/Limnobium\\_spongia](http://plantdatabase.net/Limnobium_spongia)

<sup>9</sup> University of Wisconsin-Madison Botanical Garden. 2005. *Limnobium spongia*. Retrieved December 23, 2010 from: <http://128.104.26.120/garden/db/speciesdetail.asp?genus=Limnobium%20&species=spongia>

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- <sup>10</sup> USDA, ARS, National Genetic Resources Program. 2009. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. *Limnobium spongia*. Retrieved December 23, 2010 from: <http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?419810>
- <sup>11</sup> Conway, K.E. 1978. A new species of *Cercospora* from *Limnobium spongia*. Transactions of the British Mycological Society 71(3):521-524.
- <sup>12</sup> Thompson, C.R. and D.H. Habeck. 1989. Host specificity and biology of the weevil *Neohydronomus affinis* (Coleoptera: Curculionidae), a biological control agent of *Pistia stratiotes*. Entomophaga 34(3):299-306.
- <sup>13</sup> Duthu, G.S. and R.H. Kilgen. 1975. Aquarium studies on the selectivity of 16 aquatic plants as food by fingerling hybrids of the cross between male *Ctenopharyngodon idella* [grass carp] and female *Cyprinus carpio* [Israeli common carp]. Journal of Fish Biology 7:203-208.