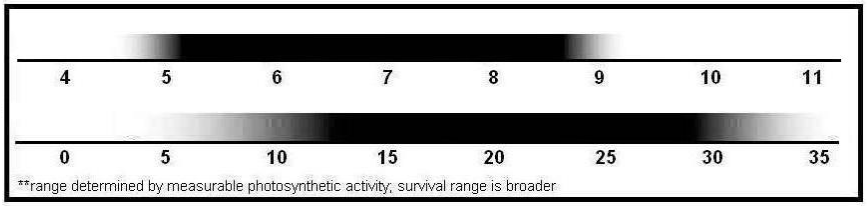
Aquatic Plant		Giant reed; Giant cane
I. Current Status and Distribution		***Arundo donax***
a. Range	**Global/Continental**	**Wisconsin**
Native Range Eastern Asia[1,2,3]; also considered by some to be native to the countries surrounding the Mediterranean Sea	 *Figure 1: U.S and Canada Distribution Map*[4] *Also reported from Indiana and Colorado*[5]	Not recorded in Wisconsin[4]
Abundance/Range Widespread: Locally Abundant: Sparse:	 Rio Grande River[1,6]; California[1,7] Mexico[1] Undocumented	 Not applicable Not applicable Not applicable
Range Expansion Date Introduced: Rate of Spread:	 Intentionally introduced to southern California in the early 1800's[1,2] Rapid	 Not applicable Not applicable
Density Risk of Monoculture: Facilitated By:	 High[1]; can produce up to 35 tons of above ground biomass per acre[6] Vegetative reproduction[1]	 Undocumented Undocumented
b. Habitat	Riparian areas, wetlands, marshes, floodplains, reservoirs, lakes, ponds, streams, drainage canals, ditches, grasslands, prairies, seeps[1], agricultural areas, forests, shrublands, coastlands, deserts, urban areas[8]	
Tolerance	Chart of tolerances: Increasingly dark color indicates increasingly optimal range	
pH[9] Temperature (°C)[10,11,12,13,14]		
Preferences	Disturbed sites[1,7,14]; water tables at or near the soil surface[15]; can tolerate saline conditions, drought, and periods of excessive mositure[6]; tolerant of a wide range of soil types, but prefers well-drained soils[6,16]; sunny habitats[8]; areas of enriched nitrogen[8,15,17]	
c. Regulation		
Noxious/Regulated[4]:	TX	
Minnesota Regulations:	*Not regulated*	
Michigan Regulations:	*Not regulated*	
Washington Regulations:	*Secondary Species of Concern*	

II. Establishment Potential and Life History Traits	
a. Life History	Rhizomatous perennial herbaceous aquatic grass[1]
Fecundity	High
Reproduction	
Importance of Seeds:	Rarely produces viable seeds in North America[1,6]
Vegetative:	Sprouts from rhizomes and stem nodes[18]; fragmentation[1]
Hybridization	Ornamental var. *versicolor* is widely cultivated[1,6,19] ; var. *macrophylla*[20]
Overwintering	
Winter Tolerance:	Can survive very low temperatures when dormant, but subject to damage by frosts after initiation of spring growth[6]
Phenology:	In California, spring and summer are the main growing season for new ramets[12,21]; flowers in late summer[7]
b. Establishment	
Climate	
Weather:	Warm-temperate to subtropical[6]; annual precipitation from 12-158 inches[20]; currently inhabits USDA zones 6-11[(8)]
Wisconsin-Adapted:	Uncertain; cultivated as far north as Washington D.C.[6]
Climate Change:	Likely to facilitate growth and distribution
Taxonomic Similarity	
Wisconsin Natives:	Medium; family Poaceae[4]
Other US Exotics:	Medium; family Poaceae[4]
Competition	
Natural Predators:	*Zyginidia quyumi* (leaf hopper)[22]; *Sesamia* spp. (stalk borer)[16]
Natural Pathogens:	*Armillaria mellea* (root rot), *Leptostroma donacis* (fungi), *Papularia sphaerosperma* (fungi), *Puccinia coronata* (crown rust), *Selenophoma donacis* (stem speckle)[20]
Competitive Strategy:	Can establish and spread in communities of various successional stages[1]; growth rate is 2-5 times faster than native vegetation[8]
Known Interactions:	Can outcomplete and displace native riparian vegetation[1,12]
Reproduction	
Rate of Spread:	Rapid[1,2]; up to 80 stems/m^2 in high nutrient locations[12]
Adaptive Strategies:	Ability to rapidly reproduce from established rhizomes and fragments[1,18]
Timeframe	Under optimal conditions, can grow 1.5 to 4 inches per day[1]; rhizomes averaged 1 to 2.5 inches per day[1,6]
c. Dispersal	
Intentional:	Cultivated throughout Asia, southern Europe, northern Africa and the Middle East for thousands of years[1,2,6]; ornamental[1,3,6]; erosion control[1,6]; biomass for energy generation[2,3]
Unintentional:	Escape from cultivation[1]; wind[1]; water currents[1]; seed contaminant[3]; mechanical equipment[12]
Propagule Pressure:	Medium; fragments easily introduced, but source populations not near Wisconsin


Figure 2: Courtesy of Larry Allain[23]
Figure 3: Courtesy of James H. Miller, USDA Forest Service, Bugwood.org[24]

III. Damage Potential	
a. Ecosystem Impacts	
Composition	Dense stands may inhibit growth of other plant species[1,12]; does not provide food or habitat for native wildlife, bird, and invertebrate species[1,7,25]
Structure	Lack of natural canopy structure may result in warmer water temperatures in riparian habitats[1,7]; riverbanks destabilized during flood events[1]
Function	May alter fire regime characteristics, hydrology, and successional processes[1,7,26]; increased transpiration of water compared to native vegetation[1]; alters nutrient cycling[8]
Allelopathic Effects	Contains a wide variety of chemicals which help protect the plant from most insects and grazers[1,7,27]
Keystone Species	Undocumented
Ecosystem Engineer	Undocumented
Sustainability	Undocumented
Biodiversity	Decreases[1,7,25,28]
Biotic Effects	Declines in several native stream fishes has been attributed to lack of natural structure and shading after infestation of *A. donax*[1]; drastic reductions in abundance and diversity of invertebrates[28]
Abiotic Effects	*A. donax* canopy structure may result in changes in water quality (pH, ammonia)[1]
Benefits	Undocumented
b. Socio-Economic Effects	
Benefits	Used to make reeds for a variety of musical instruments[6]; planted for erosion control[1]; promising bioenergy crop[2,16]; ornamental trade[1,3,6]; used for thatching roofs[1]; used in making pulp for paper and in the manufacture of rayon[6,9]; rhizomes used medicinally[3,6]; used in phytoremediation of nitrate or heavy metal contaminated waters and soils[29,30,31,32,33]
Caveats	Risk of release and population expansion outweighs benefits of use

Impacts of Restriction	Increase in monitoring, education, and research costs
Negatives	Dense stands may serve as fuel for wildfires[1,7]; floating vegetation can form debris dams causing flooding[1]
Expectations	Undocumented
Cost of Impacts	Undocumented
"Eradication" Cost	Very expensive
IV. Control and Prevention	
a. Detection	
Crypsis:	Morphologically similar to *Phragmites australis*[10]
Benefits of Early Response:	High; killing or removing rhizomes before they are well established assists in potential control
b. Control	
Management Goal 1	Nuisance relief
Tool:	Biocontrol (*Trabutina mannipar, Trabutina romana, Rhizaspidiotus donacis*)[34,35,36,37]
Caveat:	Release approval recommended but not granted yet[34,35]; many infested areas inaccessible by foot[38]
Cost:	Undocumented
Efficacy, Time Frame:	Quite variable depending on the insect population, leaf morphology and the presence of other organisms[34,39]
Tool:	Chemical (glyphosate, imazapyr, imazamox)[34]
Caveat:	Glyphosate is non-selective; negative impacts on non-target species
Cost:	Undocumented
Efficacy, Time Frame:	Foliar application during post-flowering period may be more effective than cut-stem treatment[7]
Tool:	Chemical (fluazifop-butyl, sethoxidan)[7]
Caveat:	Not currently labeled for wetland use[7]
Cost:	Undocumented
Efficacy, Time Frame:	Monocot-specific[7]; fluazifop is effective, especially when applied after flowering[19]
Tool:	Mechanical and herbicide (combination)[7,18,40]
Caveat:	Labor-intensive[7,18]
Cost:	Similar expenses to only foliar spraying[7]
Efficacy, Time Frame:	Foliar spray of herbicide applied 3 to 6 weeks after stalks are cut and biomass is removed[7]; requires less herbicide and can be applied more precisely[7]
Management Goal 2	Eradication
Tool:	Mechanical (hand pulling)
Caveat:	Only feasible for small localized populations[1]; plants should be less than 2m tall and all rhizomes and fragments must be removed[1]
Cost:	Expensive
Efficacy, Time Frame:	Extremely difficult; most effective in loose soils[1]

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