NAME OF SPECIES: *Sorghum halepense* (L.) Pers.		
Synonyms: *Andropogon controversus* Steud; *A. halepensis* (L.) Brot.; *A. halepensis* var. *anatherus* Piper; *A. miliaceus* Roxb.; *A. miliformis* Schult.; *Holcus exiguus* Forssk.; *H. halepensis* L.; *H. halepensis* var. *miliformis* (Schult.) Hitchc.; *H. sorghum* var. *exiguus* (Forssk.) Hitchc.; *Sorghum controversum* (Steud.) Snowden; *S. miliaceum* (Roxb.) Snowden; *S. miliaceum* var. *parvispicula* Snowden (12)		
Common Name: Johnson grass	**Cultivars?** YES ☒ NO ☐	
A. CURRENT STATUS AND DISTRIBUTION		
I. In Wisconsin?	1. YES ☒	NO ☐
	2. Abundance: There are 16 total records of S. halepense in Wisconsin (1).	
	3. Geographic Range: S. halepense has been found in 5 different counties, located primarily in the southern part of the state (1, 2).	
	4. Habitat Invaded: Disturbed Areas ☒ Undisturbed Areas ☐	
	5. Historical Status and Rate of Spread in Wisconsin: The earliest reports of S. halepense in Wisconsin are from 1939 (1).	
	6. Proportion of potential range occupied: Widespread throughout the United States (4).	
II. Invasive in Similar Climate Zones	1. YES ☒ NO ☐ Where (include trends): S. halepense is considered to be one of the ten worst invasive weeds in the world. Fifty-three countries, ranging in latitude from 55 N to 45 S report Johnson grass as a major problem; the problem is most serious in the region from the Mediterranean to the Middle East and India, Australia, central South America and the Gulf Coast of the United States. It is spreading north into New York, Massachusetts, Michigan, and other regions (4).	
III. Invasive in Which Habitat Types	1. Upland ☒ Wetland ☒ Dune ☐ Prairie ☒ Aquatic ☐ Forest ☐ Grassland ☒ Bog ☐ Fen ☐ Swamp ☐ Marsh ☐ Lake ☐ Stream ☒ Other: It is generally restricted to wet or mesic sites in the United States. It is most common in warm, humid southern climates that receive ample summer rainfall. Johnson grass is a facultative wetland species, frequently occurring on floodplains. Johnson grass patches are often extensive along canals and irrigation ditches. Johnson grass is not restricted to disturbed sites, however; it also invades undisturbed tallgrass and coastal prairies, savannas, and riparian zones. .(6)	
IV. Habitat Affected	1. Soil types favored or tolerated: S. halepense grows under soil pH conditions of 5.0-7.0 (3).	
	2. Conservation significance of threatened habitats: No direct evidence is available on the impact of this species on native species of conservation concern but it can be inferred, based on its widespread distribution and magnitude of effects on individual natives and community composition, that some deleterious effect on conservation concern species would result (4).	
V. Native Range and Habitat	1. List countries and native habitat types: S. halepense is a cosmopolitan weed thought to be native to the Mediterranean region, but with controversy over its origin (4).	
VI. Legal Classification	1. Listed by government entities? Listed as a noxious weed by 13 states, a C list noxious weed by 2 states, a prohibited noxious weed	

	by one state, a "B" designated weed in one state, a regulated non-native plant species by one state, and a class A noxious weed by one state (3).
	2. Illegal to sell? YES ☐ NO ☒ Notes:
B. ESTABLISHMENT POTENTIAL AND LIFE HISTORY TRAITS	
I. Life History	1. Type of plant: Annual ☐ Biennial ☐ Monocarpic Perennial ☐ Herbaceous Perennial ☒ Vine ☐ Shrub ☐ Tree ☐ **Grass** A warm-season perennial. It may grow as an annual in hot, arid climates and at the northern limits of its range. (6)
	2. Time to Maturity: Johnson grass produces seed about 2 months after initiation of spring rhizome expansion. Even 1st-year Johnson grass plants are capable of quick flowering and seed set (6).
	3. Length of Seed Viability: The longevity of seeds varies depending on the environmental conditions in which the seed was stored. Seeds stored in the laboratory under dry conditions remained viable for over seven years. Studies in California showed a 50% viability in seeds stored for five years, however another study resulted in only 2% viability in seeds which remained in the soil for six years. Seeds buried in the soil for two and a half years displayed a 60% to 75% viability (4). Johnson grass seed retains viability after passing through the digestive tracts of livestock (6).
	4. Methods of Reproduction: Asexual ☒ Sexual ☒ Notes: S. halepense is self-compatible species with prolific seed production, but its rapidly growing and immense rhizome system gives Johnson grass a tremendous competitive ability (4).
	5. Hybridization potential: Plant breeders, seed dealers and growers often observe off-type plants or "rogues" of hybrid grain sorghum. Common rogues are the tall outcrosses to sudangrass, johnsongrass or other sorghum types. Sorghum outcrosses with johnsongrass as the male parent often have rhizomes resembling those of johnsongrass. Johnsongrass-grain sorghum hybrids can become a significant weed threat (10).
II. Climate	1. Climate restrictions: Johnson grass is a warm season and short-day plant. Experiments in Mississippi resulted in flowering of all treatments, ranging from 8 to 16 hours of light. However, seedhead formation was inhibited in the 16 hour treatment and reduced in the 14 hour treatment. The 10.5 and 12 hour photoperiod treatments resulted in the greatest amount of seed production. Temperatures below 13 C to 15 C (55 F to 59 F) inhibit floral production. Most ecotypes have rhizomes that cannot tolerate freezing temperatures or hot drying conditions, but adaptation and the formation of new ecotypes account for the geographic spread of Johnson grass in northern U.S. and southern Canada (4). Until 1977 Johnson grass died during the cold winters of Canada; in 1977 the first vegetative structure survived the winter from a newly evolved cold tolerant ecotype (8). In an Illinois field experiment, Johnson grass rhizomes did not survive winter temperatures less than 1.4F (-17 C) unless buried 7.9 inches (20 cm) or more below ground. In southern Ontario, rhizomes must be 10 inches (25 cm) or more below ground to overwinter (6)

	2. Effects of potential climate change: The ability of Johnson grass to form new ecotypes allows it to spread into many different climate types. Also, Johnson grass is a warm season grass and a warming trend in the overall global climate could allow it to colonize new areas (4).
III. Dispersal Potential	1. Pathways - Please check all that apply: Unintentional: Bird ☐ Animal ☒ Vehicles/Human ☒ Wind ☒ Water ☒ Other: Intentional: Ornamental ☐ Forage/Erosion control ☒ Medicine/Food: Other:
	2. Distinguishing characteristics that aid in its survival and/or inhibit its control: The prolific seed production, extensive rhizome system, sprouting ability of fragmented rhizomes and ability to grow in a wide range of environments make Johnson grass difficult to control (8). Also, S. halepense is able to grow in nitrogen-poor tallgrass prairies. A recent study indicates that this may be due to several species of bacteria which are nitrogen-fixing. These results indicate that these plant growth-promoting bacteria may enhance the ability of S. halepense to invade and persist by altering fundamental ecosystem properties via significant changes in soil biogeochemistry. (11) Mature Johnson grass plants are moderately drought resistant and salt tolerant. Johnson grass produces toxins that may be allelopathic A single plant may produce 80,000 seeds in one growing season.(6)
IV. Ability to go Undetected	1. HIGH ☐ MEDIUM ☐ LOW ☒
C. DAMAGE POTENTIAL	
I. Competitive Ability	1. Presence of Natural Enemies: Bacteria, fungi, and nematodes are known to attack Johnson grass. It is also attacked by the leaf-gall and maize dwarf mosaic viruses (5).
	2. Competition with native species: The rapid growth of Sorghum halepense's rhizomes also provides the plant with a competitive edge over other species; the plant directly shades other plants, decreases nutrient and moisture availability to other plants, and possibly inhibits the growth of other plants via the production of allelopathic chemicals (8).
	2. Rate of Spread: -changes in relative dominance over time: -change in acreage over time: HIGH(1-3 yrs) ☒ MEDIUM (4-6 yrs) ☐ LOW (7-10 yrs) ☐ Notes:
II. Environmental Effects	1. Alteration of ecosystem/community composition? YES ☒ NO ☐ Notes: Typically, Johnson grass is a good competitor for nutrients, space, and water resources. It can outcompete associated species for water by extracting water from lower soil profiles. Johnson grass may also negatively impact plant community composition through its reputed allelopathy. Crowding of Johnson grass

	results in intraspecific competition. Along forest edges it can slow the natural succession of fields to woodlands (4).
	2. Alteration of ecosystem/community structure? YES ☒ NO ☐ Notes: Johnson grass has been shown to severely inhibit pioneer grass species which normally appear in abandoned fields and can persist in almost pure stands for many years. The massive size (up to 3 m tall) of this plant creates difficulties for the establishment of other plants. The rapid growth of rhizomes also provides the plant with a competitive edge over other species; the plant directly shades other plants, decreases nutrient and moisture availability to other plants, and possibly inhibits the growth of other plants via the production of allelopathic chemicals (4).
	3. Alteration of ecosystem/community functions and processes? YES ☒ NO ☐ Notes: Little is known about the effect of this species on ecosystem processes, but considering the magnitude of its effects on community structure and individual natives, it is likely the species has some negative effects (4).
	4. Allelopathic properties? YES ☒ NO ☐ Notes: Cyanogenetic glycosides and other toxins in Johnson grass may inhibit germination and growth of associated plant species (4).
D. SOCIO-ECONOMIC EFFECTS	
I. Positive aspects of the species to the economy/society:	Notes: S. halepense is used as a forage crop and is employed to re-vegetate overgrazed land. It is considered beneficial as a forage crop and helpful in preventing soil erosion. The leaves of Johnson grass contain a large quantity of protein available to cattle (4). Deer, rodents, quail, geese, and wild turkey consume Johnson grass (6).
II. Potential Socio-Economic Effects of Requiring Controls:	Positive: A toxic cyanide-containing substance, prussic acid, accumulates during extreme environmental conditions, such as excessive heat, cold or drought, as well as during plant maturation. Prussic acid poisoning in cattle is not unusual (4). Negative: Cultivars average 1–20 MT/ha forage. Seed yields may be small in some hybrids and cultivars, up to 1.7 kg per plant. Seeds yield range from 188 to 502 kg/ha, with 314 kg/ha considered good. Johnson grass hay was valued at approximately $50/MT in 1978 (5).
III. Direct and indirect Socio-Economic Effects of Plant :	Notes: Johnson grass impacts agricultural lands as an alternate host for many of crop-damaging insects, nematodes, fungi, and viruses. It hosts sorghum midges, southwestern corn borers, corn leaf aphids, sugarcane borers, banks grass mites, sorghum downy mildew, and maize viruses (6).
IV. Increased Costs to Sectors Caused by the Plant:	Notes: S. halepense is a problem in agricultural and natural settings (8).
V. Effects on human health:	Notes: Reported to be cyanogenetic, demulcent, depurative, diuretic, poison, and tonic, Johnson grass is a folk remedy for blood and urinary disorders. Additionally, the pollen may cause hay fever (5).
VI. Potential socio-economic	Positive: Johnson grass causes millions of dollars in lost agricultural

effects of restricting use:	revenue annually in the United States. For example, Johnson grass infestations reduce yields in Louisiana sugarcane (*Saccharum officinarum*) fields by 25-50% (6). Negative: Johnson grass may have a future role in reclamation of radioactive soils (6).
E. CONTROL AND PREVENTION	
I. Costs of Prevention (please be as specific as possible):	Notes: S. halapense prefers disturbed areas, so prevention would involve maintaining and restoring habitat.
II. Responsiveness to prevention efforts:	Notes: Management practices for preventing invasion by S. halepense should include avoiding soil and vegetation disturbances. Areas where the soil and native plants are kept intact should have few problems with Johnson grass (4).
III. Effective Control tactics:	Mechanical ☒ Biological ☐ Chemical ☒ Times and uses: Several techniques may be helpful in controlling S. halepense: torching and burning, mowing and grazing, tilling and plowing and herbicide applications (4). Light infestations can be hand pulled during June following a rain when the ground is soft. All plant parts need to be removed from the area. For heavier infestations, mowing or tilling may be effective. Any of several readily available general use herbicide treatments such as glyphosate can be used for chemical control of Sorghum halepense. Herbicide treatment may need to be repeated for several years to ensure good control (7).
IV. Costs of Control:	Notes: Yearly applications of herbicides will be required for an effective control plan. Extremely high herbicide rates are necessary to control Johnson grass in wheat fields if no other mechanical control is employed (6).
V. Cost of prevention or control vs. Cost of allowing invasion to occur:	Notes: In a study from 1989, the cost of controlling S. halepense versus the lost revenue due to the invasion was compared for soybeans. The study found that if the cost of control was $49/ha, revenue gained from control would equal cost of control at a Johnson grass density of 11 plants/10 M^2. At actual Johnson grass densities greater than 11 plants/10 m^2, the increase in revenue is greater than the cost of control, suggesting that profits would be higher with Johnson grass control than without Johnson grass control. For Johnson grass densities less than 11 plants/1Om^2, the opposite would be true (9).
VI. Non-Target Effects of Control:	Notes: Some methods of chemical control are not specific to Johnson grass and will also kill other grasses.
VII. Efficacy of monitoring:	Notes: Monitoring of S. halepense is easy, particularly in the summer, due to the large size of the plants. The number of inflorescences could predict the potential seed supply and the spread of plants into adjacent land would reveal information on the rhizome parameters. Recording the quantity of Johnson grass plants and the boundary size of the invaded area will aid in determining the optimal control technique for the specific site. The ratio of natives to Johnson grass will be indicative of the success of control on the weed as well as the effects of the manipulation on the survival and competitiveness of the native vegetation (4).
VIII. Legal and landowner issues:	Notes: Cooperation with landowners for management may be necessary.

F. HYBRIDS AND CULTIVARS	
I. Known hybrids? YES ☒ NO ☐	Name of hybrid:
	Names of hybrid cultivars: SORGRASS (*Sorghum halepense* x *S. bicolor,* including *S. halepense* x *S. sudanense* and *S. almum*) (5).
II. Species cultivars	Names of cultivars: Some examples of the cultivars of S. halepense include Mississippi Fine Stem and Mississippi Persistent (5).
	Notes: There are at least 55 morphologically distinct vegetative types in the US alone (5).

G. REFERENCES USED:

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☒ WI DNR
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☐ Native Plant Conservation Alliance
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Approved and Completed Date: 12/20/2011