Hydrilla (*Hydrilla verticillata* (L.F.) Royle)

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Problems: Forms dense mats of topped out vegetation (Figure 1). Mats can inhibit growth of native plant species and reduce the water quality of habitat utilized by aquatic fauna. Mats can also inhibit recreational uses of waterbodies, commercial navigation, hydro power generation, clog irrigation pumps, and worsen flood events. Hydrilla is often called 'the perfect aquatic weed' or 'kudzu of the water.'

Regulations: State noxious in MS; Federal noxious.

Description: Hydrilla is most often confused with the native elodea or occasionally the invasive Brazilian elodea (*Egeria* sp.), a common aquarium plant. The primary characteristic used to distinguish hydrilla from elodea is the presence of serrations on the leaf margins and small spines on the underside of the leaf midribs (Figure 1). Hydrilla can have 3-6 leaves per node while elodea always has 3. Hydrilla also produces subterranean tubers called turions (Figure 1).

Dispersal: Hydrilla is native to Asia but has been found throughout many states in the U.S. and is very common in MS (Figure 2; Turnage and Shoemaker 2018; Turnage et al. 2019). Hydrilla primarily spreads through plant fragments and turions. Each node on a stem fragment can produce roots and as such should be treated as a propagule. Fragments and turions can be spread by aquatic fauna, water currents, and boating equipment (very common).

Control Strategies: Physical-drawdown will not control hydrilla as subterranean turions can lay dormant in soil for years. Mechanical-hand removal of small patches may be effective; mechanical mowers can provide short term relief but usually cause further spread through stem fragmentation. Biological-triploid (sterile) grass carp can control hydrilla in isolated water bodies (when stocked at a rate of 10 fish/acre) but may cause other issues in the ecosystem and have to be periodically restocked; consult an aquatic vegetation control expert before stocking grass carp. Chemical-the herbicides diquat, copper ethanolamine (ETA), endothall, fluridone, and florpyrauxifen-benzyl have all been shown to be effective against hydrilla as submersed applications. Copper (alone or in combination with diquat) can provide short term control while endothall, fluridone, and florpyrauxifen-benzyl can provide longer term control (Table 1); all herbicides will likely need to be reapplied due to the rapid regrowth of hydrilla.

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References

Turnage, G. and C. M. Shoemaker. 2018. 2017 survey of aquatic plant species in Mississippi waterbodies. Geosystems Research Institute, Mississippi State University, Mississippi State, MS. February 2018. GRI Report # 5077. Pp. 69.

Turnage, G. 2019. A Brief Introduction to Factors Affecting Water Quality, Aquatic Weed Control, Herbicide Labels, & Mixing Calculations. Mississippi State University, Geosystems Research Institute Report #5084. Pp. 22.

Turnage, G., A Lazaro-Lobo, S. L. Sanders, and M. Thomas. 2019. 2019 survey of aquatic plant species in Mississippi waterbodies. Geosystems Research Institute, Mississippi State University, Mississippi State, MS. February 2018. GRI Report # 5085. Pp. 35.

Madsen, J.D. and W. Robles. 2009. Hydrilla (*Hydrilla verticillata* (L.F.) Royle) MSU GRI Factsheet. Pp. 2.

Tables and Figures

Table 1. Chemical control strategies (submersed application rates) adapted from Madsen and Robles (2009); the first row for each herbicide is the amount of product needed for commercial applications (100-gal solution), the second row is the amount of product needed for private landowners (25-gal of solution; typical ATV sprayer size); all rates are in imperial units (see Turnage 2019 for instructions on calculating ac-ft; and to gain a greater understanding of how aquatic plant management and aquatic ecosystem processes affect each other); herbicide will move to a constant concentration in the waterbody after application..

HERBICIDE	EARLY SEASON RATE	LATE SEASON RATE	NOTES
Diquat	0.185 ppm	0.37 ppm	Short term control; do not use in turbid or muddy water
	0.25 gal/ac-ft	0.5 gal/ac-ft	
Copper ETA	0.5 ppm	1.0 ppm	Short term control; do not use in water with hardness <50 ppm
	1.5 gal/ac-ft	3 gal/ac-ft	
Endothall	2.0 ppm	3.0 ppm	May need to use drop hoses if treating through a thermocline
	1.3 gal/ac-ft	1.9 gal/ac-ft	
Fluridone	10 ppb	20 ppb	Slow acting, may need bump application 30 days after first
	0.86 oz/ac-ft	1.73 oz/ac-ft	
Florpyrauxifen-benzyl	30 ppb	50 ppb	Do not use if plant exposure time is less than 48 hrs
	4.05 oz/ac-ft	6.75 oz/ac-ft	

*****Diquat rates are based on a 3.73 lb/gal formulation, copper ETA rates are based on a 0.9 lb/gal formulation, endothall rates are based on a 4.23 lb/gal formulation, fluridone rates are based on a 4.0 lb/gal formulation, and florpyrauxifen-benzyl rates are based on a 2.5 lb/gal formulation; see Turnage (2019) regarding herbicide labels and formulation determination.

†This table is meant to be an aid in mixing herbicide solutions; it is not meant to be used as a replacement for herbicide label recommendations.

Figure 1. Image of spines on hydrilla leaves (left), dense infestation on a boat motor (center), and subterranean turions (right). Images courtesy of J. Madsen and W. Robles (2009).

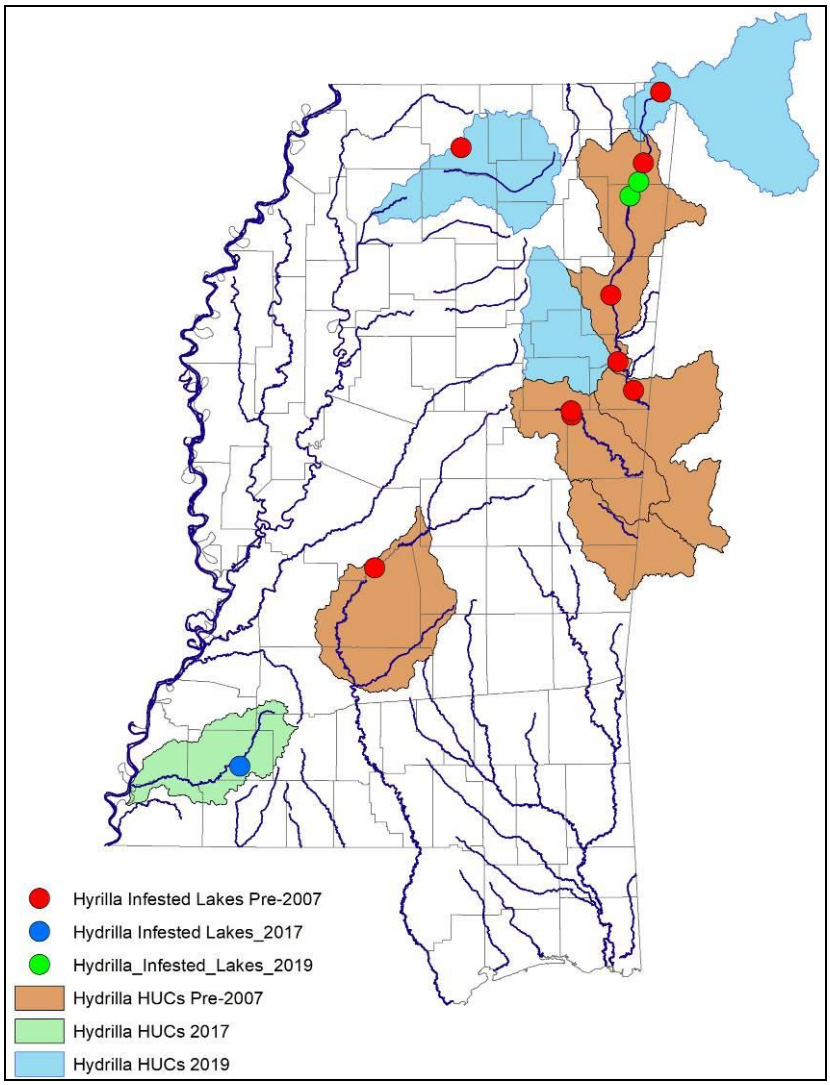

Figure 2. Mississippi Hydrologic Units and waterbodies infested by hydrilla according to surveys by Turnage and Shoemaker (2018) and Turnage et al. (2019). Hydrologic units are based on HUC 8 codes.

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