Variations in Water Exchange Characteristics Among Hydrilla (*Hydrilla verticillata* (L.f.) Royle) Sites in the Ross Barnett Reservoir

Bradley Sartain, Ryan M. Wersal, and John D. Madsen Geosystems Research Institute, Mississippi State University

Introduction

The Ross Barnett Reservoir is a 33,000 acre water body located in Central Mississippi. It serves as the primary water supply for the state's capital city, as well as, many recreational water activities. The reservoir is home to a variety of both emergent and submersed aquatic plants, including hydrilla (*Hydrilla verticillata*). Management efforts have been implemented since 2006 in order to prevent the spread of hydrilla populations within the reservoir. Within aquatic plant communities, water exchange characteristics can be very subtle; utilizing dye studies offers insight into bulk water-exchange which can enable herbicide half-lives to be determined prior to herbicide application (Wersal and Madsen 2011). Studies have shown significant relationships between the dissipation rates of rhodamine WT dye and aquatic herbicides (Turner et al. 1994, Fox et al. 1991). To date, there has never been a rhodamine WT dye study done at the Ross Barnett Reservoir. The utilization of this dye at the Ross Barnett will allow for more sound aquatic plant management and will result in site specific treatments where appropriate herbicides, application rates, and treatment techniques can be used to gain optimal control within a given area.

Materials/Methods

During May 25-26, 2011, a point-intercept survey was conducted at 16 sites where hydrilla was previously found (Figure 1). Percentage of hydrilla occurrence was shown to be anywhere from 0% to 100% based on the points surveyed. Using management data from previous years, including herbicide selection and survey data, four hydrilla sites were chosen for water exchange studies. The four sites have exhibited inadequate control in previous years; however, little information regarding site characteristics is known, including bulk water exchange. Rhodamine WT, fluorescent dye was applied to the water column (Figure 2) at a concentration of 10 parts per billion (ppb), which is standard for water exchange evaluations, at four hydrilla sites (Wersal and Madsen 2011). The concentrations of Rhodamine WT dye throughout the water column were measured using a Turner Designs field fluorometer. The field fluorometer is capable of detecting rhodamine dye at a concentration of 0.01 ppb (Wersal and Madsen 2011). Dye readings were conducted at pre-determined points that are equally spaced between each other. The concentrations at each point were measured at three depth intervals: surface, middle, and bottom depths. Dye concentrations were monitored immediately after treatment (0 hour), one hour after treatment, and at three hour intervals until dye concentrations were no longer detected (Figure 4). Once the dye was no longer detected an exponential decay regression analysis was conducted to determine a whole plot dye half life within each site.

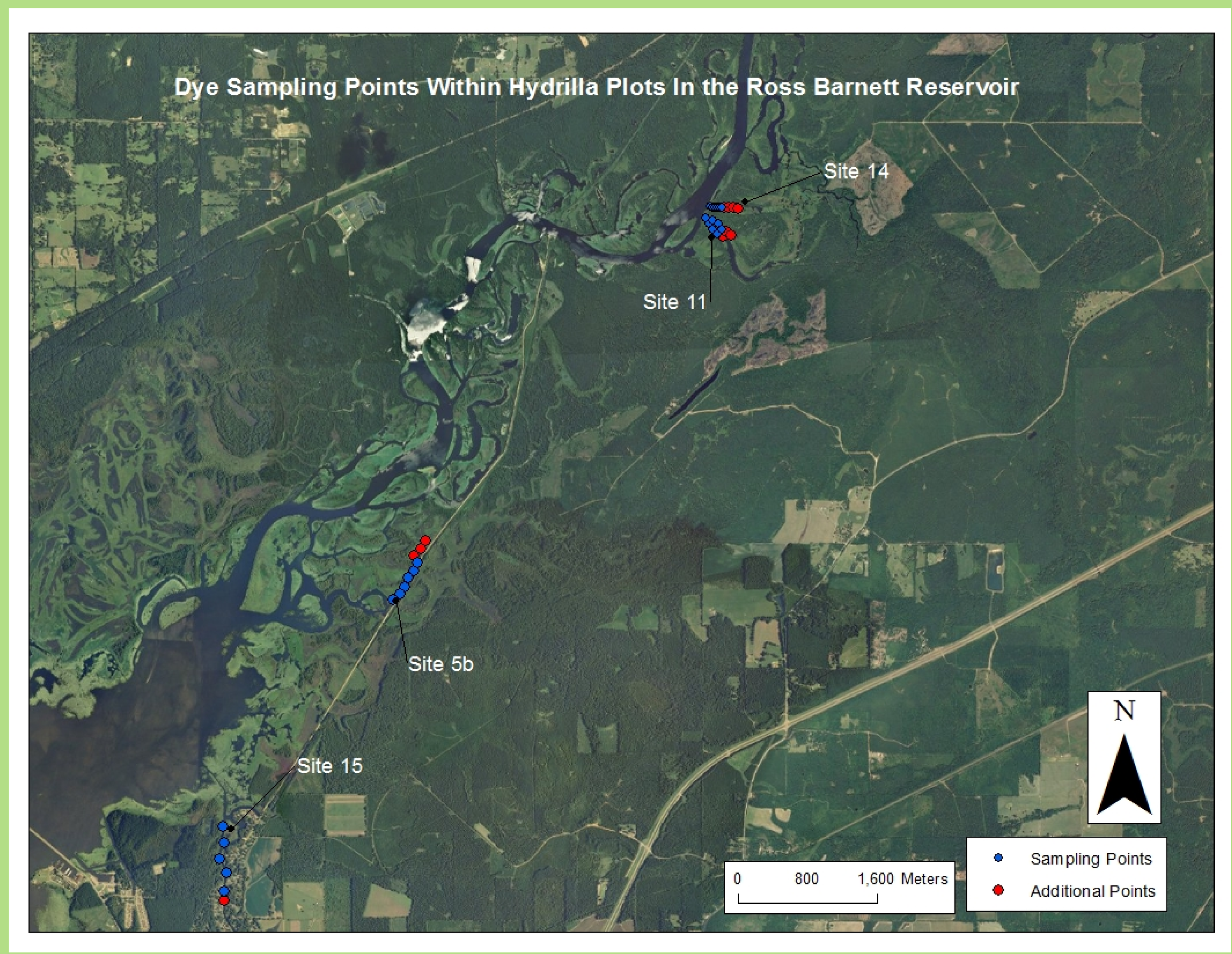

Figure 1: Pre-determined dye sampling points within the treatment plot (blue) and outside the treatment plot (red), where water samples were collected to track the movement of the dye within the four selected hydrilla sites.

Figure 2: Rhodamine WT dye being applied in site 15

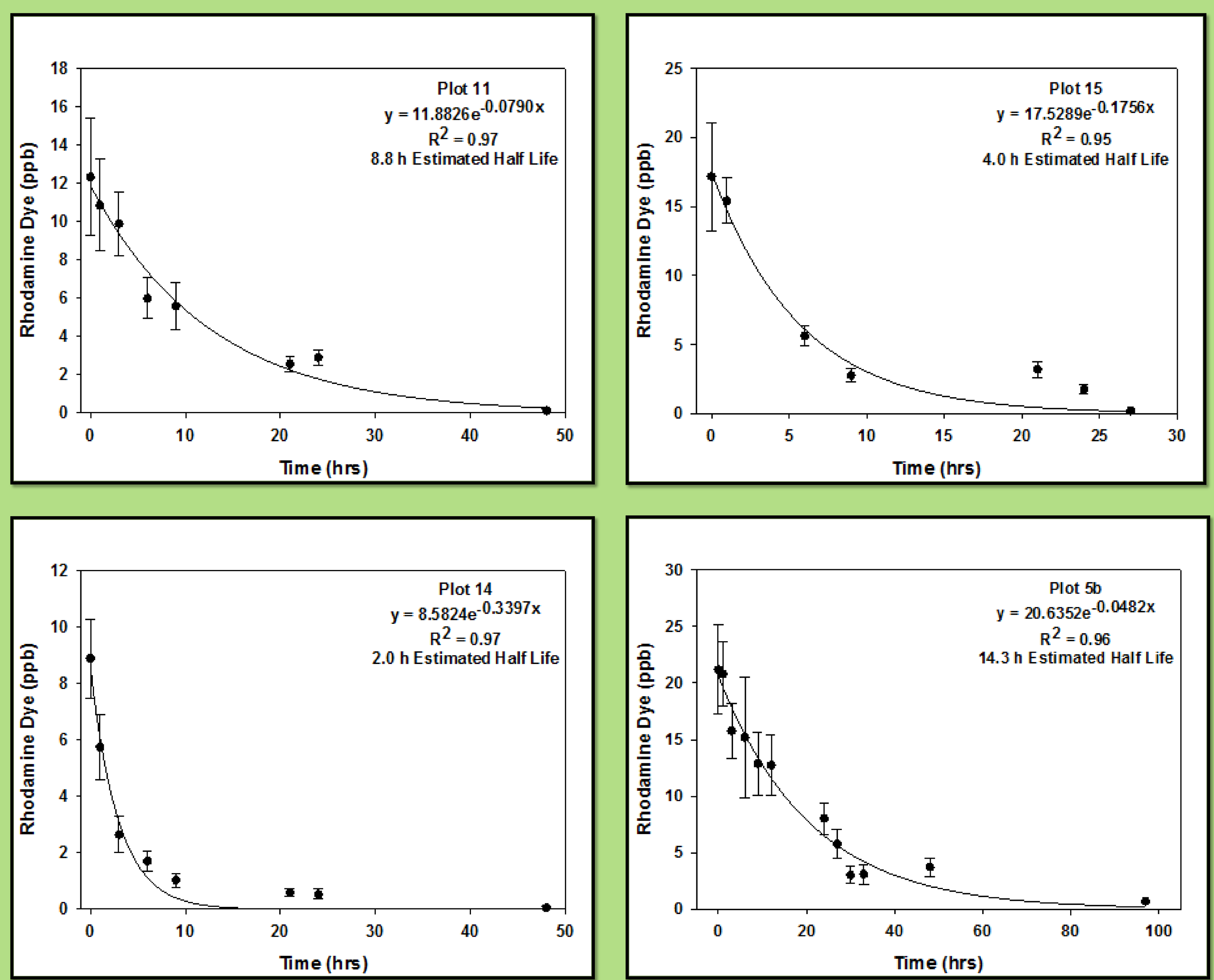

Figure 3: Rhodamine WT dye dissipation rates within each site

Results and Discussion

Water flow within the Ross Barnett Reservoir is impacting bulk water exchange within plant stands. The impacts are likely to be site specific; dye half-lives varied within each of the four sites (Figure 3), with a maximum of 14.3 hours and a minimum of 2.0 hours. During 2010, contact herbicides copper and diquat were used to treat all four sites. Sites 5b and 11 showed new growth of hydrilla during 2011 following the copper/diquat treatments. Granular combinations of fluridone (quick and slow release pellets) would be able to be maintained at an effective herbicide concentration due to the longer dye half-lives and may be the best treatment option in sites 11 and 5b. Site 15 showed good control of hydrilla with the copper diquat combination. Due to the short half-lives of Rhodamine WT dye at sites 14 and 15, contact herbicides may be needed in order to efficiently treat these areas. Both sites 14 and 15 are new sites that were discovered in 2010. The success in site 15 may be due to the fact that hydrilla was not able to establish a tuber bank. Although site 14 was not discovered until 2010, it is in close proximity to site 11 which was discovered in 2007, and may have been present well before 2010. The sites that show repeated annual growth have most likely established a tuber bank and multiple herbicide treatments need to be implemented annually.

Literature Cited

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Turner, E.G., K.D. Getsinger, and M.D. Netherland. 1994. Correlation of triclopyr and rhodamine WT dye dissipation in the Pend Oreille River. Journal of Aquatic Plant Management 32: 39-41.

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Figure 4: Samples of Rhodamine WT dye being taken at hydrilla site 11