

TECHNICAL PUBLICATION

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**Preliminary analysis of a field-scale
herbicide application of Aquathol K
to control *Hydrilla verticillata*
in Stormwater Treatment Area 2, Cell 3.**

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Introduction

Stormwater Treatment Areas (STAs) were constructed to achieve and maintain compliance with phosphorus (P) and other water quality standards according to the 1994 Everglades Forever Act. These large constructed wetlands are used to remove excess P from stormwater runoff prior to discharge into the Everglades Protection Area. STA-2 (Figure 1) is located on the Broward/Palm Beach county line, east of U.S. 27, and provides a total effective treatment area of 6,430 acres over three cells. STA-2, Cell 3 was designed to be dominated by native submerged aquatic vegetation (SAV).

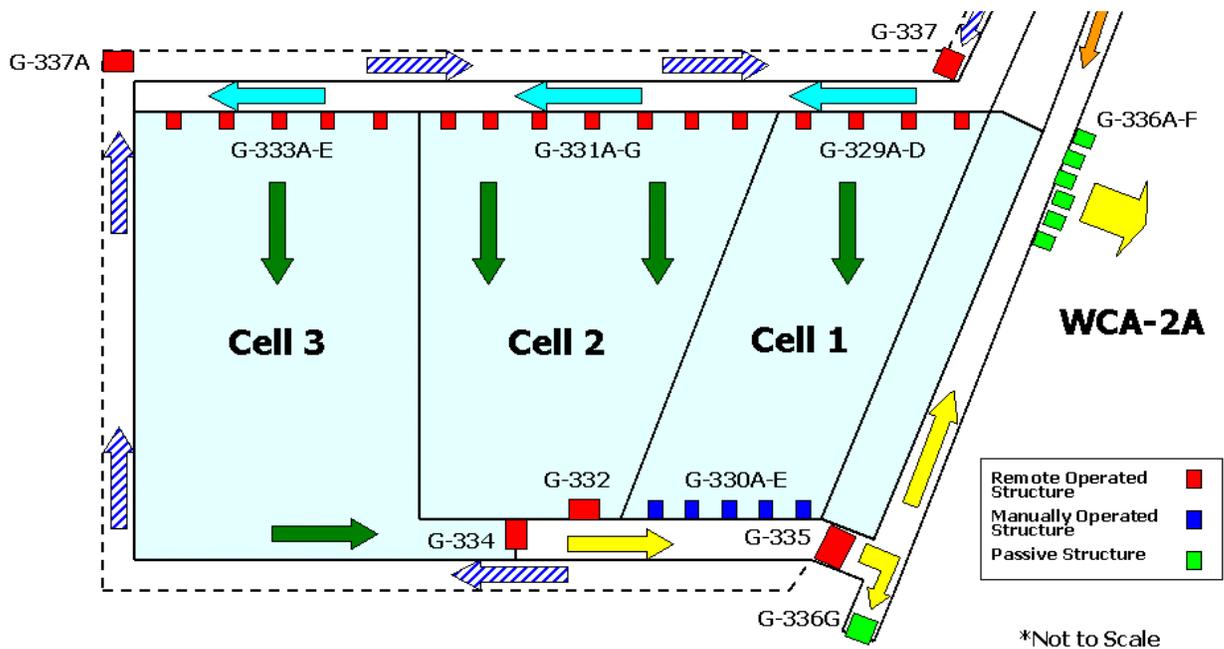


Figure 1. Schematic diagram of STA-2.

During the past year *Hydrilla verticillata* began to spread throughout the northern portion of Cell 3. *Hydrilla* is an extremely invasive aquatic plant that may form dense mats of vegetation, out competing native SAV species, such as *Najas guadalupensis* and *Ceratophyllum demersum*. The northern portion of STA-2, Cell 3 was treated with two herbicide applications in April 2004 in an attempt to drastically reduce the presence of *Hydrilla* in this system. Since this was the first time that *hydrilla* had been selectively targeted in an STA a small monitoring study was implemented to document the effects of this herbicide application on the SAV community composition. The objective of this report is to present the results of this monitoring study.

Methods

Herbicide application

Beginning in April 2004, 75.5 acres of the northern portion of STA-2, Cell 3 of SAV were treated with both liquid and granular herbicide Aquathol K in two separate applications. The targeted treatment area was divided into eight plots ranging in sizes from 2.5 acres to 30 acres (Figure 2).

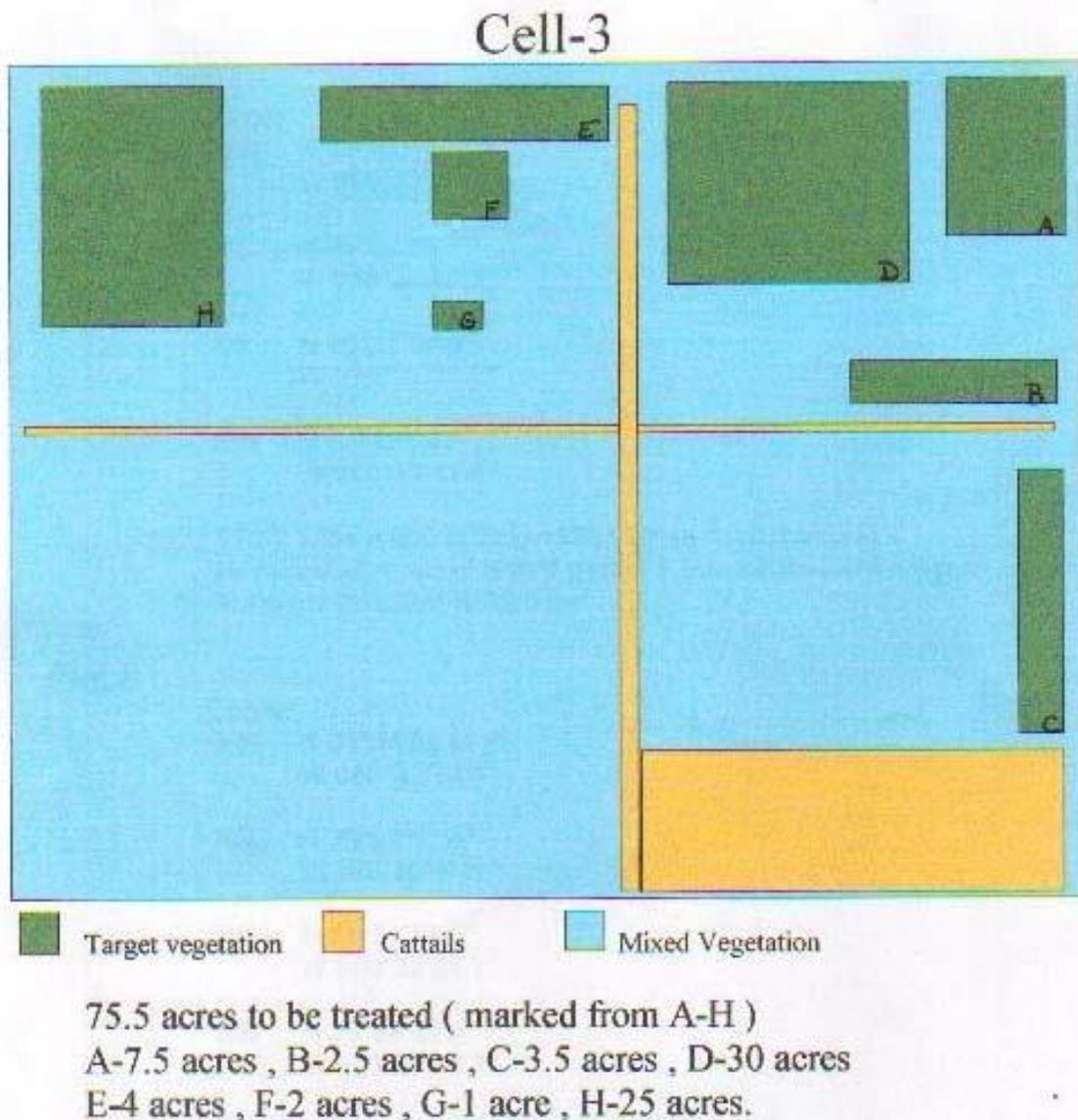


Figure 2. Schematic of treated areas.

Two (plots A and H) of the eight plots were selected for vegetation monitoring. Plot A encompassed 7.5 acres and was located near the eastern levee, while Plot H was 25 acres

and located near the western levee, both plots consisted of 43% of the total treatment area.

The first application of liquid herbicide Aquathol K was applied on April 21, 2004, at a rate of 3 ppm. Shortly following the application, Vegetation Management staff conducted a field reconnaissance and deemed that the application was not effective, and a second application was needed. Therefore, granular Aquathol K was applied at a rate of 4 ppm on May 20, 2004. Each application was applied from an airboat.

Vegetation Survey

An initial pre-treatment survey, and three subsequent post-treatment surveys were conducted to determine the effects of the herbicide application on the species composition within the treated area. The pre-treatment survey was conducted April 14, 2004. The three post-treatment surveys were conducted in June, August and September 2004.

We employed the line intercept method for this monitoring event. Within the two selected plots, we extended a transect line, centrally positioned, and parallel to flow. A survey node was located every 15.4 meters along this transect, such that Plot A consisted of 16 nodes, and Plot H had 21. From each nodal point, a 10 meter intercept was extended perpendicular to the node. The species of vegetation present along this intercept was noted at half-meter intervals.

Water Quality

Two autosamplers were installed at G334, the outflow of STA-2, Cell 3. Time proportional water samples were collected daily while the outflow gates were closed, beginning April 21 and extending through June 23, 2004. Sampling was increased to twice a day when the gates were open, beginning on June 24 and extending through July 5, 2004, when the autosamplers were removed. Water samples were analyzed for total P (TP) concentration.

Results

The pre-herbicide survey indicated that Plots A and H were dominated by *Hydrilla*, containing 59 and 68% *Hydrilla*, respectively. Additionally, open water (no plants

present) was the second most prevalent group within these plots, making up 23 and 14% of Plots A and H, respectively. These two groups were present at over 80% of the surveyed sites within the two plots, with *Ceratophyllum*, *Najas*, *Utricularia* spp., and *Potamogeton* spp. present at the remainder (Figure 3A).

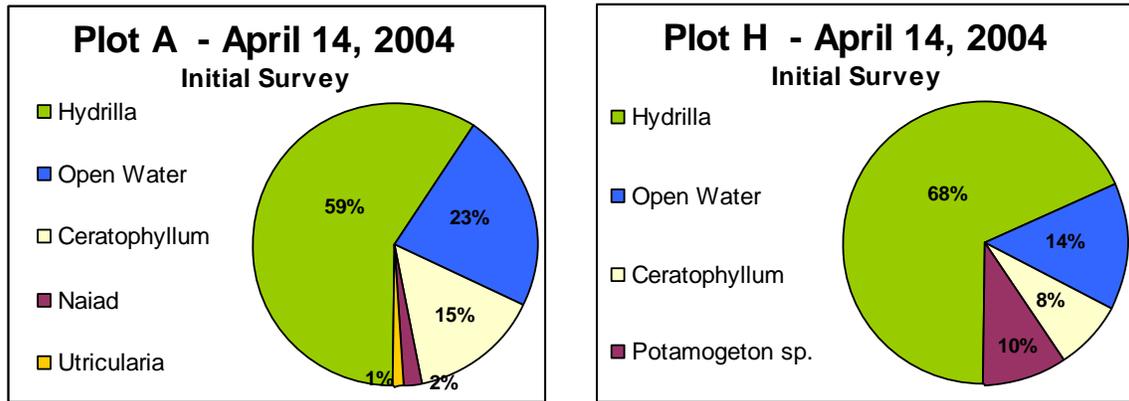


Figure 3A

The first survey conducted following the two applications of herbicide (June 15, 2004) indicated a decrease in the presence of *Hydrilla* and an increase in open water (Figure 3B). The herbicide application in Plot H resulted in a greater reduction of *Hydrilla* presence (from 68 to 20%) than was found in Plot A (from 59 to 46%). Similarly, the increase in open water areas was greater in Plot H than in Plot A, with open water present at 78 and 39% of the sites, respectively. The presence of native species, such as *Najas* decreased in both plots, while *Ceratophyllum* presence decreased only in Plot H.

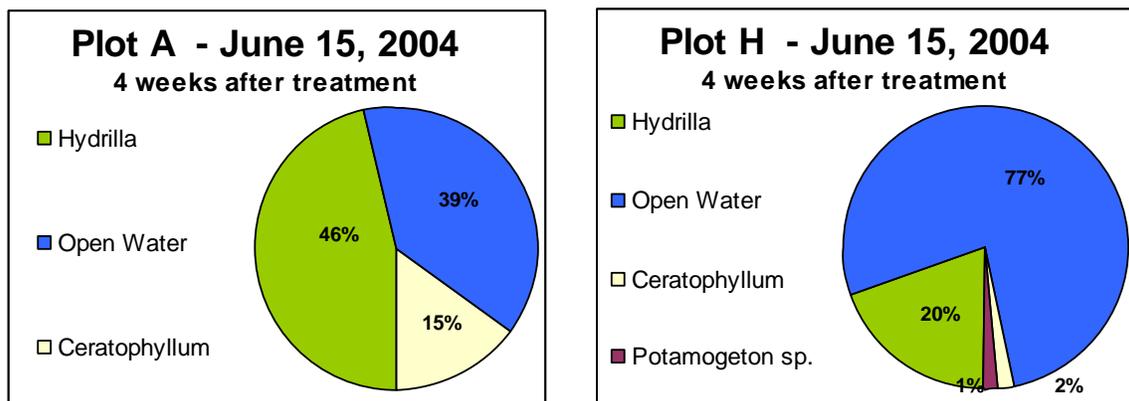


Figure 3B

The survey conducted ten weeks post-treatment (August 4, 2004) indicated an increase in *Hydrilla* presence in both plots relative to the pre-treatment period (Figure 3c). *Hydrilla* presence increased to 78 and 88% percent coverage in Plots A and H,

respectively. Similarly, this resulted in an overall decrease in the presence of other vegetation species and open water-sites.

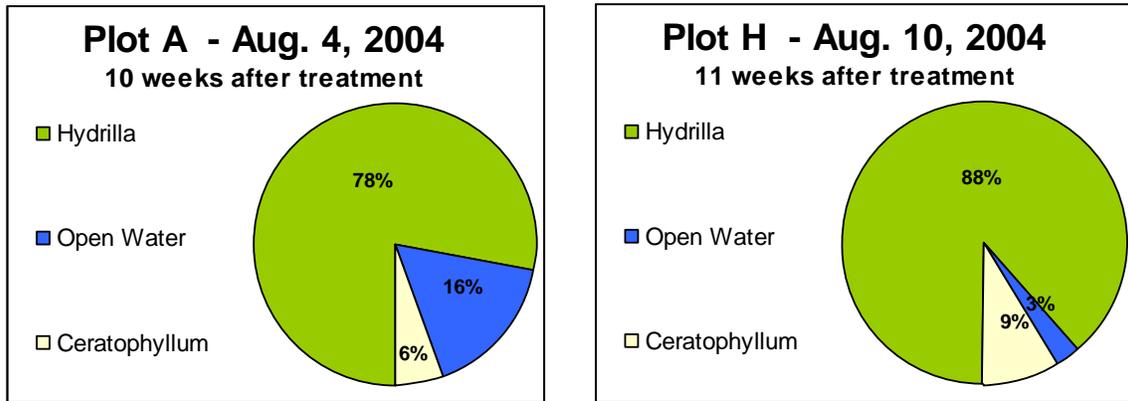


Figure 3C

The final survey was conducted on September 21, 2004, which was 2.5 weeks after the arrival of Hurricane Frances. Plot A was devoid of all vegetation with open-water present at all sites (Figure 3d). We did notice that a large volume of SAV was piled onto the eastern levee of STA-2, Cell 3. This would be consistent with the direction of hurricane generated wind gusts. The mixture and percent presence of vegetation species in Plot H was essentially unchanged relative to the previous survey, with the exception of the presence of *Pistia stratiotes* at 11% of the sites.

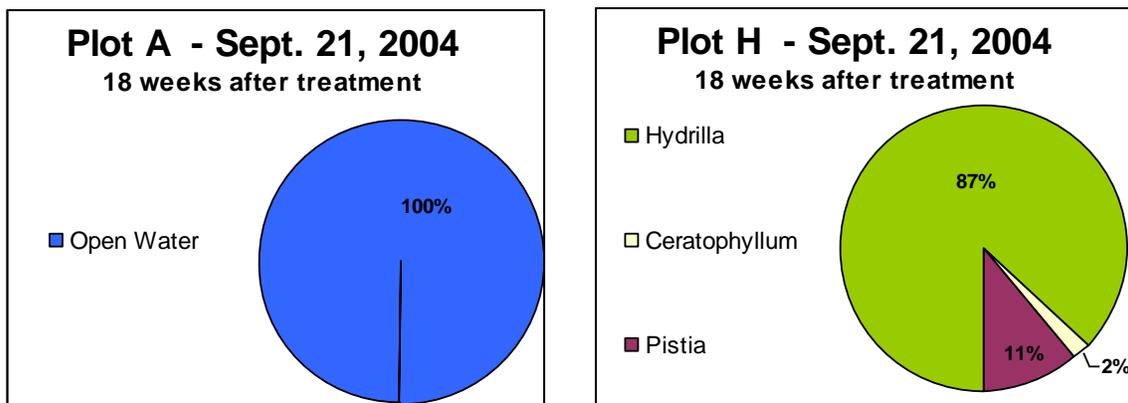


Figure 3D

Water Quality

An initial increase in TP concentration within the water column at the outflow gates was noted during the static period following the herbicide treatment (Figure 4). However,

by the time flow was restored and the outflow gates opened, the TP concentrations returned to pre-herbicide levels.

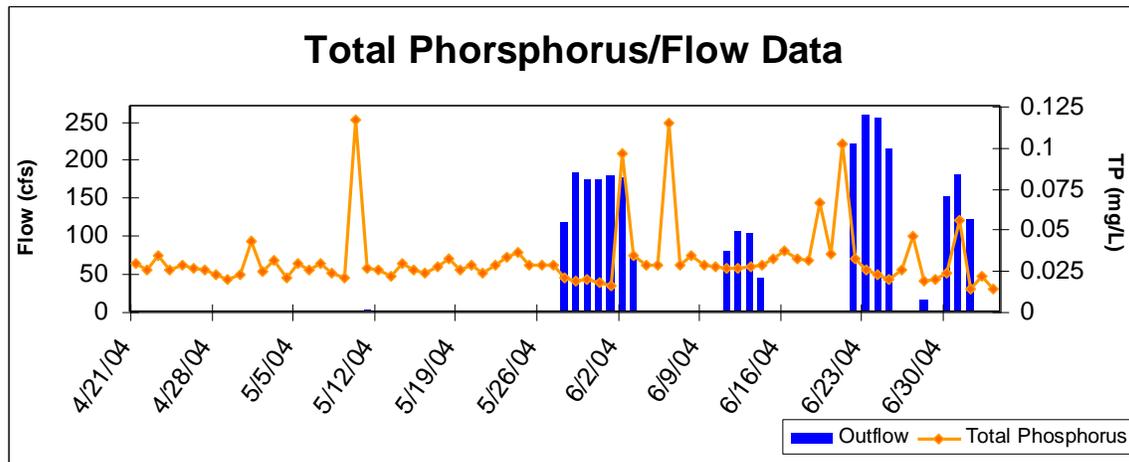


Figure 4

Associated Costs

The cost of the chemical for the first application of Aquathol K was \$12,967. The equipment costs including an airboat, trailer and utility truck for the three days of the applications totaled \$291. The labor cost for the three technicians who applied the treatments was \$1800. The total cost of the first treatment was \$15,058.

The second treatment was applied at a higher concentration (4 ppm) and used a granular formulation of the endothall product. The cost of the chemical in the second application was \$32,555. Equipment costs and applicators labor was similar to the first application bringing the total for the second treatment to \$34,646. Total for the both treatments was \$49,704, or a cost of \$41,529.35 per acre.

Summary

The collective results of the post-treatment surveys indicated an increase in the presence of *Hydrilla* and a decrease in the presence of other vegetation species, such as *Ceratophyllum*, indicating that this herbicide treatment was ineffective at decreasing the presence of *Hydrilla*. Several visual assessments of the other six plots indicated that the *Hydrilla* presence appeared to be similar to pre-treatment conditions, corroborating that conditions found in Plots A and H were not an aberration. Therefore, based on the results of this study, it is our finding that this method of *Hydrilla* eradication within the STAs was not cost-effective within this system.