

**Post-Treatment Assessment  
for Aquatic Plant Control  
ERDC Demonstration Project  
Stewart Park, Cayuga Lake  
Ithaca, New York  
2019**

**Contract No. W912P4-16-0002**

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**US Army Corps  
of Engineers®**  
Buffalo District  
*BUILDING STRONG®*

**Prepared for:**

**UNITED STATES ARMY CORPS OF ENGINEERS**  
Buffalo District

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## List of Abbreviations and Acronyms

APCRP	Aquatic Plant Control Research Program
E & E	Ecology and Environment, Inc., member of WSP
ERDC	Engineer Research and Development Center
GPS	Global Positioning System
HPLC	high-performance liquid chromatography
Hydrilla	<i>Hydrilla verticillata</i>
NYSDEC	New York State Department of Environmental Conservation
ppb	parts per billion
ppm	parts per million
Project	Stewart Park, Cayuga Lake Hydrilla Demonstration Project
SePRO	SePRO Corporation
SLM	SOLitude Lake Management, LLC
SOW	scope of work
TAT	turnaround time
USACE	United States Army Corps of Engineers (Buffalo District)

# 1

## Introduction

The Stewart Park, Cayuga Lake Hydrilla Demonstration Project (the Project) is a field-scale demonstration of a technology developed under the United States Army Corps of Engineers – Buffalo District’s (USACE’s) Aquatic Plant Control Research Program to manage monoecious hydrilla (*Hydrilla verticillata*; Hydrilla) in a high water exchange environment.

This report contributes to the Year 2 post-treatment monitoring and assessment of herbicide efficacy on Hydrilla by summarizing field conditions during the treatment; summarizing herbicide treatment methodology and contact time; and identifying lessons learned to benefit future work. [Note: Year 1 efforts were summarized in the *Post-Treatment Assessment for Aquatic Plant Control, ERDC Demonstration Project, Wells College Bay, Cayuga Lake 2018* (E & E 2018).]

### 1.1 Background

Hydrilla is a very aggressive, submerged aquatic plant. Treatment of Hydrilla at the southern end of Cayuga Lake began in 2013, and the USACE began leading herbicide application efforts in 2018, as discussed below. Given the ease with which this plant spreads by fragments, proximity to the Erie Canal, and heavy use of the waterway, this infestation has caused urgent concern regarding spread to other areas of Cayuga Lake, the Finger Lakes, the Erie Canal system, and, potentially, the Great Lakes. These concerns provided the impetus for implementing this Project.

The majority of the Hydrilla treated as a part of the first year of the Project was identified along the shoreline of Stewart Park. Two copper spot treatments were conducted in 2018. During the second year of treatment to control and eradicate Hydrilla, treatment occurred within a 70-acre treatment area that focused on application of fluridone (Sonar® H4C). The 70-acre area is located along approximately 3,500 linear feet of shoreline at Stewart Park (see Figure 1-1). The water depths in the treatment area range from approximately 0 to greater than 8 feet with an average depth of 4.67 feet. Additionally, a 6.5-acre area near the Cornell Sailing Center, northeast of the 70-acre treatment area near Stewart Park, was spot treated with fluridone and copper (Harpoon® Granular) (see Figure 1-1).

These treatment areas were delineated by the USACE to provide detailed maps for targeting Hydrilla beds in these blocks.

Implementation of the Project was a collaborative effort between the Engineer Research and Development Center (ERDC); USACE; Ecology and Environment, Inc., member of WSP (E & E); New York State Department of Environmental Conservation (NYSDEC); the City of Ithaca; the Tompkins County Soil and Water Conservation District; the Tompkins County Health Department; Finger Lakes Partnership for Regional Invasive Species Management; Cayuga Lake Watershed Network; and the applicator, SOLitude Lake Management, LLC (SLM). Although the USACE was not required to obtain an Article 15, New York Code of Rules and Regulations Part 327 aquatic pesticide permit for this Project, reasonable measures were taken to meet the intent and conditions that would be associated with such a permit.

## **1.2 Purpose and Scope**

The purpose of the Project is to perform a field-scale demonstration of a technology developed under the Aquatic Plant Control Research Program (APCRP) to evaluate the effectiveness of an aquatic herbicide to manage monoecious hydrilla in high water exchange environments. The USACE is also funding a separate research project titled “Improving Chemical Control in High Water Exchange Environments in Northern Waters”; this line of research has been ongoing since 2010. This method and the underlying concepts are being tested against monoecious Hydrilla at the Tonawanda Creek/Erie Canal demonstration project in Western New York, Wells College Bay, as well as this Project.

The findings in this program will provide valuable information for developing future guidance on how to manage this invasive aquatic plant that is expanding in high water exchange systems throughout the northeastern United States. The sprouting dynamics of Hydrilla tubers and condition of plants were monitored by the USACE prior to and several weeks post-treatment to determine optimal timing of treatment, length of exposure and concentration of herbicide required for effective control of Hydrilla.

This post-treatment report includes a summary of the herbicide treatment methodology, including quantity of herbicide used and total acreage treated; a discussion of herbicide contact time and dispersion through the system; and a discussion of the monitoring that accompanied the herbicide application. Lastly, conclusions are provided, in the form of lessons learned, to help shape future treatment projects.

**Figure 1-1**

**Hydrilla Treatment Areas - Summer 2019  
Cayuga Lake, Tompkins County, New York**

 Stewart Park Fluridone Treatment Area  
(69.9 acres)- Summer 2019

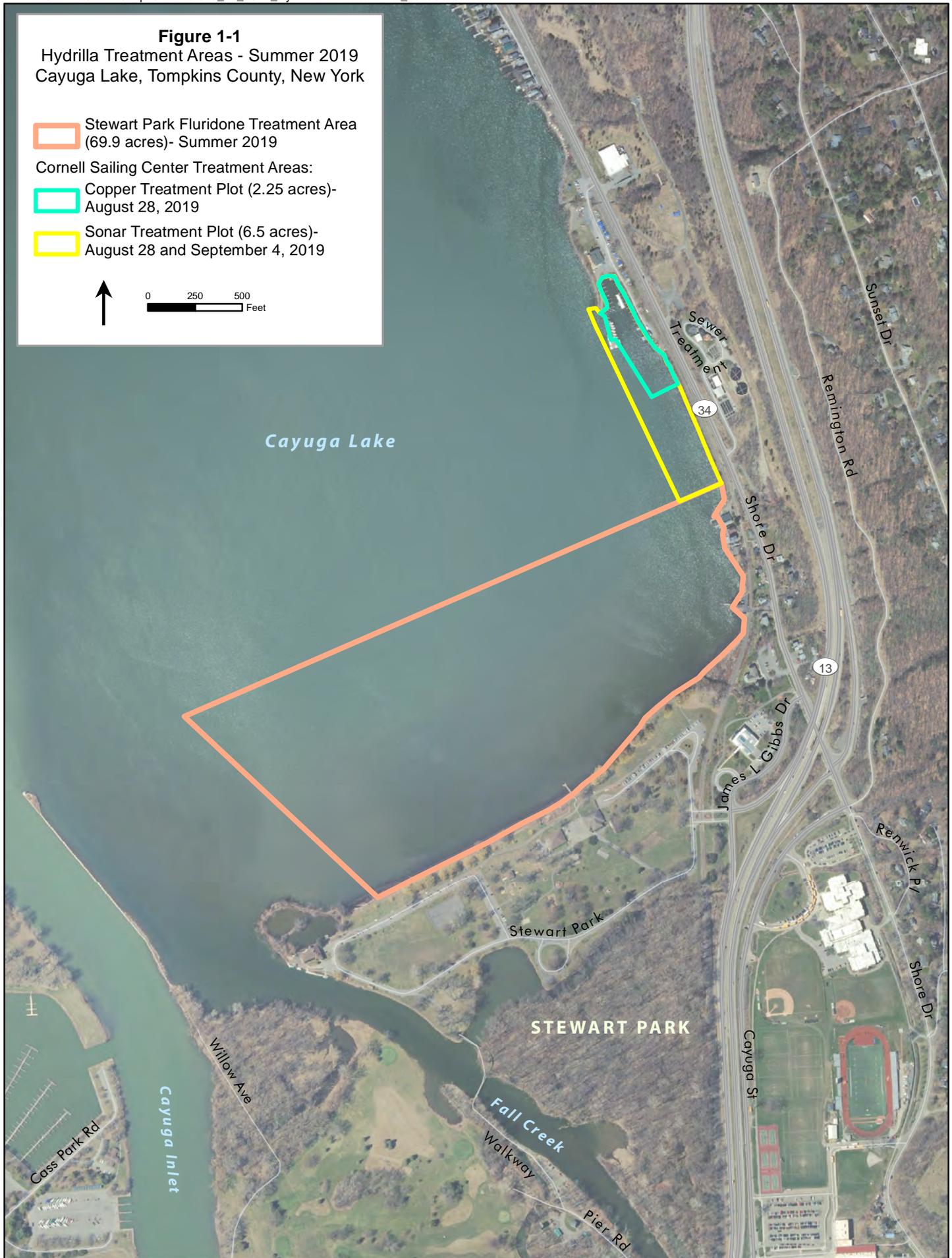
Cornell Sailing Center Treatment Areas:

 Copper Treatment Plot (2.25 acres)-  
August 28, 2019

 Sonar Treatment Plot (6.5 acres)-  
August 28 and September 4, 2019



0 250 500  
Feet



# 2

## Overview of Herbicide Treatment and Monitoring

Treatment of Hydrilla for this Project focused on the application of the aquatic herbicides fluridone (Sonar® 4HC) and copper (Harpoon® Granular) within Cayuga Lake near Stewart Park and the Cornell Sailing Center in Ithaca. The following sections outline the public notification that preceded treatment; field conditions before, during, and after treatment; herbicide treatment methodology; and quantity of herbicide used.

### 2.1 Public Notification

Public awareness and understanding of the Project were important to its successful implementation. The USACE and its interagency partners conducted outreach activities to potentially affected users in advance of treatment. The outreach and notification activities associated with treatment near Stewart Park included the following:

- Dates for the initial treatments were provided to NYSDEC, the Tompkins County Health Department, the City of Ithaca, the Bolton Point water treatment plant, and the Cayuga Lake Watershed Network and email reminder notifications were sent out 24 hours prior to each treatment;
- Written notifications were sent certified mail 17 days prior to the first fluridone treatment to all riparian owners/users within the half-mile buffer (north and west) of the treatment area;
- Agency notification letters were distributed approximately 10 days prior to the first fluridone treatment; and
- Yellow warning signs were deployed and maintained at public access points along the lakeshore at the commencement of each treatment. The signs indicated applicable water use restrictions regarding irrigation and drinking, culinary, or food processing purposes. The signs also displayed water use restrictions that were in effect for the duration of the treatment and until the times listed were reached, or until testing determined that the threshold concentration had been met.

Tompkins County Soil and Water Conservation District posted and maintained the yellow warning signs (as described above) to meet the intent of permit requirements. Application dates and times were updated on the signs prior to

## 2 Overview of Herbicide Treatment and Monitoring

each of the 10 fluridone treatments. As in the first year of the Project, NYSDEC did not require any newspaper notifications of the treatment activities.

Public notification efforts for the two spot treatments in Ithaca near the Cornell Sailing Center included a certified mailing of those riparian owners within ½ mile of the 6.5-acre spot treatment area that were not part of the Stewart Park mailing. Written notifications were mailed five days prior to the first spot treatment on August 28, 2019. Additionally, several warning signs were placed in the vicinity of the sailing center.

### 2.2 Herbicide Treatment Methodology

The aquatic herbicide fluridone was applied in designated sections of Cayuga Lake during 10 treatment events that occurred between June and September 2019 (see Table 2-1). Additionally, spot treatments of fluridone and copper were applied on two dates near the Cornell Sailing Center. The herbicide applications were completed by SLM in accordance with the *Architect-Engineer Scope of Work (SOW) Aquatic Plant Control ERDC Demonstration Project Wells Stewart Park, Cayuga Lake, Ithaca, NY*, dated May 22, 2019, and subsequently amended with a modification dated July 31, 2019 (USACE 2019a and 2019b).

Two boats were used for the herbicide applications. The primary boat used was an airboat. Depending on availability, a 20-foot work skiff powered by a conventional outboard motor was also used for the treatment effort in all areas.

#### 2.2.1 Herbicide Transfer

A Vortex spreader was used for the fluridone treatments. An Agri-Fab granular spreader was used for the copper treatments. A 20-foot skiff and airboat were utilized during the treatments and were outfitted with a Vortex spreader and granular spreaders. Herbicide transfer occurred at the Allen H. Treman State Park launch, where the chemical delivery truck was able to park so that access to the boat launch could be maintained during the herbicide transfer process. The fluridone was delivered in 40-pound buckets and the copper was delivered in 20-pound bags. The empty buckets and bags were triple rinsed and recycled at the Montgomery-Otsego-Schoharie Counties' Solid Waste Management Authority Oneonta Transfer Station. Personal protective equipment was worn by SLM staff during the transfer from the truck to the treatment system.

#### 2.2.2 Herbicide Application

##### Stewart Park

Two methods of application were used throughout the treatment season. Vortex spreaders on the front of the boats were used primarily in the earlier treatments, and Vortex blowers were used later in the season. Neither method involved subsurface injections to the lake. The boats had Global Positioning System (GPS) navigation systems, with all the treatment sectors preloaded. Treatment passes were made parallel to the shoreline. The quantity of herbicide needed for each section was determined by the total acreage and volume of the treatment areas.

## **2 Overview of Herbicide Treatment and Monitoring**

All product was applied to each section before moving to the next adjacent section.

For all 10 fluridone treatments, the boat was launched at the Allen H. Treman State Park launch. SLM staff arrived at the boat launch between 9:00 AM and 10:00 AM on each scheduled treatment day, with the exception of August 22 and September 9. On August 22, SLM treated both the Aurora and Stewart Park sites, treatment at Stewart Park began in the early afternoon. On September 9, the Cornell Sailing Center spot treatment was completed first, followed by the Stewart Park application, which commenced around 11:00 AM. The staff included a lead applicator and an assistant/technician that assembled the treatment systems before going out for treatment. With the exception of the two dates noted above, treatment started around 9:30 AM.

### **Cornell Sailing Center**

Spot treatments near the Cornell Sailing Center were done on the same day as fluridone treatments at Stewart Park. A 20-foot skiff was used with a Vortex spreader and it was launched at the Cornell Sailing Center. On August 28, 2019, the fluridone treatment at Stewart Park preceded the spot treatment; the fluridone and copper spot treatment began at the Cornell Sailing Center at 9:00 AM. On September 4, 2019, the fluridone spot treatment began around 9:00 AM and the Stewart Park application followed. Fluridone was prepared and loaded as described above for Stewart Park. The copper herbicide was poured into the granular spreader and evenly distributed over the surface at the bow of the boats.

## **2.3 Quantity of Herbicide Used and Total Area Treated**

### **Stewart Park**

Ten fluridone treatments were scheduled in the 70-acre treatment area during the summer of 2019. The treatment plan specified that the first two treatments would consist of application of fluridone to achieve a target concentration of 20 parts per billion (ppb), and the third through tenth treatments would achieve a target concentration of 13.75 ppb (see Table 2-1). Treatments were conducted every seven days, with one exception: there were two weeks between treatments seven and eight due to a lack of Hydrilla observations in the treatment area and to minimize effects on non-target species.

The eighth and ninth fluridone treatments were reduced by 10% (or 46 pounds of fluridone) to allow for treatment of the additional Hydrilla infestation near the Cornell Sailing Center.

## 2 Overview of Herbicide Treatment and Monitoring

**Table 2-1 In-lake Fluridone Herbicide Application at Stewart Park  
Summary by Treatment**

Date	Target Concentration (ppb)	Total Pounds of Sonar H4C
6/27/19	20	659
7/3/19	20	659
7/11/19	13.75	453
7/18/19	13.75	453
7/25/19	13.75	453
8/1/19	13.75	453
8/8/19	13.75	453
8/22/19 <sup>1</sup>	12.375	407
8/28/19 <sup>1</sup>	12.375	407
9/4/19	13.75	453
<b>Total Pounds</b>		<b>4,850</b>

Note:

<sup>1</sup> These treatments had a 10% reduction in fluridone for the reason noted above.

Key:

ppb = parts per billion

### Cornell Sailing Center

Two in-lake spot treatments occurred in the 6.5-acre treatment area delineated near the Cornell Sailing Center. These occurred on August 28 and September 4, 2019. The August 28, 2019, treatment combined fluridone and copper (Harpoon® Granular), and the September 4, 2019, treatment was comprised only of a fluridone treatment (see Table 2-2). Fluridone was applied at 20 ppb for both applications, and copper was applied at 1,000 ppb (1 part per million [ppm]). The maximum application rate for fluridone was 72.5 pounds due to the presence of the water intake.

**Table 2-2 Cornell Sailing Center Spot Treatment Summary**

Date	Acres	Target Sonar® H4C Concentration (ppb)	Total Pounds of Sonar® H4C	Target Harpoon® Concentration (ppb)	Total Pounds of Harpoon®
8/28/19	6.5 – Sonar	20	72.5	N/A	N/A
	2.25 – Harpoon	N/A	N/A	1	797.7
9/4/19	6.5 - Sonar	20	72.5	N/A	N/A

Key:

ppm = parts per billion

## 2.4 Water Quality Sampling

Fluridone was applied during 10 treatment events, between June 27, 2019, and September 4, 2019. E & E performed in-lake water quality sampling to determine the fluridone concentrations and dispersion of herbicide between July 1, 2019, and September 9, 2019. Refer to Appendix A for analytical results of the sampling. The USACE performed water quality sampling at 11 sites over four dates during the season.

Additionally, Tompkins County Health Department conducted water sampling at three locations following the all 10 fluridone treatments to determine fluridone concentrations and the results of that sampling are included in this report.

### 2.4.1 Stewart Park In-Lake Sampling

#### 2.4.1.1 E & E Sampling

E & E collected eight in-lake water samples following each of the 10 treatment events (see Figure 2-1 and Table 2-3 for sample locations). The purpose of the sampling was to determine the fluridone concentrations just prior to the next planned treatment event so that herbicide application could be refined, if necessary, to maintain the proper concentrations throughout each event (i.e., to ensure follow-up applications would not exceed approved rates/concentrations). The sampling events were weather dependent and scheduled so that results from each event were available for review by the Project team prior to the next application (i.e., there was a 48-hour turnaround time [TAT] for sample analyses that factored into planning each sampling event). Weekly sampling events occurred approximately four days following each application.

**Table 2-3 In-Lake Water Sample Collection Sites  
Stewart Park**

Sample Collection Site	Latitude <sup>a</sup>	Longitude <sup>a</sup>
Out N	42.473481892	-76.5052723852
Out W	42.4623608472	-76.5208066912
Treat 1	42.4637428386	-76.5076712464
Treat 2	42.4623983152	-76.5060771864
Treat 3	42.4647702219	-76.5052120563
Treat 4	42.4635210437	-76.5037594566
Treat 5	42.4657022987	-76.5027915151
Treat 6	42.4647391436	-76.5016345526

Note:

<sup>a</sup> Latitude and longitude are provided in decimal degrees (WGS84).

The samples were collected with a stainless-steel Kemmerer bottle sampler. The eight in-lake sampling locations consisted of the following (see Figure 2-1):

- Six sample locations in the 70-acre treatment block (Treat 1 through Treat 6);

## 2 Overview of Herbicide Treatment and Monitoring

- One sample approximately a half mile north of the treatment block (OutN); and
- One sample approximately a half mile west of the treatment block (OutW).

Samples from each sample location listed above were collected approximately 1 foot from the lake bottom to be representative of the fluridone concentrations where the plants were actively growing. The depth at each sample location was determined from the boat using a sounding tape, to confirm the depth at each location.

Prior to sample collection, the Kemmerer sampler was locked in the “open” position and completely submerged and rinsed in the surface water at each sample location. The Kemmerer was lowered so that the bottom edge of the cylinder was approximately 1 foot above the lake bottom for sample collection. After the messenger was sent down to “close” the Kemmerer sampler, each sample was retrieved and transferred into brown high-density polyethylene 30 milliliter sample bottles provided by the laboratory. Samples were stored protected from light and shipped in coolers to SePRO Corporation (SePRO) in Whitakers, North Carolina, for analysis.

In-lake water samples were analyzed using a high-performance liquid chromatography (HPLC) method specific for fluridone. The standard operating procedure for measuring fluridone is a proprietary HPLC method developed by SePRO. The laboratory reported results for fluridone at a reporting limit of 1 part per billion (micrograms per liter). Quality control samples were collected in the field during the post-application sampling period and consisted of field duplicate sample pairs collected at the same location at the rate of 5%.

Samples collected a half mile to the north and west of the lake treatment block were all below 1 ppb, whereas samples collected within the lake treatment block ranged from less than 1 ppb up to 6.9 ppb (see Table 2-4). This indicated that the fluridone did remain concentrated within the application site at the end of a week.

### 2.4.1.2 USACE Sampling

The USACE collected two samples at 11 sampling locations on four different dates following fluridone treatments (see Figure 2-1 and Table 2-5). One sample was collected in the middle of the water column, and one was collected at the lake bottom to address dilution and spread of herbicide. Due to the granular nature of fluridone, sampling in the middle of the water column is more likely to pick up herbicide residues than sampling at the water’s surface. Samples were analyzed using the RaPID assay (enzyme-linked immunosorbent assay) method (RaPID Assay Fluridone Test Kit).



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**Table 2-4 E & E In-Lake Water Sampling Results for Fluridone (ppb)**

Date	Sample Location	Time	Sample Depth	Fluridone Concentration (ppb) <sup>b</sup>
07/01/2019	Out N	1330	7 ft 7 in	<1
07/01/2019	Out W	1215	3 ft 9 in	<1
07/01/2019	Treat 1	1315	3 ft 5 in	<b>2.9</b>
07/01/2019	Treat 2	1310	7 ft 11 in	<1
07/01/2019	Treat 3	1305	7 ft 3 in	<b>1.2</b>
07/01/2019	Treat 4	1300	3 ft 8 in	<1
07/01/2019	Treat 5	1240	5 ft 2 in	<b>1.6/1.1<sup>b</sup></b>
07/01/2019	Treat 6	1250	3 ft 3 in	<b>5.9</b>
07/08/2019	Out N	1500	5 ft 4 in	<1
07/08/2019	Out W	1340	2 ft 8 in	<1
07/08/2019	Treat 1	1440	5 ft 7 in	<b>1.4</b>
07/08/2019	Treat 2	1435	2 ft 1 in	<b>1.5</b>
07/08/2019	Treat 3	1425	6 ft 2 in	<b>1.5</b>
07/08/2019	Treat 4	1420	2ft 0 in	<b>3.2</b>
07/08/2019	Treat 5	1400	5 ft 0 in	<b>1.5</b>
07/08/2019	Treat 6	1410	2 ft 0 in	<b>3.5</b>
07/15/2019	Out N	1130	6 ft 3 in	<1
07/15/2019	Out W	1020	2 ft 9 in	<1
07/15/2019	Treat 1	1115	5 ft 7 in	<1
07/15/2019	Treat 2	1120	2 ft 0 in	<b>4.5</b>
07/15/2019	Treat 3	1110	5 ft 7 in	<b>2.2</b>
07/15/2019	Treat 4	1100	2 ft 2 in	<b>3</b>
07/15/2019	Treat 5	1040	4 ft 4 in	<b>2.3</b>
07/15/2019	Treat 6	1050	2 ft 0 in	<b>2.8</b>
07/22/2019	Out N	1110	7 ft 4 in	<1
07/22/2019	Out W	1030	2 ft 7 in"	<1
07/22/2019	Treat 1	1103	6 ft 3 in	<1
07/22/2019	Treat 2	1058	1 ft 9 in	<b>4.7</b>
07/22/2019	Treat 3	1040	5 ft 5 in	<b>1.5</b>
07/22/2019	Treat 4	1053	1 ft 9 in	<b>3.9</b>
07/22/2019	Treat 5	1043	4 ft 3 in	<1
07/22/2019	Treat 6	1044	1 ft 6 in	<b>2.9</b>
07/30/2019 <sup>a</sup>	Out N	1218	6 ft 11 in	<1
07/30/2019 <sup>a</sup>	Out W	1202	3 ft 9 in	<1
07/30/2019 <sup>a</sup>	Treat 1	1251	7 ft 11 in	<1
07/30/2019 <sup>a</sup>	Treat 2	1257	2 ft 9 in	<1
07/30/2019 <sup>a</sup>	Treat 3	1242	7 ft 2 in	<1
07/30/2019 <sup>a</sup>	Treat 4	1238	2 ft 9 in	<b>1.3</b>

## 2 Overview of Herbicide Treatment and Monitoring

**Table 2-4 E & E In-Lake Water Sampling Results for Fluridone (ppb)**

Date	Sample Location	Time	Sample Depth	Fluridone Concentration (ppb) <sup>b</sup>
07/30/2019 <sup>a</sup>	Treat 5	1225	5 ft 11 in	<1
07/30/2019 <sup>a</sup>	Treat 6	1232	2 ft 7 in	<b>1.5</b>
08/05/2019	Out N	1639	7 ft 5 in	<1
08/05/2019	Out W	1548	3 ft 5 in	<1
08/05/2019	Treat 1	1626	6 ft 9 in	<b>3.4</b>
08/05/2019	Treat 2	1631	2 ft 7 in	<b>6.2</b>
08/05/2019	Treat 3	1620	6 ft 1 in	<b>4</b>
08/05/2019	Treat 4	1616	2 ft 7 in	<b>5.1</b>
08/05/2019	Treat 5	1604	5 ft 7 in	<b>1.5</b>
08/05/2019	Treat 6	1611	2 ft 4 in	<b>3.1</b>
08/12/2019	Out N	1155	6 ft 0 in	<1
08/12/2019	Out W	1110	2 ft 5 in	<1
08/12/2019	Treat 1	1142	5 ft 6 in	<b>3.2</b>
08/12/2019	Treat 2	1147	1 ft 6 in	<b>2.8</b>
08/12/2019	Treat 3	1137	6 ft 0 in	<b>2.4</b>
08/12/2019	Treat 4	1131	1 ft 7 in	<b>2.3</b>
08/12/2019	Treat 5	1118	4 ft 4 in	<1
08/12/2019	Treat 6	1123	1 ft 7 in	<b>1.2</b>
08/26/2019	Out N	1125	6 ft 4 in	<1
08/26/2019	Out W	1040	3 ft 8 in	<1/<1 <sup>b</sup>
08/26/2019	Treat 1	1111	6 ft 6 in	<b>3.6</b>
08/26/2019	Treat 2	1115	3 ft 1 in	<b>5.1</b>
08/26/2019	Treat 3	1108	7 ft 1 in	<b>1.4</b>
08/26/2019	Treat 4	1102	3 ft 2 in	<b>2.1</b>
08/26/2019	Treat 5	1048	5 ft 5 in	<1/<1 <sup>b</sup>
08/26/2019	Treat 6	1058	2 ft 8 in	<b>1.3</b>
09/03/2019	Out N	1235	6 ft 3 in	<1
09/03/2019	Out W	1127	2 ft 9 in	<1/<1 <sup>b</sup>
09/03/2019	Treat 1	1228	6 ft 4 in	<1
09/03/2019	Treat 2	1221	2 ft 2 in	<b>2.4</b>
09/03/2019	Treat 3	1215	6 ft 6 in	<b>2.1</b>
09/03/2019	Treat 4	1211	2 ft 0 in	<b>3.4</b>
09/03/2019	Treat 5	1200	4 ft 7 in	<1
09/03/2019	Treat 6	1206	1 ft 9 in	<b>2</b>
09/09/2019	Out N	1213	6 ft 3 in	<1
09/09/2019	Out W	1124	2 ft 8 in	<1
09/09/2019	Treat 1	1207	6 ft 6 in	<b>1.7</b>
09/09/2019	Treat 2	1202	2 ft 0 in	<b>6</b>
09/09/2019	Treat 3	1158	6 ft 3 in	<b>2.6</b>
09/09/2019	Treat 4	1154	2 ft 0 in	<b>5.2</b>

## 2 Overview of Herbicide Treatment and Monitoring

**Table 2-4 E & E In-Lake Water Sampling Results for Fluridone (ppb)**

Date	Sample Location	Time	Sample Depth	Fluridone Concentration (ppb) <sup>b</sup>
09/09/2019	Treat 5	1144	5 ft 0 in	<b>3.7</b>
09/09/2019	Treat 6	1150	1 ft 8 in	<b>6.9</b>

Notes:

<sup>a</sup> Sampling was to occur on July 29, 2019, per the Sampling and Analysis Plan. However, sampling was delayed by one day.

<sup>b</sup> Two reported results in a single cell indicate an instance where a field duplicate sample was collected.

Bold values denote positive detections.

Key:

ft = feet

in = inches

ppb = parts per billion

**Table 2-5 USACE In-Lake Water Sampling Results for Fluridone (ppb)**

Sampling Location	Fluridone Concentration (ppb)			
	7/16/19	8/7/19	8/27/19	9/16/19
<b>IFS1 MID</b>	<b>3.33</b>	<b>2.55</b>	<b>2.79</b>	<b>1.32</b>
<b>IFS1 BOT</b>	<b>1.75</b>	<b>3.53</b>	<b>1.84</b>	<b>0.96</b>
<b>IFS2 MID</b>	<b>2.51</b>	<b>2.23</b>	<b>0.88</b>	<b>0.66</b>
<b>IFS2 BOT</b>	<b>2.56</b>	<b>2.18</b>	<b>1.42</b>	<b>0.92</b>
<b>IFS3 MID</b>	<b>2.25</b>	<b>2.18</b>	<b>2.33</b>	<b>0.16</b>
<b>IFS3 BOT</b>	<b>1.34</b>	<b>1.40</b>	<b>2.19</b>	<b>1.05</b>
<b>IFS4 MID</b>	<b>0.77</b>	<b>2.44</b>	<b>1.97</b>	<b>0.12</b>
<b>IFS4 BOT</b>	<b>0.85</b>	<b>1.36</b>	<b>0.42</b>	<b>ND</b>
<b>IFS5 MID</b>	<b>0.60</b>	<b>1.28</b>	<b>1.38</b>	<b>0.79</b>
<b>IFS5 BOT</b>	<b>ND</b>	<b>1.53</b>	<b>0.95</b>	<b>0.12</b>
<b>IFS6 MID</b>	<b>1.43</b>	<b>1.98</b>	<b>1.22</b>	<b>0.83</b>
<b>IFS6 BOT</b>	<b>1.02</b>	<b>0.24</b>	<b>0.70</b>	<b>1.54</b>
IFS7 MID	0.33	0.10	0.19	0.45
IFS7 BOT	0.11	0.16	0.56	0.70
IFS8 MID	ND	0.13	0.39	ND
IFS8 BOT	ND	0.17	0.29	ND
IFS9 MID	0.08	0.41	0.81	0.08
IFS9 BOT	0.33	0.30	1.26	0.24
IFS10 MID	0.18	0.14	0.42	0.12
IFS10 BOT	0.40	0.24	0.88	0.70

## 2 Overview of Herbicide Treatment and Monitoring

**Table 2-5 USACE In-Lake Water Sampling Results for Fluridone (ppb)**  
Fluridone Concentration (ppb)

Sampling Location	Fluridone Concentration (ppb)			
	7/16/19	8/7/19	8/27/19	9/16/19
<b>IFS11 MID<sup>a</sup></b>	<b>0.52</b>	<b>0.32</b>	<b>0.42</b>	<b>0.66</b>
<b>IFS11 BOT<sup>a</sup></b>	<b>1.62</b>	<b>0.41</b>	<b>0.16</b>	<b>1.59</b>

Notes:

Bold denotes sample location within application area.

<sup>a</sup>This sampling site was in the fluridone treatment area for the Cornell Sailing Center.

Key:

BOT = bottom of water column

MID = middle of water column

ND = non-detect

As indicated in Table 2-5, variation in herbicide residues was detected within the water column.

Herbicide concentrations generally corresponded to the treatment areas – higher concentrations were detected at sampling sites within the treatment area (IFS1 through IFS6 and IFS12). Fluridone concentrations were generally lower at sampling sites outside of directly treated areas (IFS7 through IFS10).

Sampling results from September 16, 2019, one week after the final treatment, which occurred on September 9, 2019, indicate that fluridone was detected at all but one of the 11 sampling sites; concentrations ranged from 0.08 ppb to 1.59 ppb.

### 2.4.1.3 Tompkins County Health Department Sampling

The Tompkins County Health Department collected water samples at three locations following all 10 fluridone applications (see Figure 2-1 and Table 2-6). All three locations were outside of the treatment area in Fall Creek, the west side of Cayuga Lake, and at Bolton Point.

**Table 2-6 Tompkins County Health Department In-Lake Water Sampling Results for Fluridone (Stewart Park) (ppb)**

Date	Sample Location	Fluridone Concentration (ppb)
07/01/2019	SE-1	<0.5
07/01/2019	SE-9	NS
07/01/2019	BP-1	<0.5
07/08/2019	SE-1	<0.5
07/08/2019	SE-9	<0.5
07/08/2019	BP-1	<0.5
07/15/2019	SE-1	<0.5
07/15/2019	SE-9	<0.5

## 2 Overview of Herbicide Treatment and Monitoring

**Table 2-6 Tompkins County Health Department In-Lake Water Sampling Results for Fluridone (Stewart Park) (ppb)**

Date	Sample Location	Fluridone Concentration (ppb)
07/15/2019	BP-1	<0.5
07/22/2019	SE-1	<0.5
07/22/2019	SE-9	<0.5
07/22/2019	BP-1	<0.5
07/29/2019	SE-1	<0.5
07/29/2019	SE-9	<0.5
07/29/2019	BP-1	<0.5
08/05/2019	SE-1	<0.5
08/05/2019	SE-9	<0.5
08/05/2019	BP-1	<0.5
08/12/2019	SE-1	<0.5
08/12/2019	SE-9	<0.5
08/12/2019	BP-1	<0.5
8/26/2019	SE-1	<0.5
8/26/2019	SE-9	<0.5
8/26/2019	BP-1	<0.5
9/3/2019	SE-1	<0.5
9/3/2019	SE-9	<0.5
9/3/2019	BP-1	<0.5
9/9/2019	SE-1	<0.5
9/9/2019	SE-9	<0.5
9/9/2019	BP-1	<0.5

Source: Tompkins County Health Department 2019

**Key:**

- SE-1 = Shoreline – 0.5 miles upstream of TA on Fall Creek
- SE-9 = Shoreline – west lakeshore, 0.5 miles from TA
- BP-1 = Bolton Point Intake approximately 70 feet below lake surface
- E & E = Ecology and Environment, Inc.
- ppb = parts per billion
- NS = not sampled

As indicated in Table 2-6, all fluridone concentrations were 0.5 ppb or below at all sites.

### 2.4.2 Cornell Sailing Center In-lake Sampling

E & E conducted water sampling on two dates following the two spot treatments at the Cornell Sailing Center, September 3 and September 9, 2019 (see Table 2-7 and Figure 2-2).

## 2 Overview of Herbicide Treatment and Monitoring

**Table 2-7 E & E In-Lake Water Sampling Results for Fluridone (Cornell Sailing Center) (ppb)**

Date	Sample Location	Time	Sample Depth	Fluridone Concentration (ppb)
9/3/19	SCTreat1	1153	6 ft 6 in	<1
9/3/19	SCOutN	1240	9 ft	<1
9/9/19	SCTreat1	1134	6 ft	<b>2.1</b>
9/9/19	SCOutN	1218	3 ft	<1

Note:

Bold values denote positive detections.

Key:

ft = feet

in = inches

ppb = parts per billion

One positive detection occurred in the treatment area on the second sampling date; all others were below 1 ppb.

### 2.5 Vegetative Monitoring

The USACE conducted point intercept surveys during the growing season to determine Hydrilla distribution and frequency at multiple survey points within and adjacent to the 70-acre treatment area near Stewart Park (see Figure 2-3). Surveys conducted in September 2019 indicated that Hydrilla frequency was at 0% within the treatment area.

**Figure 2-2**  
In-Lake Water Sampling Locations  
Cornell Sailing Center Spot Treatment Area  
Cayuga Lake  
Tompkins County, New York

● Sampling Site 2019

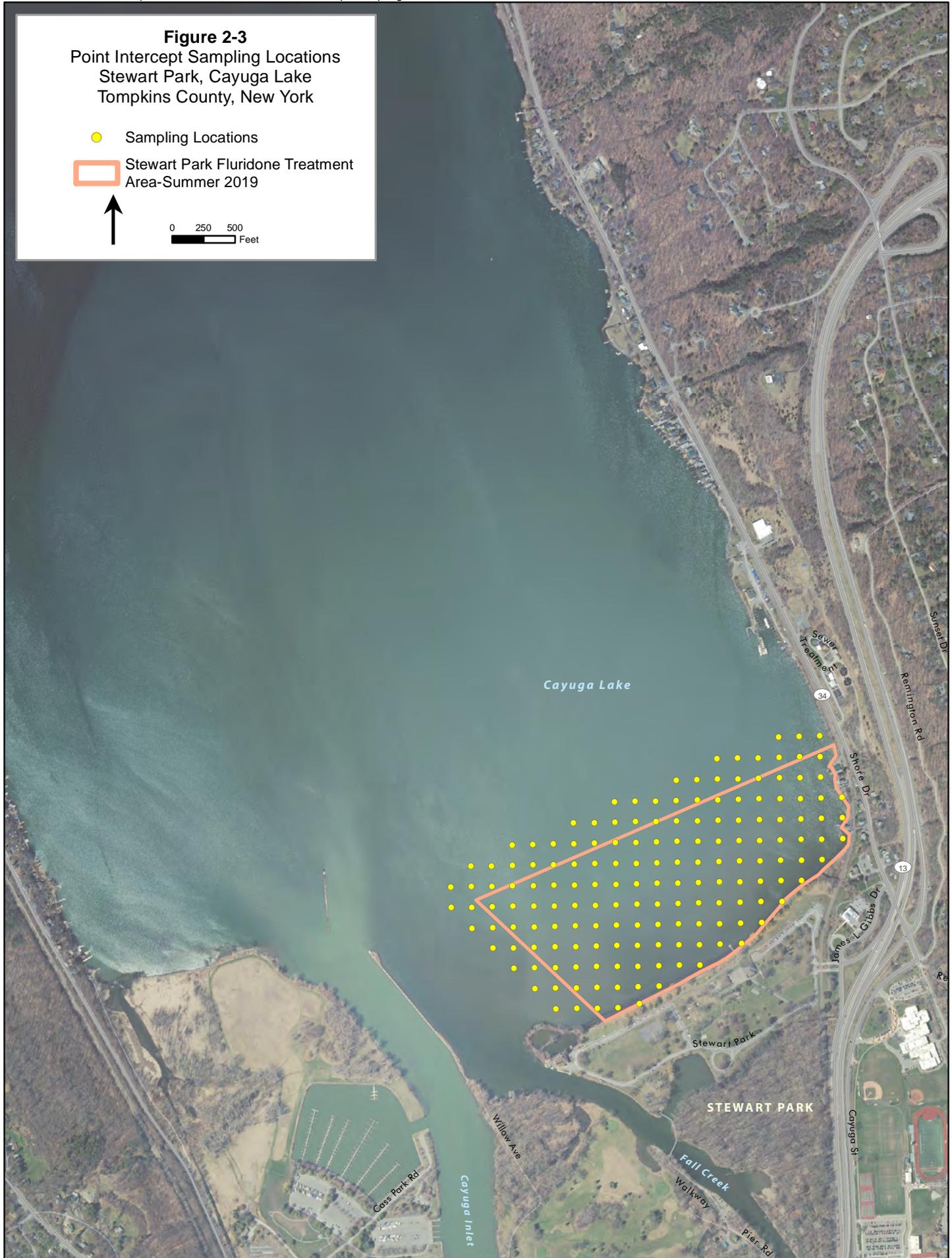
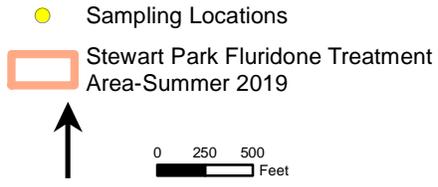
▭ Sonar Treatment Plot (6.5 acres) -  
August 28 and September 4, 2019



0 250 500  
Feet



**Figure 2-3**  
Point Intercept Sampling Locations  
Stewart Park, Cayuga Lake  
Tompkins County, New York



# 3

## Recommended Study Improvements

The study improvements, summarized in this section were based on lessons learned from the second year of herbicide applications, coordination with the study partners' work plan development, and activities conducted during the 2019 herbicide application.

### 3.1 Herbicide Application and Analysis

#### Herbicide Application

Transfer of the herbicide from the shore-based areas to the skiff and airboat and application of the herbicide in 2019 was smooth and efficient. The staging areas at both locations in Ithaca adequately supported operations for the in-lake treatments. Public access to the boat ramps during used by the applicators was uninterrupted. Although inclement weather can significantly affect the application and subsequent in-lake sampling schedule, there were no weather delays in 2019. The Project team needs to continue to look at long-range weather forecasts when planning future applications/sampling, and build in schedule flexibility for each event.

#### Analysis

SePRO's proprietary HPLC method was used for analysis of fluridone in the in-lake samples. Additionally, the Community Science Institute analyzed the finished drinking water samples taken by the Tompkins County Health Department, using the RaPID assay to determine fluridone concentrations. The RaPID assay is considered a screening method whereas the HPLC method is considered a definitive method. Comparing the results between the E & E sampled location at OutN with the Tompkins County Health Department sampled location at SE-2, no discernible differences were evident between the results. For future work, the Tompkins County samples could be removed from inclusion in the Project.

### 3.2 2019 Lessons Learned

#### Treatment Areas

Due to the consistency with scheduling and the fluridone treatment, the application operations proceeded smoothly. When working on waterbodies of

### 3 Recommended Study Improvements

this scale, it is critical for the broader Project Team (referring to the entities defined in Section 1.2) to continue to maintain proper contact through E & E or the USACE to communicate needs, especially concerning the water intake facility adjacent to the treatment area.

#### **Herbicide Application and Volumes**

To improve the efficacy of the treatments, isolation techniques such as limnocorrals and bubble curtains may be employed at the smaller treatment zones as a possible method to extend exposure times. The efficacy of bubble curtains is still being evaluated by the USACE; however, they may allow for longer residence time in the area, regardless of the weather conditions on the lake.

Additionally, the results of the diver survey were much more informative regarding the impact of the fluridone applications than relying on herbicide concentration results. It is recommended that the diver survey be incorporated into the treatment plan in future treatment years.

As future years of the program will include more reactive smaller-scale spot-treatments, the applicator will need to have greater flexibility to accommodate last minute changes to the SOW. The applicator will need to have enough herbicide on-hand to be able to target all areas that require treatment, but have the flexibility to return unused product to inventory. Improvements with preliminary estimates of the anticipated and potential maximum quantities of herbicide to be applied will be needed, to arrange for product delivery.

#### **Communication**

Twenty-four-hour email notification of herbicide treatments, including changes in treatment schedule was effective and no issues were raised by Tompkins County Health Department or other stakeholders. This type of communication needs to continue in future treatment programs.

Due to unpredictable weather conditions and the open nature of the lake, inclement weather can stir up on short notice and cause delays or cancellations in applications or sampling events. There were no such delays during the 2019 season, but the importance of communicating when delays arise has been acknowledged by all team members.

#### **In-Lake Sampling**

**Frequency of In-Lake Sampling and Logistics.** Samples should continue to be collected between day four and day seven of each application so that results can be obtained before the next treatment (assuming a 48-hour TAT). That way, the results can be used to ensure that target concentrations are achieved and not exceeded, in-lake sampling should continue to be performed between days 4 and 7 following fluridone application.

**Analytical Turnaround Times.** Samples are analyzed on a 48-hour TAT. There are no apparent needs to change this TAT at this time. If weather significantly

### **3 *Recommended Study Improvements***

affects sampling, it may be necessary to implement a 24-hour TAT, if deemed necessary.

# 4

## References

Ecology and Environment, Inc. (E & E). 2018. *Post-Treatment Assessment for Aquatic Plant Control, ERDC Demonstration Project, Wells College Bay, Cayuga Lake 2018*. Prepared by Ecology and Environment, Inc., Lancaster, New York.

Tompkins County Health Department. 2019. “Hydrilla Monitoring 2019.” Available online at: <http://tomkinscountyny.gov/health/eh/water/hydrilla/2019>. Accessed on November 14, 2019.

United States Army Corps of Engineers (USACE). 2019a. *Architect-Engineer Scope of Work Aquatic Plant Control ERDC Demonstration Project Stewart Park, Cayuga Lake, Aurora, NY*. May 22, 2019.

\_\_\_\_\_. 2019b. *Architect-Engineer Scope of Work Modification Aquatic Plant Control ERDC Demonstration Project Stewart Park, Cayuga Lake, Ithaca, NY*. July 31, 2019.

**A**

**Analytical Data**



16013 Watson Seed Farm Road, Whitakers, NC 27891

## Chain of Custody: COC5419 LABORATORY REPORT

### Customer Company Customer Contact

Company Name Ecology and Environment Inc	Contact Person: Katie Evans
Address: 368 Pleasant View Dr. Lancaster NY 14086	E-mail Address: Kevans@ene.com
	Phone: 716-684-8060

### Waterbody Information

Waterbody:	Cayuga Lake - NY
Waterbody size:	42956
Depth Average:	0

Sample ID	Sample Location	Test	Method	Results	Sampling Date / Time
CTM16619-1	Out N	Sonar/fluridone (ug/L)	FAST 10	<1	07/01/2019
CTM16620-1	Out W	Sonar/fluridone (ug/L)	FAST 10	<1	07/01/2019
CTM16621-1	Treat 1	Sonar/fluridone (ug/L)	FAST 10	2.9	07/01/2019
CTM16622-1	Treat 2	Sonar/fluridone (ug/L)	FAST 10	<1	07/01/2019
CTM16623-1	Treat 3	Sonar/fluridone (ug/L)	FAST 10	1.2	07/01/2019
CTM16624-1	Treat 4	Sonar/fluridone (ug/L)	FAST 10	<1	07/01/2019
CTM16625-1	Treat 5	Sonar/fluridone (ug/L)	FAST 10	1.6	07/01/2019
CTM16626-1	Treat 5-Q	Sonar/fluridone (ug/L)	FAST 10	1.1	07/01/2019
CTM16627-1	Treat 6	Sonar/fluridone (ug/L)	FAST 10	5.9	07/01/2019

### ANALYSIS STATEMENTS:

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QA/QC CRITERIA: All analyses met method criteria, except as noted in the report with data qualifiers.

COMMENTS: No significant observations were made unless noted in the report.

MEASUREMENT UNCERTAINTY: Uncertainty of measurement has been determined and is available upon request.

**Laboratory Information**

Date / Time Received: 07/02/19 11:00 AM

Date Results Sent: Wednesday, July 3, 2019

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*This entire report was reviewed and approved for release.*



*Reviewed By: Laboratory Supervisor*

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16013 Watson Seed Farm Road, Whitakers, NC 27891

Chain of Custody: COC5483 **LABORATORY REPORT**

**Customer Company Customer Contact**

Company Name Ecology and Environment Inc	Contact Person: Katie Evans
Address: 368 Pleasant View Dr. Lancaster NY 14086	E-mail Address: Kevans@ene.com
	Phone: 716-684-8060

**Waterbody Information**

Waterbody:	Cayuga Lake - NY
Waterbody size:	42956
Depth Average:	0

Sample ID	Sample Location	Test	Method	Results	Sampling Date / Time
CTM16849-1	Lake N	Sonar/fluridone (ug/L)	FAST 10	<1	07/08/2019
CTM16850-1	Lake S	Sonar/fluridone (ug/L)	FAST 10	<1	07/08/2019
CTM16851-1	Treat N	Sonar/fluridone (ug/L)	FAST 10	<1	07/08/2019
CTM16852-1	Treat S	Sonar/fluridone (ug/L)	FAST 10	1.5	07/08/2019
CTM16853-1	Out N	Sonar/fluridone (ug/L)	FAST 10	<1	07/08/2019
CTM16854-1	Out W	Sonar/fluridone (ug/L)	FAST 10	<1	07/08/2019
CTM16855-1	Treat 1	Sonar/fluridone (ug/L)	FAST 10	1.4	07/08/2019
CTM16856-1	Treat 2	Sonar/fluridone (ug/L)	FAST 10	1.5	07/08/2019
CTM16857-1	Treat 3	Sonar/fluridone (ug/L)	FAST 10	1.5	07/08/2019
CTM16858-1	Treat 4	Sonar/fluridone (ug/L)	FAST 10	3.2	07/08/2019
CTM16859-1	Treat 5	Sonar/fluridone (ug/L)	FAST 10	1.5	07/08/2019
CTM16860-1	Treat 6	Sonar/fluridone (ug/L)	FAST 10	3.5	07/08/2019

ANALYSIS STATEMENTS:

**SAMPLE RECEIPT /HOLDING TIMES:** All samples arrived in an acceptable condition and were analyzed within prescribed holding times in accordance with the SRTC Laboratory Sample Receipt Policy unless otherwise noted in the report.

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**QA/QC CRITERIA:** All analyses met method criteria, except as noted in the report with data qualifiers.

**COMMENTS:** No significant observations were made unless noted in the report.

**MEASUREMENT UNCERTAINTY:** Uncertainty of measurement has been determined and is available upon request.

**Laboratory Information**

Date / Time Received: 07/10/19 11:00 AM

Date Results Sent: Thursday, July 11, 2019

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*This entire report was reviewed and approved for release.*



*Reviewed By: Laboratory Supervisor*

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16013 Watson Seed Farm Road, Whitakers, NC 27891

## Chain of Custody: COC5562 LABORATORY REPORT

### Customer Company Customer Contact

Company Name Ecology and Environment Inc	Contact Person: Katie Evans
Address: 368 Pleasant View Dr. Lancaster NY 14086	E-mail Address: Kevans@ene.com
	Phone: 716-684-8060

### Waterbody Information

Waterbody:	Cayuga Lake - NY
Waterbody size:	42956
Depth Average:	0

Sample ID	Sample Location	Test	Method	Results	Sampling Date / Time
CTM17135-1	Out N	Sonar/fluridone (ug/L)	FAST 10	<1	07/15/2019
CTM17136-1	Out W	Sonar/fluridone (ug/L)	FAST 10	<1	07/15/2019
CTM17137-1	Treat 1	Sonar/fluridone (ug/L)	FAST 10	<1	07/15/2019
CTM17138-1	Treat 2	Sonar/fluridone (ug/L)	FAST 10	4.5	07/15/2019
CTM17139-1	Treat 3	Sonar/fluridone (ug/L)	FAST 10	2.2	07/15/2019
CTM17140-1	Treat 4	Sonar/fluridone (ug/L)	FAST 10	3.0	07/15/2019
CTM17141-1	Treat 5	Sonar/fluridone (ug/L)	FAST 10	2.3	07/15/2019
CTM17142-1	Treat 6	Sonar/fluridone (ug/L)	FAST 10	2.8	07/15/2019
CTM17143-1	Treat N	Sonar/fluridone (ug/L)	FAST 10	<1	07/15/2019
CTM17144-1	Treat S	Sonar/fluridone (ug/L)	FAST 10	<1	07/15/2019
CTM17145-1	Lake N	Sonar/fluridone (ug/L)	FAST 10	<1	07/15/2019
CTM17146-1	Lake S	Sonar/fluridone (ug/L)	FAST 10	<1	07/15/2019

ANALYSIS STATEMENTS:

**SAMPLE RECEIPT /HOLDING TIMES:** All samples arrived in an acceptable condition and were analyzed within prescribed holding times in accordance with the SRTC Laboratory Sample Receipt Policy unless otherwise noted in the report.

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**COMMENTS:** No significant observations were made unless noted in the report.

**MEASUREMENT UNCERTAINTY:** Uncertainty of measurement has been determined and is available upon request.

**Laboratory Information**

Date / Time Received: 07/17/19 11:00 AM

Date Results Sent: Thursday, July 18, 2019

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*This entire report was reviewed and approved for release.*



*Reviewed By: Laboratory Supervisor*

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16013 Watson Seed Farm Road, Whitakers, NC 27891

## Chain of Custody: COC5626 LABORATORY REPORT

### Customer Company Customer Contact

Company Name Ecology and Environment Inc	Contact Person: Katie Evans
Address: 368 Pleasant View Dr. Lancaster NY 14086	E-mail Address: Kevans@ene.com
	Phone: 716-684-8060

### Waterbody Information

Waterbody:	Cayuga Lake - NY
Waterbody size:	42956
Depth Average:	0

Sample ID	Sample Location	Test	Method	Results	Sampling Date / Time
CTM17547-1	Out W	Sonar/fluridone (ug/L)	FAST 10	<1	07/22/2019
CTM17548-1	Out N	Sonar/fluridone (ug/L)	FAST 10	<1	07/22/2019
CTM17549-1	Treat 1	Sonar/fluridone (ug/L)	FAST 10	<1	07/22/2019
CTM17550-1	Treat 2	Sonar/fluridone (ug/L)	FAST 10	4.7	07/22/2019
CTM17551-1	Treat 3	Sonar/fluridone (ug/L)	FAST 10	1.5	07/22/2019
CTM17552-1	Treat 4	Sonar/fluridone (ug/L)	FAST 10	3.9	07/22/2019
CTM17553-1	Treat 5	Sonar/fluridone (ug/L)	FAST 10	<1	07/22/2019
CTM17554-1	Treat 6	Sonar/fluridone (ug/L)	FAST 10	2.9	07/22/2019
CTM17555-1	Lake N	Sonar/fluridone (ug/L)	FAST 10	<1	07/22/2019
CTM17556-1	Lake S	Sonar/fluridone (ug/L)	FAST 10	<1	07/22/2019
CTM17557-1	Treat N	Sonar/fluridone (ug/L)	FAST 10	<1	07/22/2019
CTM17558-1	Treat S	Sonar/fluridone (ug/L)	FAST 10	<1	07/22/2019

ANALYSIS STATEMENTS:

**SAMPLE RECEIPT /HOLDING TIMES:** All samples arrived in an acceptable condition and were analyzed within prescribed holding times in accordance with the SRTC Laboratory Sample Receipt Policy unless otherwise noted in the report.

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**QA/QC CRITERIA:** All analyses met method criteria, except as noted in the report with data qualifiers.

**COMMENTS:** No significant observations were made unless noted in the report.

**MEASUREMENT UNCERTAINTY:** Uncertainty of measurement has been determined and is available upon request.

**Laboratory Information**

Date / Time Received: 07/23/19 11:00 AM

Date Results Sent: Wednesday, July 24, 2019

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*Reviewed By: Laboratory Supervisor*

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16013 Watson Seed Farm Road, Whitakers, NC 27891

## Chain of Custody: COC5721 LABORATORY REPORT

### Customer Company Customer Contact

Company Name Ecology and Environment Inc	Contact Person: Katie Evans
Address: 368 Pleasant View Dr. Lancaster NY 14086	E-mail Address: Kevans@ene.com
	Phone: 716-684-8060

### Waterbody Information

Waterbody:	Cayuga Lake - NY
Waterbody size:	42956
Depth Average:	0

Sample ID	Sample Location	Test	Method	Results	Sampling Date / Time
CTM17851-1	Out N	Sonar/fluridone (ug/L)	FAST 10	<1	07/30/2019
CTM17852-1	Out W	Sonar/fluridone (ug/L)	FAST 10	<1	07/30/2019
CTM17853-1	Treat 1	Sonar/fluridone (ug/L)	FAST 10	<1	07/30/2019
CTM17854-1	Treat 2	Sonar/fluridone (ug/L)	FAST 10	<1	07/30/2019
CTM17855-1	Treat 3	Sonar/fluridone (ug/L)	FAST 10	<1	07/30/2019
CTM17856-1	Treat 4	Sonar/fluridone (ug/L)	FAST 10	1.3	07/30/2019
CTM17857-1	Treat 5	Sonar/fluridone (ug/L)	FAST 10	<1	07/30/2019
CTM17858-1	Treat 6	Sonar/fluridone (ug/L)	FAST 10	1.5	07/30/2019
CTM17859-1	Treat N	Sonar/fluridone (ug/L)	FAST 10	<1	07/30/2019
CTM17860-1	Lake N	Sonar/fluridone (ug/L)	FAST 10	<1	07/30/2019
CTM17861-1	Lake S	Sonar/fluridone (ug/L)	FAST 10	<1	07/30/2019
CTM17862-1	Treat S	Sonar/fluridone (ug/L)	FAST 10	1.0	07/30/2019

ANALYSIS STATEMENTS:

**SAMPLE RECEIPT /HOLDING TIMES:** All samples arrived in an acceptable condition and were analyzed within prescribed holding times in accordance with the SRTC Laboratory Sample Receipt Policy unless otherwise noted in the report.

**PRESERVATION:** Samples requiring preservation were verified prior to sample analysis and any qualifiers will be noted in the report.

**QA/QC CRITERIA:** All analyses met method criteria, except as noted in the report with data qualifiers.

**COMMENTS:** No significant observations were made unless noted in the report.

**MEASUREMENT UNCERTAINTY:** Uncertainty of measurement has been determined and is available upon request.

**Laboratory Information**

Date / Time Received: 07/31/19 11:00 AM

Date Results Sent: Wednesday, July 31, 2019

*Disclaimer: The results listed within this Laboratory Report relate only to the samples tested in the laboratory. The analyses contained in this report were performed in accordance with the applicable certifications as noted. All soil samples are reported on a dry weight basis unless otherwise noted in the report. This Laboratory Report is confidential and is intended for the exclusive use of SRTC Laboratory and its client. This report shall not be reproduced, except in full, without written permission from SRTC Laboratory. The Chain of Custody is included and is an essential component of this report.*

*This entire report was reviewed and approved for release.*



*Reviewed By: Laboratory Supervisor*

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16013 Watson Seed Farm Road, Whitakers, NC 27891

## Chain of Custody: COC5784 LABORATORY REPORT

### Customer Company Customer Contact

Company Name Ecology and Environment Inc	Contact Person: Katie Evans
Address: 368 Pleasant View Dr. Lancaster NY 14086	E-mail Address: Kevans@ene.com
	Phone: 716-684-8060

### Waterbody Information

Waterbody:	Cayuga Lake - NY
Waterbody size:	42956
Depth Average:	0

Sample ID	Sample Location	Test	Method	Results	Sampling Date / Time
CTM18048-1	Treat N	Sonar/fluridone (ug/L)	FAST 10	<1	08/05/2019
CTM18049-1	Lake N	Sonar/fluridone (ug/L)	FAST 10	1.0	08/05/2019
CTM18050-1	Lake S	Sonar/fluridone (ug/L)	FAST 10	<1	08/05/2019
CTM18051-1	Treat S	Sonar/fluridone (ug/L)	FAST 10	1.9	08/05/2019
CTM18052-1	DWSS	Sonar/fluridone (ug/L)	FAST 10	<1	08/05/2019
CTM18053-1	Out N	Sonar/fluridone (ug/L)	FAST 10	<1	08/05/2019
CTM18054-1	Out W	Sonar/fluridone (ug/L)	FAST 10	<1	08/05/2019
CTM18055-1	Treat 1	Sonar/fluridone (ug/L)	FAST 10	3.4	08/05/2019
CTM18056-1	Treat 2	Sonar/fluridone (ug/L)	FAST 10	6.2	08/05/2019
CTM18057-1	Treat 3	Sonar/fluridone (ug/L)	FAST 10	4.0	08/05/2019
CTM18058-1	Treat 4	Sonar/fluridone (ug/L)	FAST 10	5.1	08/05/2019
CTM18059-1	Treat 5	Sonar/fluridone (ug/L)	FAST 10	1.5	08/05/2019
CTM18060-1	Treat 6	Sonar/fluridone (ug/L)	FAST 10	3.1	08/05/2019

**ANALYSIS STATEMENTS:**

**SAMPLE RECEIPT /HOLDING TIMES:** All samples arrived in an acceptable condition and were analyzed within prescribed holding times in accordance with the SRTC Laboratory Sample Receipt Policy unless otherwise noted in the report.

**PRESERVATION:** Samples requiring preservation were verified prior to sample analysis and any qualifiers will be noted in the report.

**QA/QC CRITERIA:** All analyses met method criteria, except as noted in the report with data qualifiers.

**COMMENTS:** No significant observations were made unless noted in the report.

**MEASUREMENT UNCERTAINTY:** Uncertainty of measurement has been determined and is available upon request.

**Laboratory Information**

Date / Time Received: 08/06/19 11:00 AM

Date Results Sent: Wednesday, August 7, 2019

*Disclaimer: The results listed within this Laboratory Report relate only to the samples tested in the laboratory. The analyses contained in this report were performed in accordance with the applicable certifications as noted. All soil samples are reported on a dry weight basis unless otherwise noted in the report. This Laboratory Report is confidential and is intended for the exclusive use of SRTC Laboratory and its client. This report shall not be reproduced, except in full, without written permission from SRTC Laboratory. The Chain of Custody is included and is an essential component of this report.*

*This entire report was reviewed and approved for release.*



*Reviewed By: Laboratory Supervisor*

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16013 Watson Seed Farm Road, Whitakers, NC 27891

## Chain of Custody: COC5839 LABORATORY REPORT

### Customer Company Customer Contact

Company Name Ecology and Environment Inc	Contact Person: Katie Evans
Address: 368 Pleasant View Dr. Lancaster NY 14086	E-mail Address: Kevans@ene.com
	Phone: 716-684-8060

### Waterbody Information

Waterbody:	Cayuga Lake - NY
Waterbody size:	42956
Depth Average:	0

Sample ID	Sample Location	Test	Method	Results	Sampling Date / Time
CTM18216-1	Out N	Sonar/fluridone (ug/L)	FAST 10	<1	08/12/2019
CTM18217-1	Out W	Sonar/fluridone (ug/L)	FAST 10	<1	08/12/2019
CTM18218-1	Treat 1	Sonar/fluridone (ug/L)	FAST 10	3.2	08/12/2019
CTM18219-1	Treat 2	Sonar/fluridone (ug/L)	FAST 10	2.8	08/12/2019
CTM18220-1	Treat 3	Sonar/fluridone (ug/L)	FAST 10	2.4	08/12/2019
CTM18221-1	Treat 4	Sonar/fluridone (ug/L)	FAST 10	2.3	08/12/2019
CTM18222-1	Treat 5	Sonar/fluridone (ug/L)	FAST 10	<1	08/12/2019
CTM18223-1	Treat 6	Sonar/fluridone (ug/L)	FAST 10	1.2	08/12/2019
CTM18224-1	Lake N	Sonar/fluridone (ug/L)	FAST 10	<1	08/12/2019
CTM18225-1	Lake S	Sonar/fluridone (ug/L)	FAST 10	<1	08/12/2019
CTM18226-1	Treat N	Sonar/fluridone (ug/L)	FAST 10	<1	08/12/2019
CTM18227-1	Treat S	Sonar/fluridone (ug/L)	FAST 10	<1	08/12/2019

ANALYSIS STATEMENTS:

**SAMPLE RECEIPT /HOLDING TIMES:** All samples arrived in an acceptable condition and were analyzed within prescribed holding times in accordance with the SRTC Laboratory Sample Receipt Policy unless otherwise noted in the report.

**PRESERVATION:** Samples requiring preservation were verified prior to sample analysis and any qualifiers will be noted in the report.

**QA/QC CRITERIA:** All analyses met method criteria, except as noted in the report with data qualifiers.

**COMMENTS:** No significant observations were made unless noted in the report.

**MEASUREMENT UNCERTAINTY:** Uncertainty of measurement has been determined and is available upon request.

**Laboratory Information**

Date / Time Received: 08/13/19 11:00 AM

Date Results Sent: Thursday, August 15, 2019

*Disclaimer: The results listed within this Laboratory Report relate only to the samples tested in the laboratory. The analyses contained in this report were performed in accordance with the applicable certifications as noted. All soil samples are reported on a dry weight basis unless otherwise noted in the report. This Laboratory Report is confidential and is intended for the exclusive use of SRTC Laboratory and its client. This report shall not be reproduced, except in full, without written permission from SRTC Laboratory. The Chain of Custody is included and is an essential component of this report.*

*This entire report was reviewed and approved for release.*



*Reviewed By: Laboratory Supervisor*

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16013 Watson Seed Farm Road, Whitakers, NC 27891

## Chain of Custody: COC5980 LABORATORY REPORT

### Customer Company Customer Contact

Company Name Ecology and Environment Inc	Contact Person: Katie Evans
Address: 368 Pleasant View Dr. Lancaster NY 14086	E-mail Address: Kevans@ene.com
	Phone: 716-684-8060

### Waterbody Information

Waterbody:	Cayuga Lake - NY
Waterbody size:	42956
Depth Average:	0

Sample ID	Sample Location	Test	Method	Results	Sampling Date / Time
CTM18647-1	Out N	Sonar/fluridone (ug/L)	FAST 10	<1	08/26/2019
CTM18648-1	Out W	Sonar/fluridone (ug/L)	FAST 10	<1	08/26/2019
CTM18649-1	Treat 1	Sonar/fluridone (ug/L)	FAST 10	3.6	08/26/2019
CTM18650-1	Treat 2	Sonar/fluridone (ug/L)	FAST 10	5.1	08/26/2019
CTM18651-1	Treat 3	Sonar/fluridone (ug/L)	FAST 10	1.4	08/26/2019
CTM18652-1	Treat 4	Sonar/fluridone (ug/L)	FAST 10	2.1	08/26/2019
CTM18653-1	Treat 5	Sonar/fluridone (ug/L)	FAST 10	<1	08/26/2019
CTM18654-1	Treat 6	Sonar/fluridone (ug/L)	FAST 10	1.3	08/26/2019
CTM18655-1	Lake N	Sonar/fluridone (ug/L)	FAST 10	<1	08/26/2019
CTM18656-1	Lake S	Sonar/fluridone (ug/L)	FAST 10	<1	08/26/2019
CTM18657-1	Treat N	Sonar/fluridone (ug/L)	FAST 10	<1	08/26/2019
CTM18658-1	Treat S	Sonar/fluridone (ug/L)	FAST 10	<1	08/26/2019
CTM18659-1	Out W-Q	Sonar/fluridone (ug/L)	FAST 10	<1	08/26/2019

CTM18660-1	Treat 5-Q	Sonar/fluridone (ug/L)	FAST 10	<1	08/26/2019
CTM18661-1	Lake S-Q	Sonar/fluridone (ug/L)	FAST 10	<1	08/26/2019

**ANALYSIS STATEMENTS:**

**SAMPLE RECEIPT /HOLDING TIMES:** All samples arrived in an acceptable condition and were analyzed within prescribed holding times in accordance with the SRTC Laboratory Sample Receipt Policy unless otherwise noted in the report.

**PRESERVATION:** Samples requiring preservation were verified prior to sample analysis and any qualifiers will be noted in the report.

**QA/QC CRITERIA:** All analyses met method criteria, except as noted in the report with data qualifiers.

**COMMENTS:** No significant observations were made unless noted in the report.

**MEASUREMENT UNCERTAINTY:** Uncertainty of measurement has been determined and is available upon request.

**Laboratory Information**

Date / Time Received: 08/27/19 11:00 AM

Date Results Sent: Wednesday, August 28, 2019

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*This entire report was reviewed and approved for release.*



*Reviewed By: Laboratory Supervisor*

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16013 Watson Seed Farm Road, Whitakers, NC 27891

## Chain of Custody: COC6055 LABORATORY REPORT

### Customer Company Customer Contact

Company Name Ecology and Environment Inc	Contact Person: Katie Evans
Address: 368 Pleasant View Dr. Lancaster NY 14086	E-mail Address: Kevans@ene.com
	Phone: 716-684-8060

### Waterbody Information

Waterbody:	Cayuga Lake - NY
Waterbody size:	42956
Depth Average:	0

Sample ID	Sample Location	Test	Method	Results	Sampling Date / Time
CTM18833-1	LAKE S	Sonar/fluridone (ug/L)	FAST 10	<1	09/03/2019
CTM18834-1	LAKE S-Q	Sonar/fluridone (ug/L)	FAST 10	<1	09/03/2019
CTM18835-1	TREAT S	Sonar/fluridone (ug/L)	FAST 10	<1	09/03/2019
CTM18836-1	TREAT N	Sonar/fluridone (ug/L)	FAST 10	<1	09/03/2019
CTM18837-1	LAKE N	Sonar/fluridone (ug/L)	FAST 10	<1	09/03/2019
CTM18838-1	OUT W	Sonar/fluridone (ug/L)	FAST 10	<1	09/03/2019
CTM18839-1	OUT W-Q	Sonar/fluridone (ug/L)	FAST 10	<1	09/03/2019
CTM18840-1	OUT N	Sonar/fluridone (ug/L)	FAST 10	<1	09/03/2019
CTM18841-1	TREAT 1	Sonar/fluridone (ug/L)	FAST 10	<1	09/03/2019
CTM18842-1	TREAT 2	Sonar/fluridone (ug/L)	FAST 10	2.4	09/03/2019
CTM18843-1	TREAT 3	Sonar/fluridone (ug/L)	FAST 10	2.1	09/03/2019
CTM18844-1	TREAT 4	Sonar/fluridone (ug/L)	FAST 10	3.4	09/03/2019
CTM18845-1	TREAT 5	Sonar/fluridone (ug/L)	FAST 10	<1	09/03/2019

CTM18846-1	TREAT 6	Sonar/fluridone (ug/L)	FAST 10	2.0	09/03/2019
CTM18847-1	SC OUT N	Sonar/fluridone (ug/L)	FAST 10	<1	09/03/2019
CTM18848-1	SC TREAT 1	Sonar/fluridone (ug/L)	FAST 10	<1	09/03/2019

**ANALYSIS STATEMENTS:**

**SAMPLE RECEIPT /HOLDING TIMES:** All samples arrived in an acceptable condition and were analyzed within prescribed holding times in accordance with the SRTC Laboratory Sample Receipt Policy unless otherwise noted in the report.

**PRESERVATION:** Samples requiring preservation were verified prior to sample analysis and any qualifiers will be noted in the report.

**QA/QC CRITERIA:** All analyses met method criteria, except as noted in the report with data qualifiers.

**COMMENTS:** No significant observations were made unless noted in the report.

**MEASUREMENT UNCERTAINTY:** Uncertainty of measurement has been determined and is available upon request.

**Laboratory Information**

Date / Time Received: 09/04/19 12:00 PM

Date Results Sent: Thursday, September 5, 2019

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*This entire report was reviewed and approved for release.*



*Reviewed By: Laboratory Supervisor*

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16013 Watson Seed Farm Road, Whitakers, NC 27891

## Chain of Custody: COC6112 LABORATORY REPORT

### Customer Company Customer Contact

Company Name Ecology and Environment Inc	Contact Person: Katie Evans
Address: 368 Pleasant View Dr. Lancaster NY 14086	E-mail Address: Kevans@ene.com
	Phone: 716-684-8060

### Waterbody Information

Waterbody:	Cayuga Lake - NY
Waterbody size:	42956
Depth Average:	0

Sample ID	Sample Location	Test	Method	Results	Sampling Date / Time
CTM18991-1	OUT N	Sonar/fluridone (ug/L)	FAST 10	<1	09/09/2019
CTM18992-1	OUT W	Sonar/fluridone (ug/L)	FAST 10	<1	09/09/2019
CTM18993-1	TREAT 1	Sonar/fluridone (ug/L)	FAST 10	1.7	09/09/2019
CTM18994-1	TREAT 2	Sonar/fluridone (ug/L)	FAST 10	6.0	09/09/2019
CTM18995-1	TREAT 3	Sonar/fluridone (ug/L)	FAST 10	2.6	09/09/2019
CTM18996-1	TREAT 4	Sonar/fluridone (ug/L)	FAST 10	5.2	09/09/2019
CTM18997-1	TREAT 5	Sonar/fluridone (ug/L)	FAST 10	3.7	09/09/2019
CTM18998-1	TREAT 6	Sonar/fluridone (ug/L)	FAST 10	6.9	09/09/2019
CTM18999-1	SC OUT N	Sonar/fluridone (ug/L)	FAST 10	<1	09/09/2019
CTM19000-1	SC TREAT 1	Sonar/fluridone (ug/L)	FAST 10	2.1	09/09/2019
CTM19001-1	LAKE N	Sonar/fluridone (ug/L)	FAST 10	<1	09/09/2019
CTM19002-1	LAKE S	Sonar/fluridone (ug/L)	FAST 10	<1	09/09/2019
CTM19003-1	TREAT N	Sonar/fluridone (ug/L)	FAST 10	<1	09/09/2019

**ANALYSIS STATEMENTS:**

**SAMPLE RECEIPT /HOLDING TIMES:** All samples arrived in an acceptable condition and were analyzed within prescribed holding times in accordance with the SRTC Laboratory Sample Receipt Policy unless otherwise noted in the report.

**PRESERVATION:** Samples requiring preservation were verified prior to sample analysis and any qualifiers will be noted in the report.

**QA/QC CRITERIA:** All analyses met method criteria, except as noted in the report with data qualifiers.

**COMMENTS:** No significant observations were made unless noted in the report.

**MEASUREMENT UNCERTAINTY:** Uncertainty of measurement has been determined and is available upon request.

**Laboratory Information**

Date / Time Received: 09/10/19 12:00 PM

Date Results Sent: Wednesday, September 11, 2019

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*This entire report was reviewed and approved for release.*



*Reviewed By: Laboratory Supervisor*

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