



Investigate

Design

Restore

**Prepared for:**

United States Army Corp of Engineers

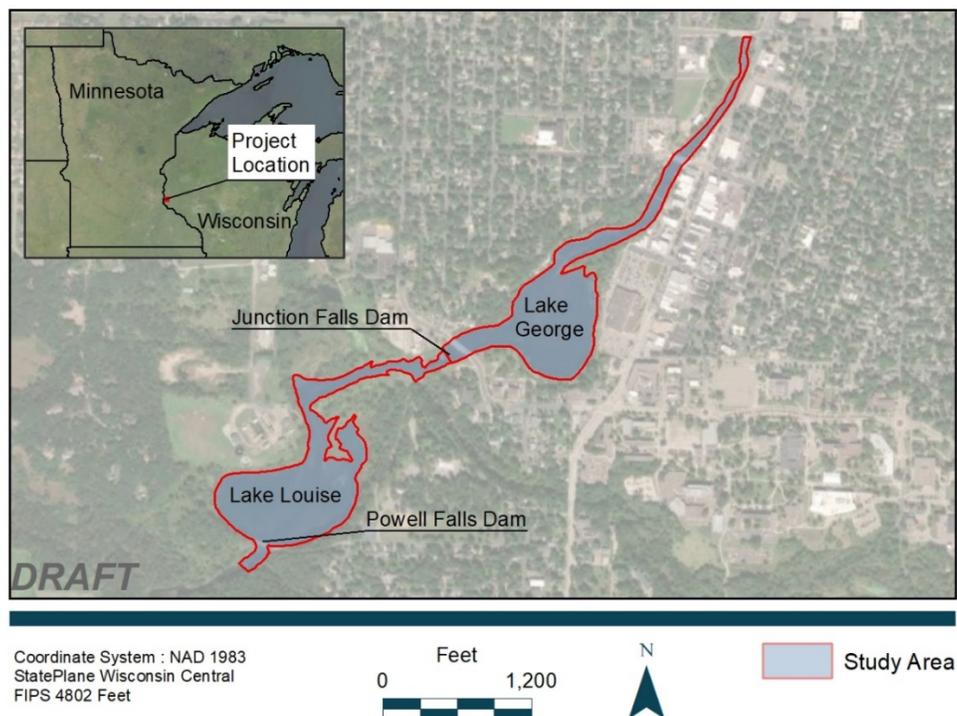
—

Planning Assistance to States (PAS)  
Program

**Project:**

RIVER FALLS HYDROELECTRIC PROJECT AQUATIC INVASIVE SPECIES SURVEY  
Contract W912ES20D0001

Inter-Fluve staff conducted an aquatic invasive species (AIS) survey on July 6-7, 2020, on behalf of the United States Army Corps of Engineers (USACE) Planning Assistance to States (PAS) Program- St. Paul District and River Falls Municipal Utilities in two impoundments located on the Kinnickinnic River in River Falls, Wisconsin (Figure 1). The two dams in the project area are the Junction Falls and Powell Falls Dams which are both currently licensed under FERC Permit No. 10489. The impoundments are commonly called Lake Louise and Lake George. Survey results indicate the presence of seven aquatic plant species, of these only curly-leaf pondweed (*Potamogeton crispus*) is considered invasive by the Wisconsin Department of Natural Resources (DNR) under Wisconsin Administrative Code Chapter NR 40.



**Figure 1: Location of the project area.**

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## 1. Introduction

The Powell Falls and Junction Falls Dams impound the Kinnickinnic River within the City of River Falls, in Pierce County, Wisconsin, approximately 10 miles upstream of the river's confluence with the St. Croix River, and 30 miles downstream from its headwaters in Erin Prairie Township, Wisconsin. The dams create the downstream Lake Louise and the upstream Lake George, within the Powell Falls and Junction Falls Impoundments, respectively. The River Falls Municipal Utilities is proposing to relicense the Junction Falls Development and decommission the Powell Falls development with dam removal. As part of these efforts, an aquatic invasive species (AIS) survey was conducted in both impoundments.

## 2. Methods

An AIS survey was conducted by Inter-Fluve staff on July 6, 2020, on Lake George and July 7, 2020, on Lake Louise. Air temperatures varied between 70 and 90 degrees with cloud cover in the mornings clearing into the afternoons. Rain occurred on the morning of July 7. Maximum humidity was approximately 90 percent (%). The mean discharge at the United States Geological Survey (USGS) stream gage 05342000 located downstream of the project site at the County Road F crossing was 182 cubic feet per second (cfs) on July 6, 2020, and 125 cfs on July 7, 2020. Flooding on June 29, 2020, caused discharge to rise to a maximum of 6,220 cfs resulting in deposition within the sampled impoundments which may have buried formerly vegetated areas. However, aquatic vegetation along the impoundment margins, where vegetation has historically been most dense, did not visually appear affected by the flooding.

The aquatic vegetation survey methodology followed Hauxwell et al. (2010) and used a rope mounted rake sampler to sample vegetation. A double-sided rake was cast from a flat-bottom row boat into sampling locations based on a predetermined sampling grid consisting of 311 sample points. In Lake Louise, 162 sample points were collected, and in Lake George, 149 sample points were collected. An Apple iPad integrated global positioning system (GPS) was used to navigate to individual sampling locations. Rake fullness, a quantitative estimate based on vegetation coverage on the rake head, was rated as 1 -few, 2 - moderate, 3 - abundant (Figure 2). Visually estimated total and species-specific rake fullness was recorded directly onto the field form on the iPad. Individual species were collected in the field and preserved in a water filled bag for later identification.



**Figure 2: Typical photos used for rake fullness rating.**

### 3. Results - General

Of the 311 initial sample sites, 291 sites were sampled. The 20 which were not sampled were located on recently deposited sand bars (17 sites), were located on rocky outcrops with unsafe access (2 sites), or were located onshore (1 site). Of the sampled sites, 197 contained aquatic vegetation with an average rake fullness of 1.64.

In total, seven aquatic plant species were identified in the two impoundments: sago pondweed (*Stuckenia pectinata*) which occurred at 65.48% of vegetated sample sites, curly-leaf pondweed (*Potamogeton crispus*) which occurred at 50.76% of vegetated sample sites, waterweed (*Elodea canadensis*) which occurred at 43.65%, coontail (*Cerstophyllum demersum*) which occurred at 24.87% of vegetated sample sites, duckweed (*Lemna Spp.*) which occurred at 3.55% of vegetated sample sites, floating pondweed (*Potamogeton natans*) which occurred at 0.51% of vegetated sample sites, and fine-leaf pondweed (*Stuckenia filiformis*) which occurred at 6.09% of vegetated sample sites. Of these species, only curly-leaf pondweed is considered invasive by the Wisconsin DNR under Wisconsin Administrative Code Chapter NR40.

## 4. Results – Powell Falls Impoundment

In Powell Falls Impoundment, also identified as Lake Louise, water clarity was relatively clear with the bottom observable in shallow areas. Average depth was estimated based on the length of submerged rope to be between 1 and 2 feet with the maximum estimated depth of 5 feet. Aquatic vegetation was generally most abundant within 0 to 2 feet deep water on the eastern and western sides of the ponded section of the impoundment. Narrower sections of the impoundment were largely devoid of vegetation. All observed aquatic vegetation species listed in section 3 were present. Sago pondweed was the most abundant aquatic vegetation and observed at 77.48% of sampled sites. Followed by curly-leaf pondweed (48.65%), common waterweed (39.64%), coontail (8.11%), ducked (6.31%), and floating-leaf pondweed (0.90%), and fine-leaf pondweed (0.90%).



**Figure 3: Typical photo of Powell Falls Impoundment/Lake Louise.**

## 5. Results – Junction Falls Impoundment

In the Junction Falls Impoundment, also identified as Lake George, water clarity was relatively clear with the bottom observable in shallow areas. Average depth was estimated based on length of submerged rope to be between 2 and 3 feet with the maximum estimated depth of 6 feet. Aquatic vegetation was generally most abundant within 0 to 2 feet deep water on the eastern side of the ponded section of the impoundment. Narrower sections of the impoundment were largely devoid of vegetation. Floating pondweed and duckweed were the only aquatic vegetation species listed in section 3 that were absent from the impoundment. Curly-leaf pondweed was the most abundant aquatic vegetation and observed at 50.00% of sampled sites. Followed by sago pondweed (46.74%), common waterweed (45.65%), coontail (43.48%), and fine-leaved pondweed (11.96%).



**Figure 4: Typical photo of Junction Falls Impoundment/Lake George.**

## 6. References

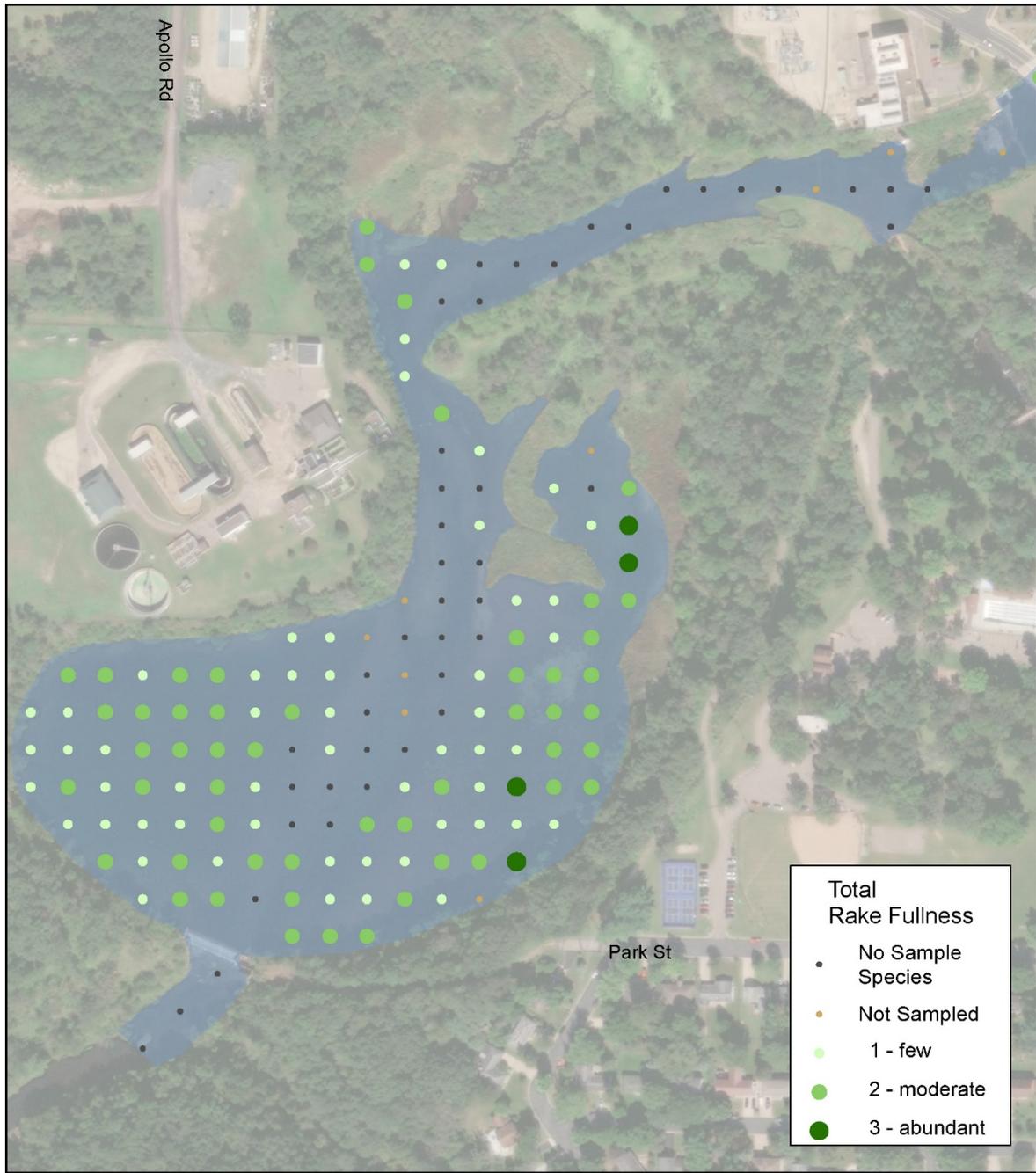
Hauxwell, et al., 2010. Recommended Baseline Monitoring of Aquatic Plants in Wisconsin: Sampling Design, Field and Laboratory Procedures, Data Entry and Analysis, and Applications. Available online:  
[https://www.researchgate.net/profile/Michelle\\_Nault/publication/267832775\\_Recommended\\_Baseline\\_Monitoring\\_of\\_Aquatic\\_Plants\\_in\\_Wisconsin\\_Sampling\\_Design\\_Field\\_a\\_20190611-5044\\_FERC\\_PDF\\_\(Unofficial\)\\_6/11/2019\\_1:24:50\\_PM\\_River\\_Falls\\_Hydroelectric\\_Project\\_Revised\\_Study\\_Plan\\_FERC\\_Project\\_No.\\_10489\\_6-19\\_June\\_2019\\_and\\_Laboratory\\_Procedures\\_Data\\_Entry\\_and\\_Analysis\\_and\\_Applications/links/54b98bc220cf2d11571a4b588/Recommended-Baseline-Monitoring-of-Aquatic-Plants-in-Wisconsin-Sampling-Design-Field-and-Laboratory-Procedures-Data-Entry-and-Analysisand-Applications.pdf?origin=publication\\_detail](https://www.researchgate.net/profile/Michelle_Nault/publication/267832775_Recommended_Baseline_Monitoring_of_Aquatic_Plants_in_Wisconsin_Sampling_Design_Field_a_20190611-5044_FERC_PDF_(Unofficial)_6/11/2019_1:24:50_PM_River_Falls_Hydroelectric_Project_Revised_Study_Plan_FERC_Project_No._10489_6-19_June_2019_and_Laboratory_Procedures_Data_Entry_and_Analysis_and_Applications/links/54b98bc220cf2d11571a4b588/Recommended-Baseline-Monitoring-of-Aquatic-Plants-in-Wisconsin-Sampling-Design-Field-and-Laboratory-Procedures-Data-Entry-and-Analysisand-Applications.pdf?origin=publication_detail)

## 7. Appendices

The following appendixes are included in this report and provide supporting documentation.

- Appendix A – Maps of Rake Fullness
- Appendix B – Rake Fullness Summary Statistics
- Appendix C – Plant ID Photos
- Appendix D – Raw Datasheets

## Appendix A



**River Falls Hydroelectric Project  
Aquatic Invasive Species Survey**

Field work conducted on 7/6/2020 - 7/7/2020  
Field team - Garrett Shear and Sean Morrison

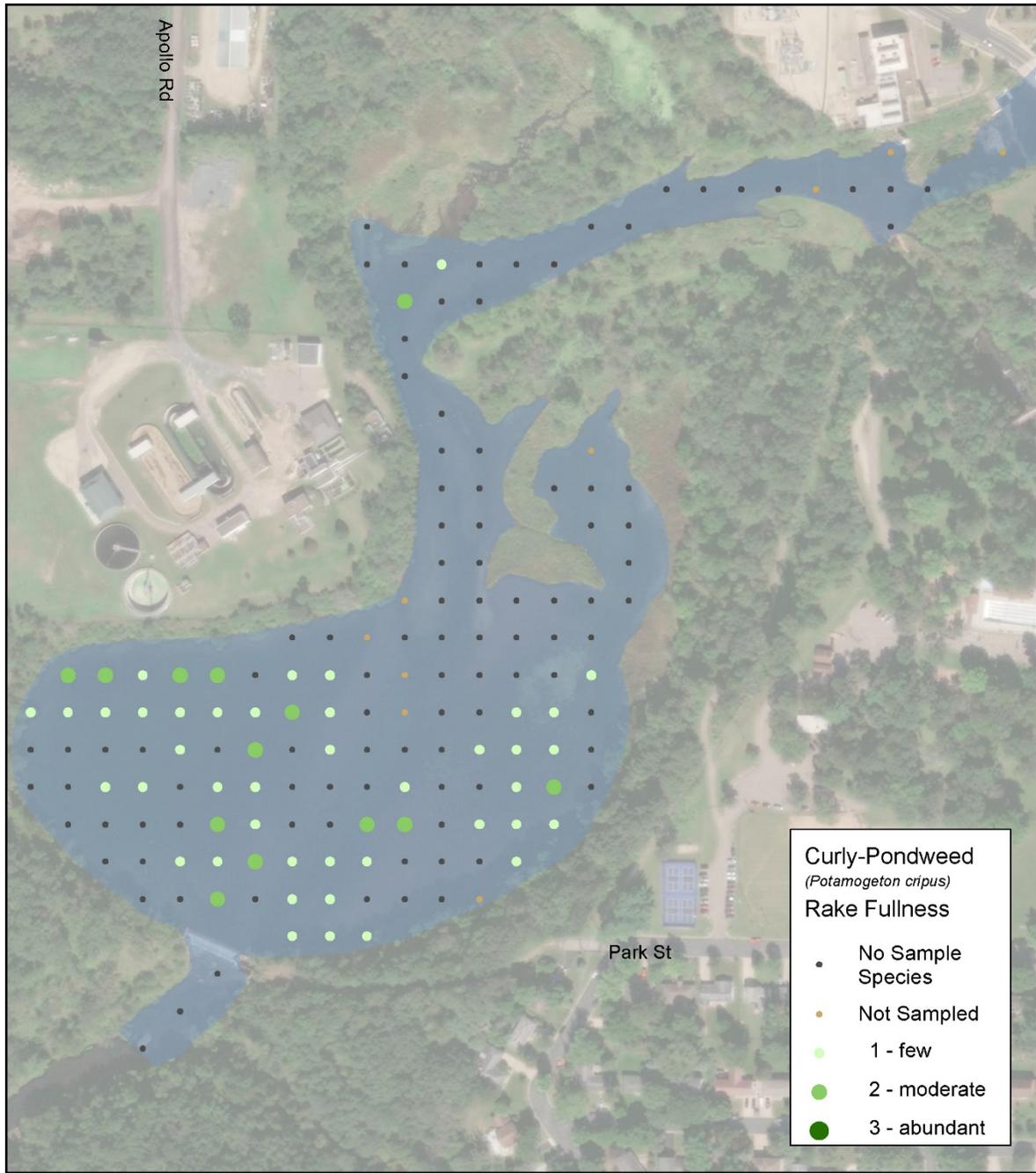


Coordinate System : NAD 1983  
StatePlane Wisconsin Central  
FIPS 4802 Feet



Lake Louise  
Pierce Co.  
Wisconsin

Figure A-1: Total rake fullness for Lake Louise.



**River Falls Hydroelectric Project  
Aquatic Invasive Species Survey**

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Field team - Garrett Shear and Sean Morrison

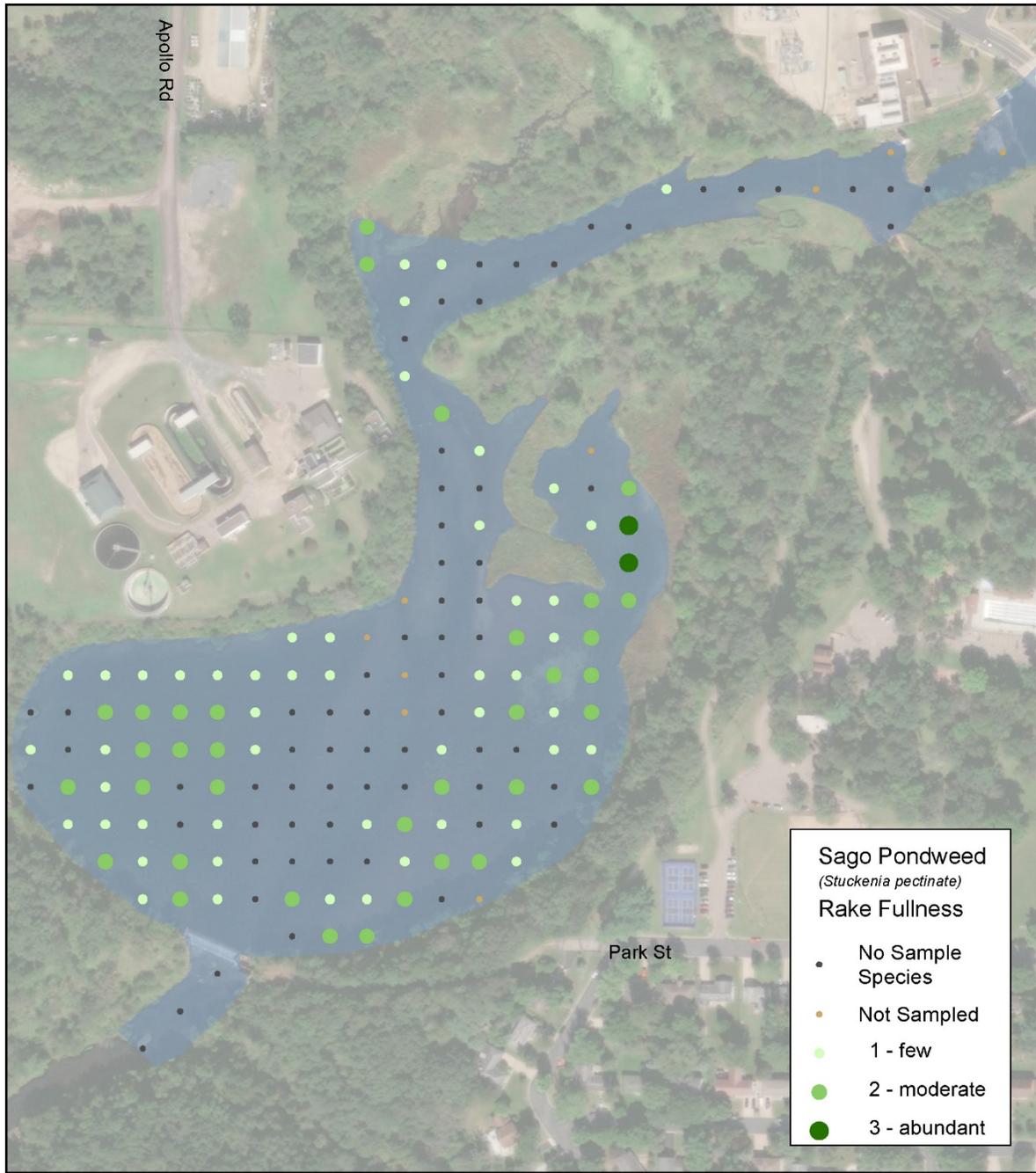


Coordinate System : NAD 1983  
StatePlane Wisconsin Central  
FIPS 4802 Feet



Lake Louise  
Pierce Co.  
Wisconsin

Figure A-2: Curly-leaf pondweed rake fullness for Lake Louise.



**River Falls Hydroelectric Project  
Aquatic Invasive Species Survey**

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Field team - Garrett Shear and Sean Morrison

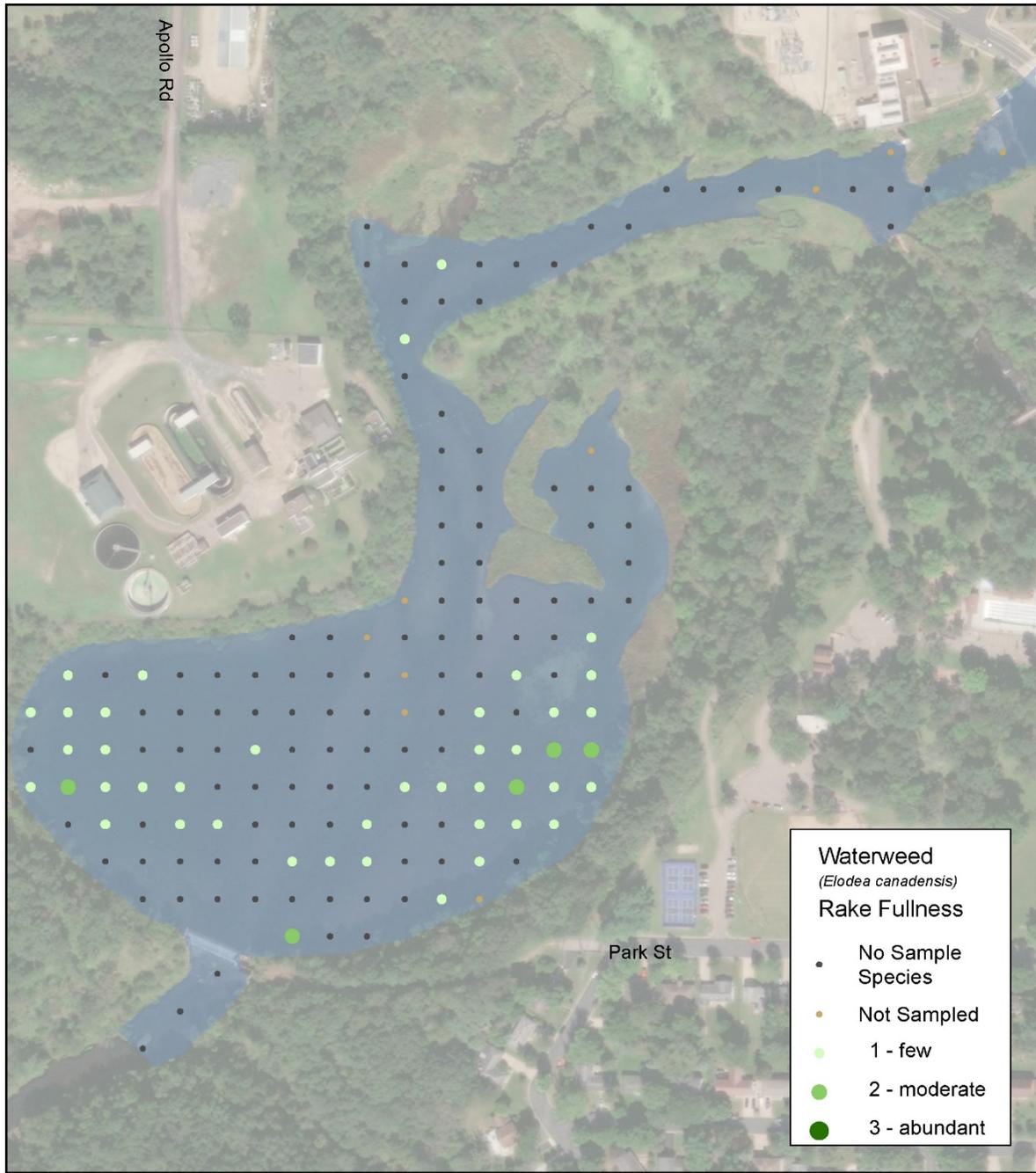


Coordinate System : NAD 1983  
StatePlane Wisconsin Central  
FIPS 4802 Feet



Lake Louise  
Pierce Co.  
Wisconsin

Figure A-3: Sago pondweed rake fullness for Lake Louise.



**River Falls Hydroelectric Project  
Aquatic Invasive Species Survey**

Field work conducted on 7/6/2020 - 7/7/2020  
Field team - Garrett Shear and Sean Morrison

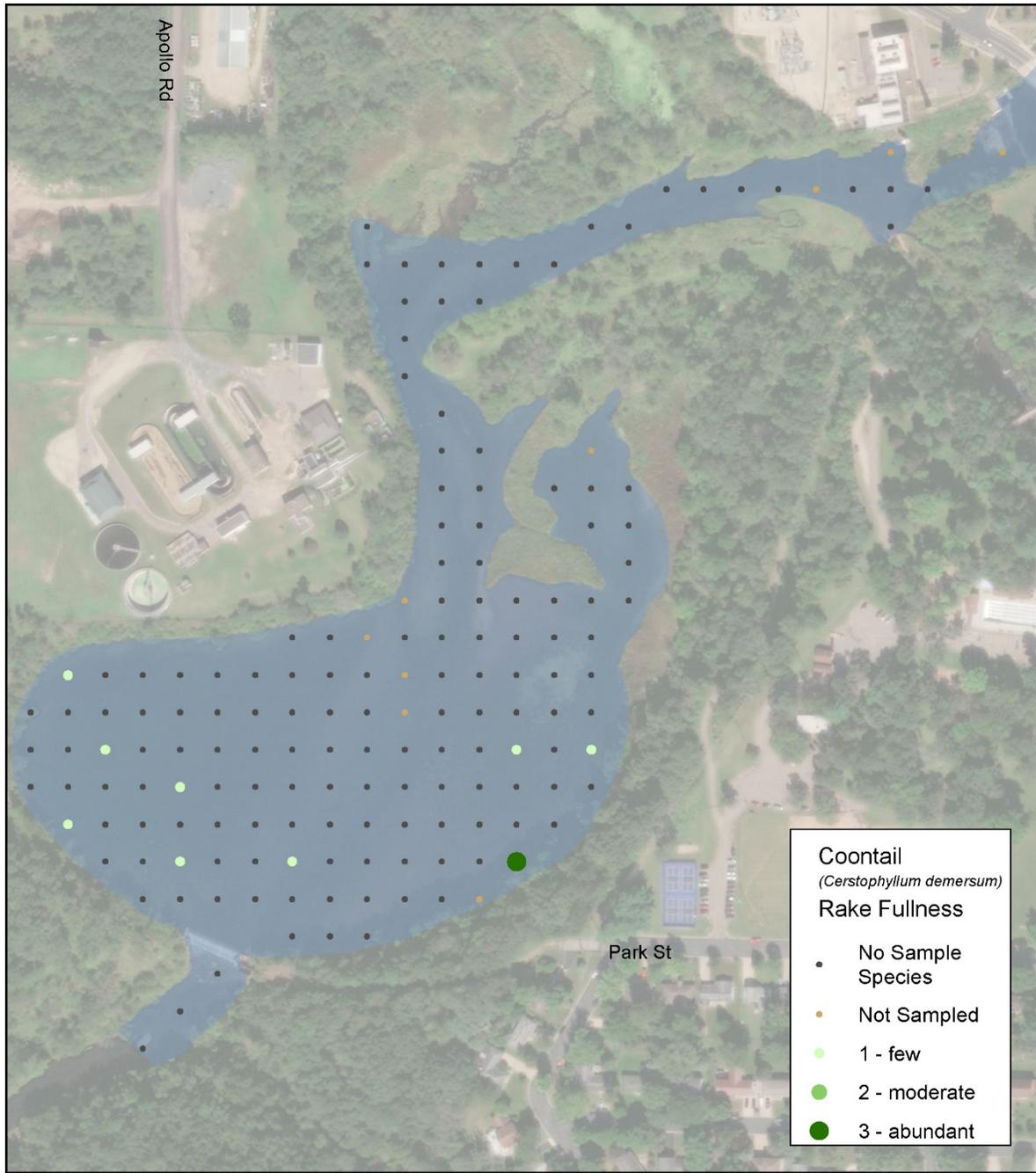


Coordinate System : NAD 1983  
StatePlane Wisconsin Central  
FIPS 4802 Feet



Lake Louise  
Pierce Co.  
Wisconsin

Figure A-4: Waterweed rake fullness for Lake Louise.



**River Falls Hydroelectric Project  
Aquatic Invasive Species Survey**

Field work conducted on 7/6/2020 - 7/7/2020  
Field team - Garrett Shear and Sean Morrison

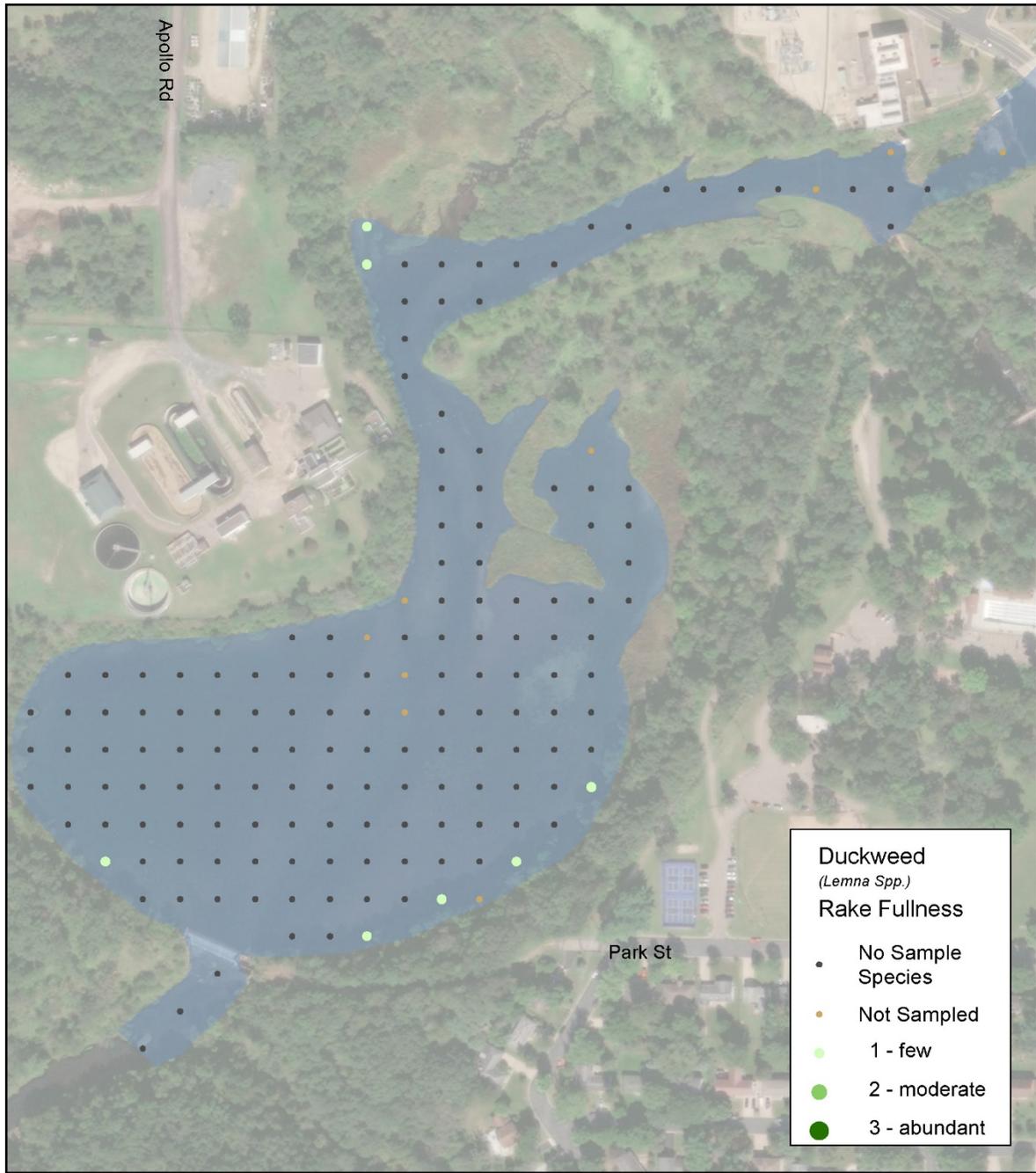


Coordinate System : NAD 1983  
StatePlane Wisconsin Central  
FIPS 4802 Feet



Lake Louise  
Pierce Co.  
Wisconsin

Figure A-5: Coontail rake fullness for Lake Louise.



**River Falls Hydroelectric Project  
Aquatic Invasive Species Survey**

Field work conducted on 7/6/2020 - 7/7/2020  
Field team - Garrett Shear and Sean Morrison

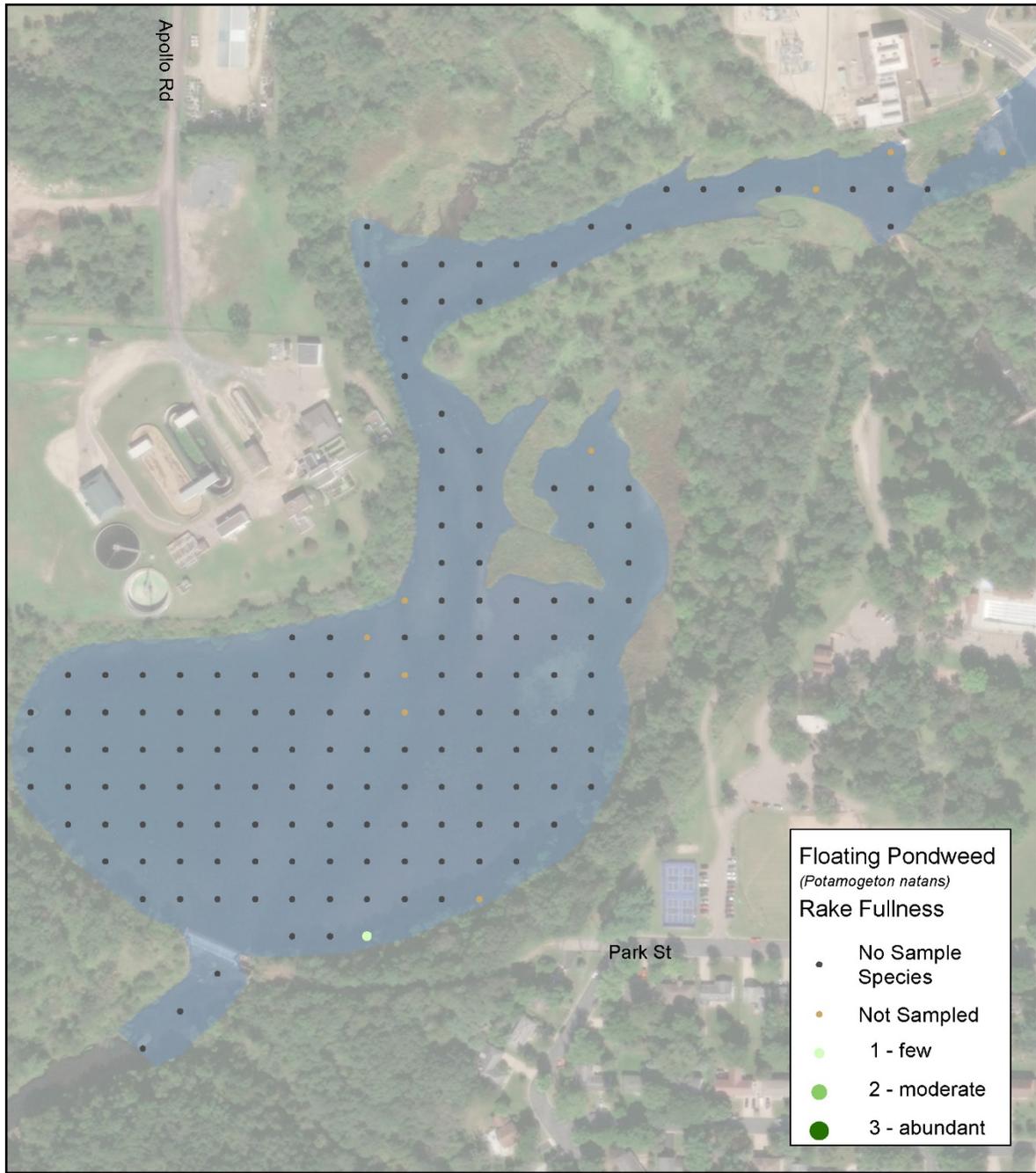


Coordinate System : NAD 1983  
StatePlane Wisconsin Central  
FIPS 4802 Feet



Lake Louise  
Pierce Co.  
Wisconsin

Figure A-6: Duckweed rake fullness for Lake Louise.



**River Falls Hydroelectric Project  
 Aquatic Invasive Species Survey**

Field work conducted on 7/6/2020 - 7/7/2020  
 Field team - Garrett Shear and Sean Morrison

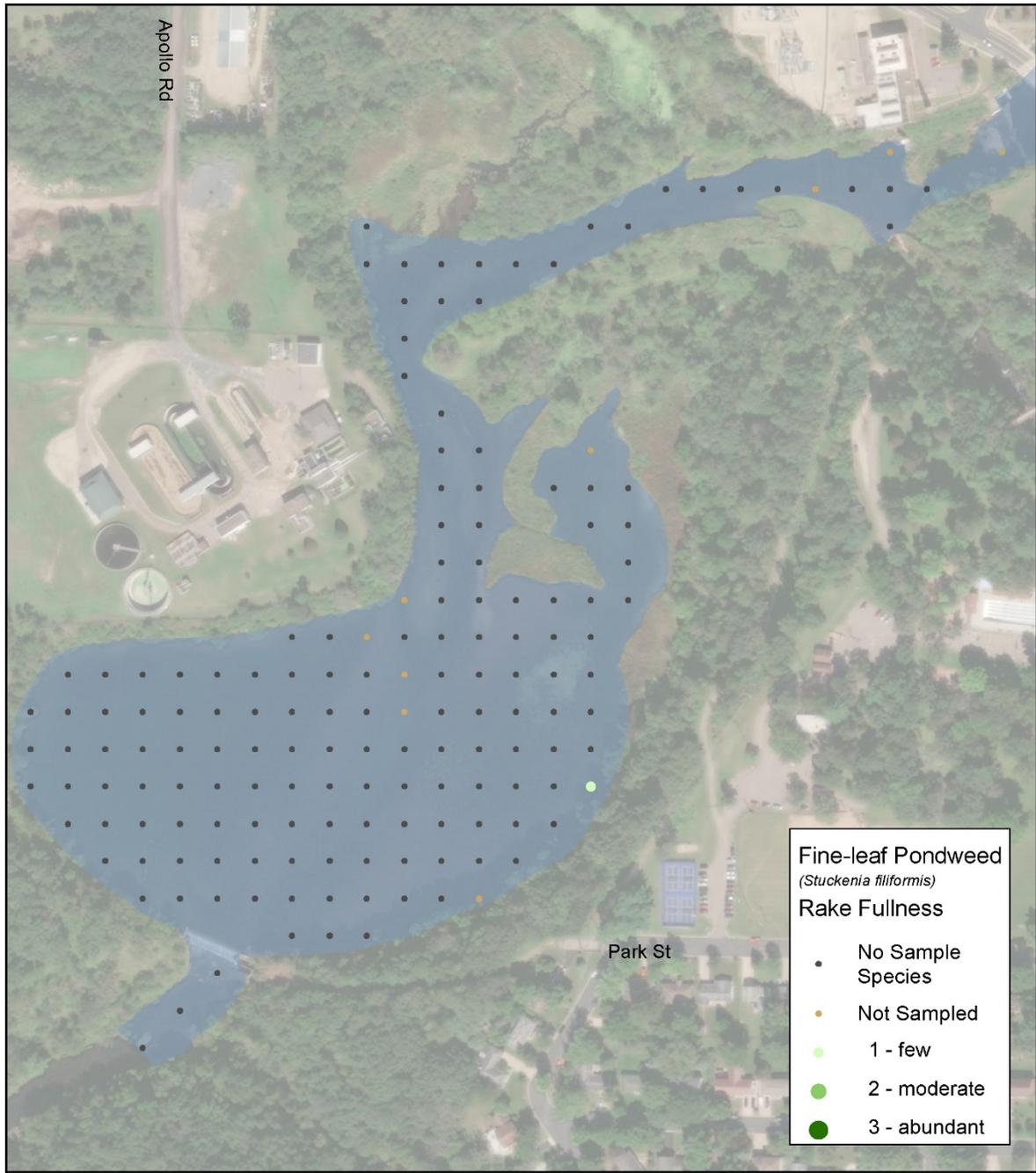


Coordinate System : NAD 1983  
 StatePlane Wisconsin Central  
 FIPS 4802 Feet



Lake Louise  
 Pierce Co.  
 Wisconsin

Figure A-7: Floating pondweed rake fullness for Lake Louise.



**River Falls Hydroelectric Project  
 Aquatic Invasive Species Survey**

Field work conducted on 7/6/2020 - 7/7/2020  
 Field team - Garrett Shear and Sean Morrison

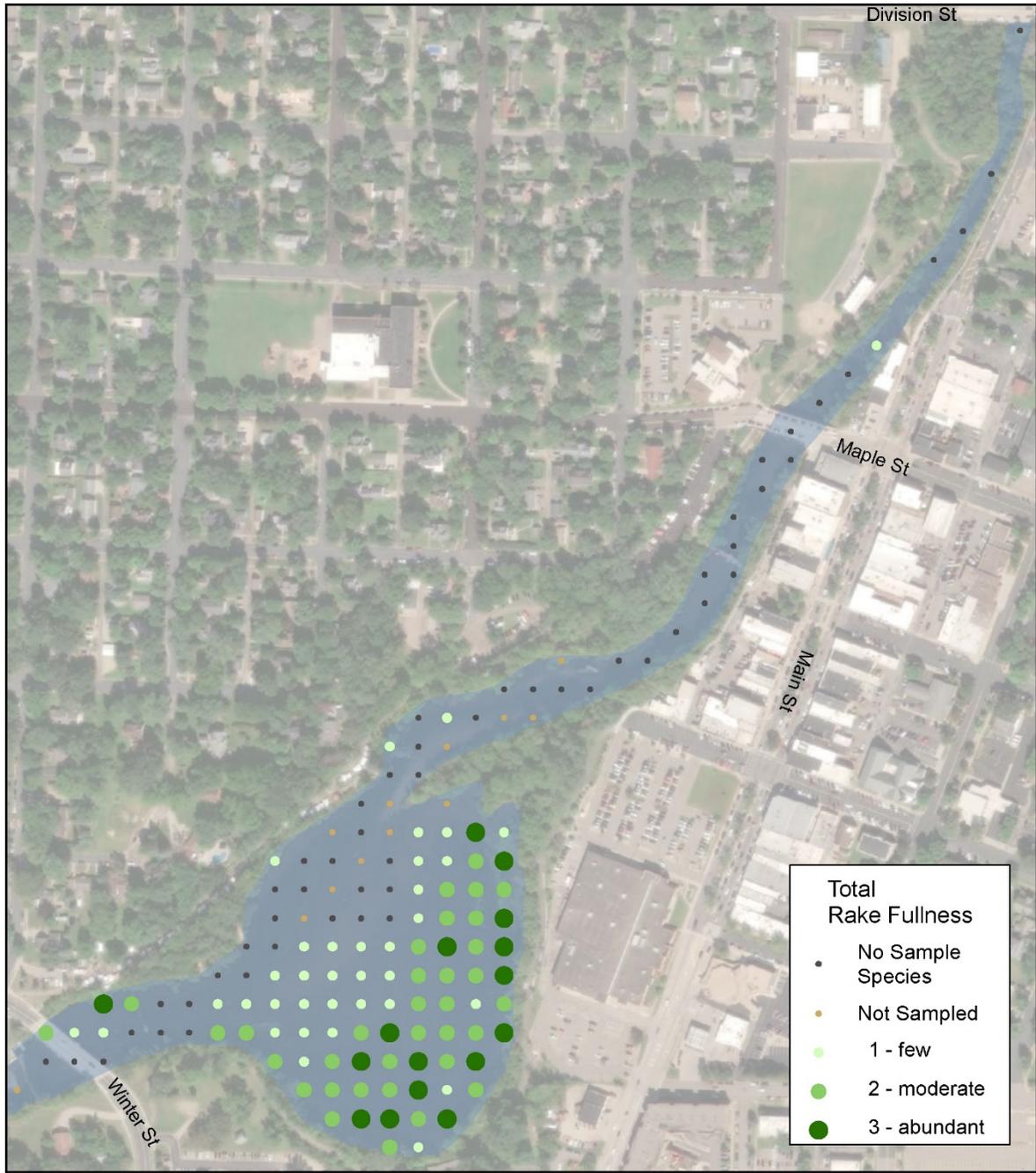


Coordinate System : NAD 1983  
 StatePlane Wisconsin Central  
 FIPS 4802 Feet



Lake Louise  
 Pierce Co.  
 Wisconsin

Figure A-8: Fine-leaf pondweed rake fullness for Lake Louise.



**River Falls Hydroelectric Project  
Aquatic Invasive Species Survey**

Field work conducted on 7/6/2020 - 7/7/2020  
Field team - Garrett Shear and Sean Morrison

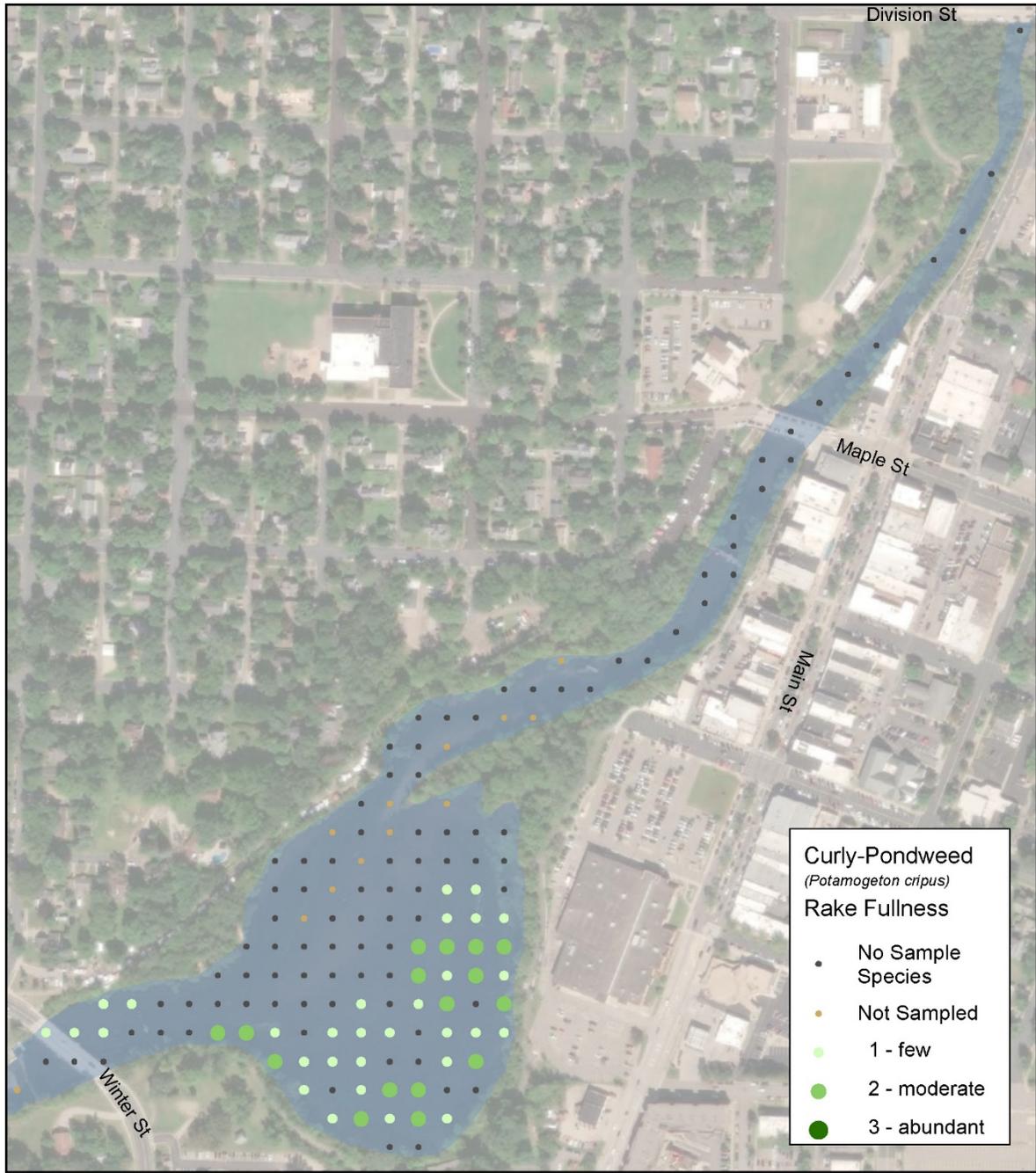


Coordinate System : NAD 1983  
StatePlane Wisconsin Central  
FIPS 4802 Feet



Lake George  
Pierce Co.  
Wisconsin

Figure A-9: Total rake fullness for Lake George.



**River Falls Hydroelectric Project  
Aquatic Invasive Species Survey**

Field work conducted on 7/6/2020 - 7/7/2020  
Field team - Garrett Shear and Sean Morrison

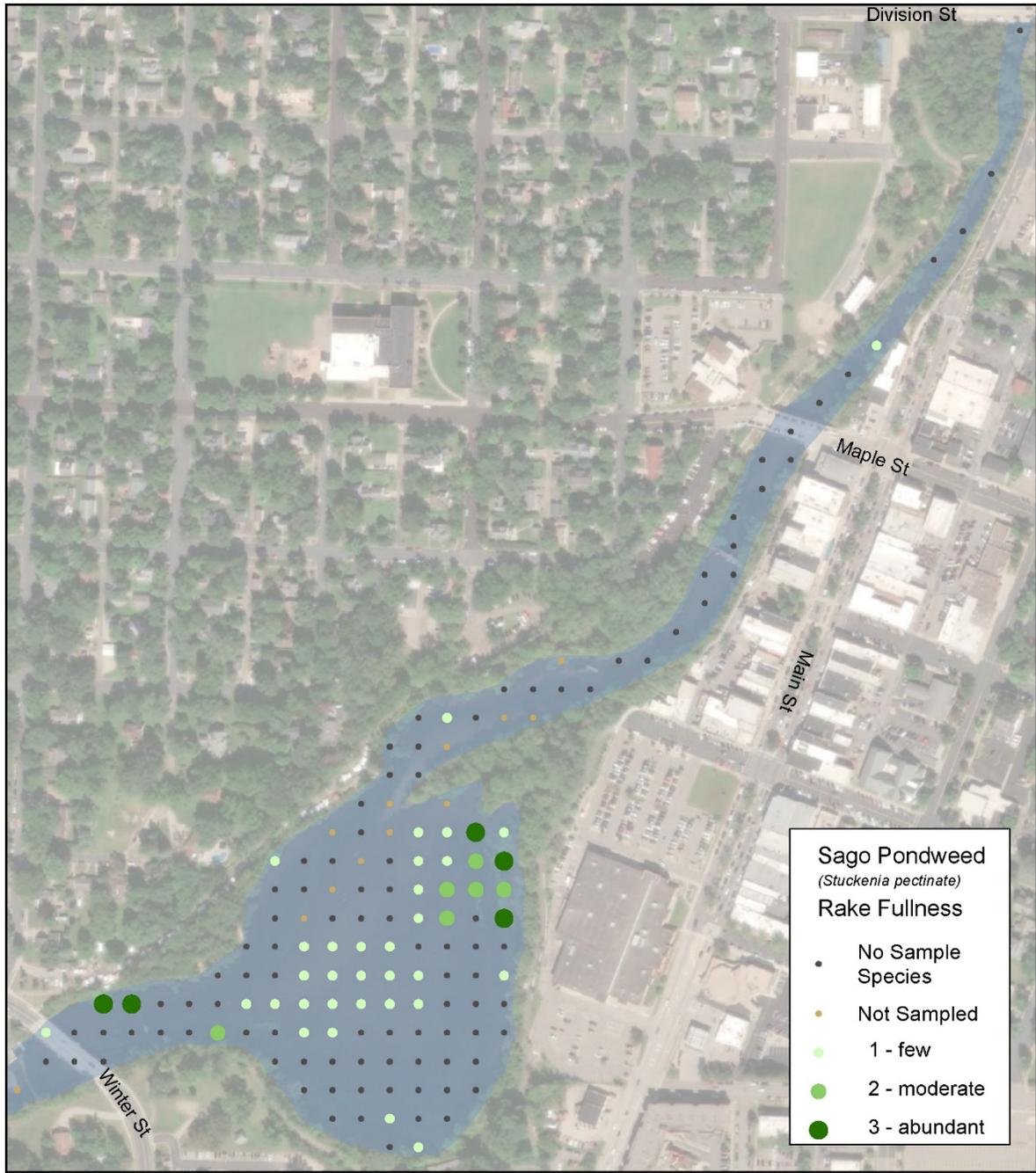


Coordinate System : NAD 1983  
StatePlane Wisconsin Central  
FIPS 4802 Feet



Lake George  
Pierce Co.  
Wisconsin

Figure A-10: Curly-leaf pondweed rake fullness for Lake George.



**River Falls Hydroelectric Project  
Aquatic Invasive Species Survey**

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Field team - Garrett Shear and Sean Morrison

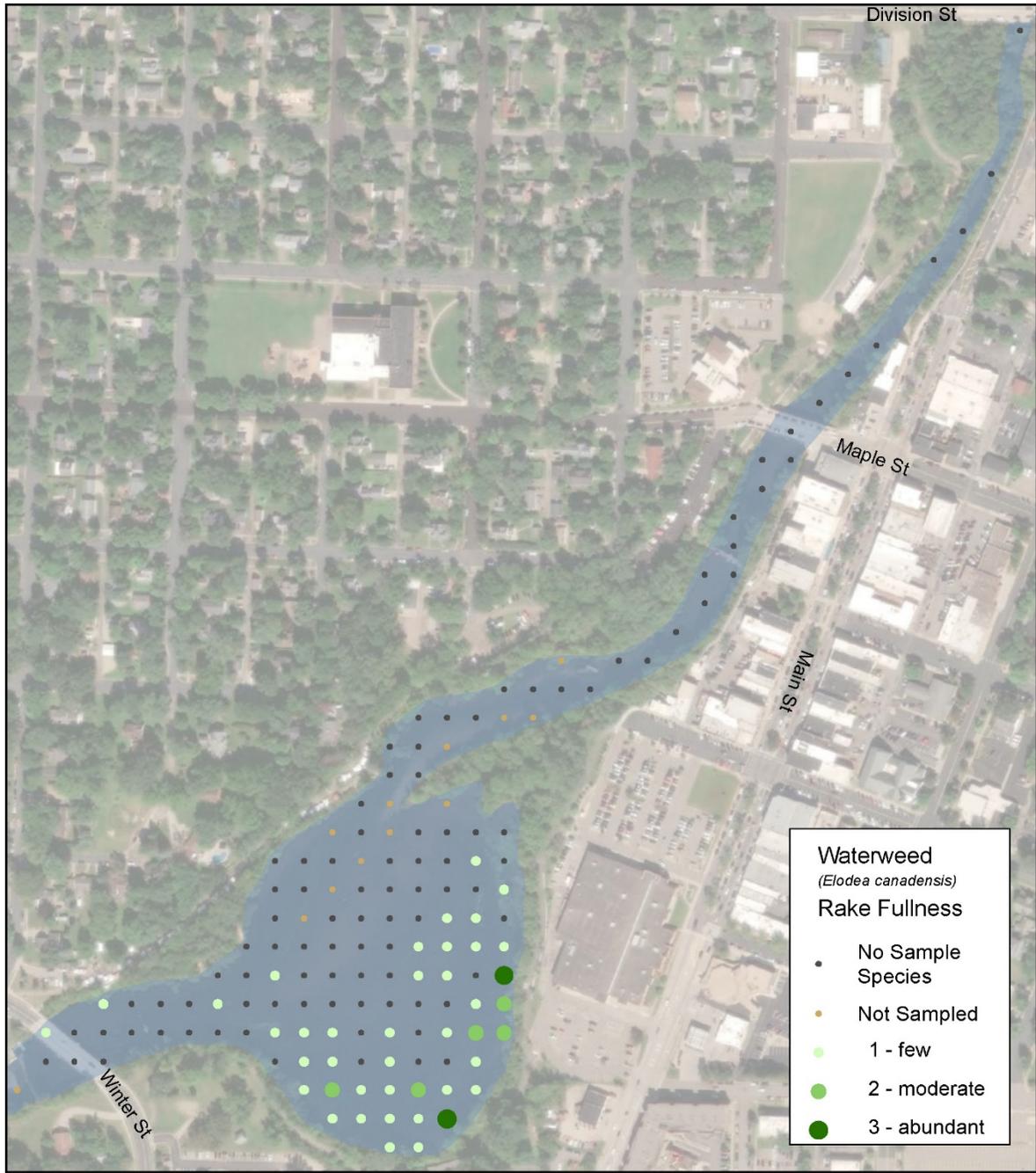


Coordinate System : NAD 1983  
StatePlane Wisconsin Central  
FIPS 4802 Feet



Lake George  
Pierce Co.  
Wisconsin

Figure A-11: Sago pondweed rake fullness for Lake George.



**River Falls Hydroelectric Project  
Aquatic Invasive Species Survey**

Field work conducted on 7/6/2020 - 7/7/2020  
Field team - Garrett Shear and Sean Morrison

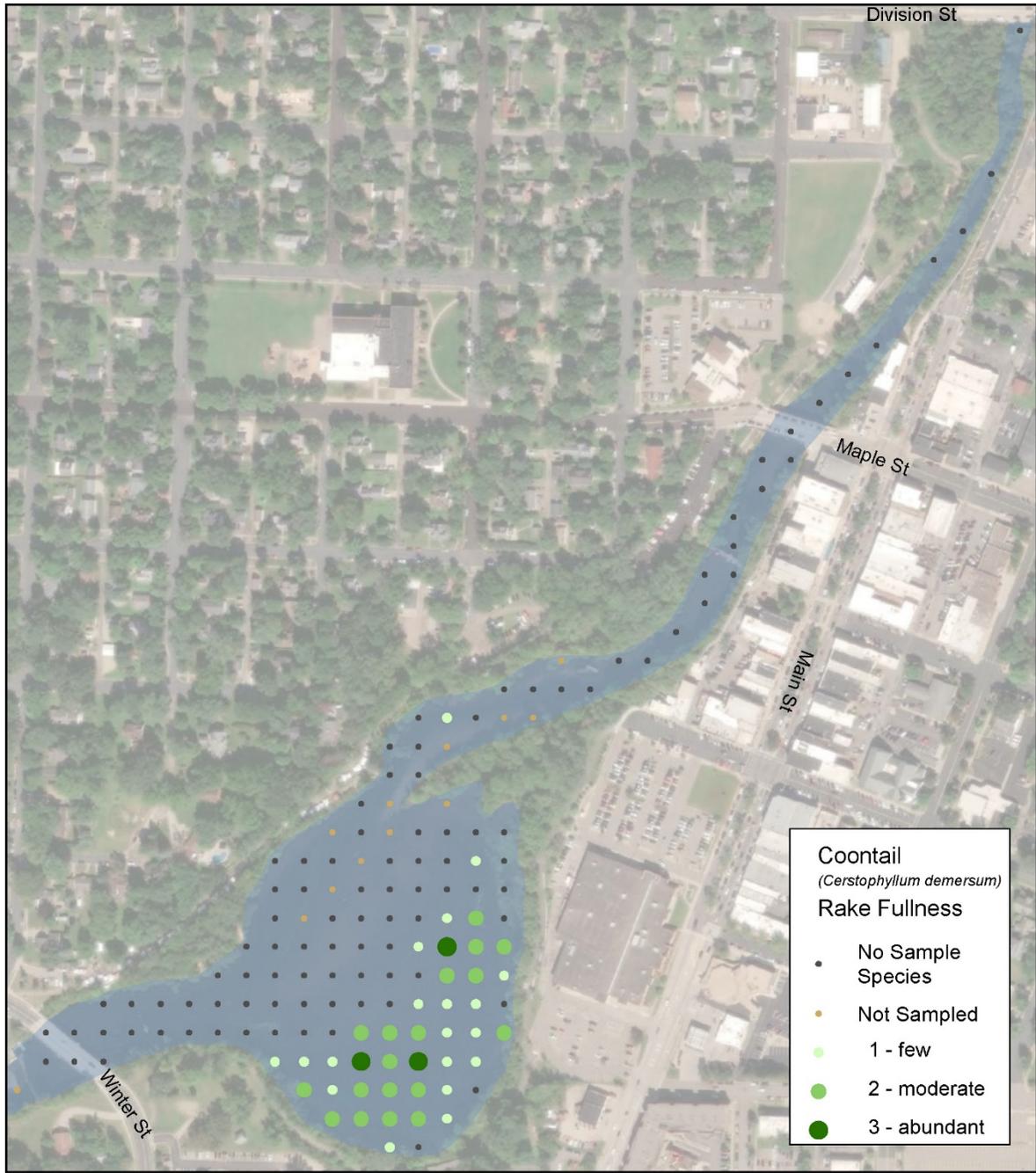


Coordinate System : NAD 1983  
StatePlane Wisconsin Central  
FIPS 4802 Feet



Lake George  
Pierce Co.  
Wisconsin

Figure A-12: Waterweed rake fullness for Lake George.



**River Falls Hydroelectric Project  
Aquatic Invasive Species Survey**

Field work conducted on 7/6/2020 - 7/7/2020  
Field team - Garrett Shear and Sean Morrison

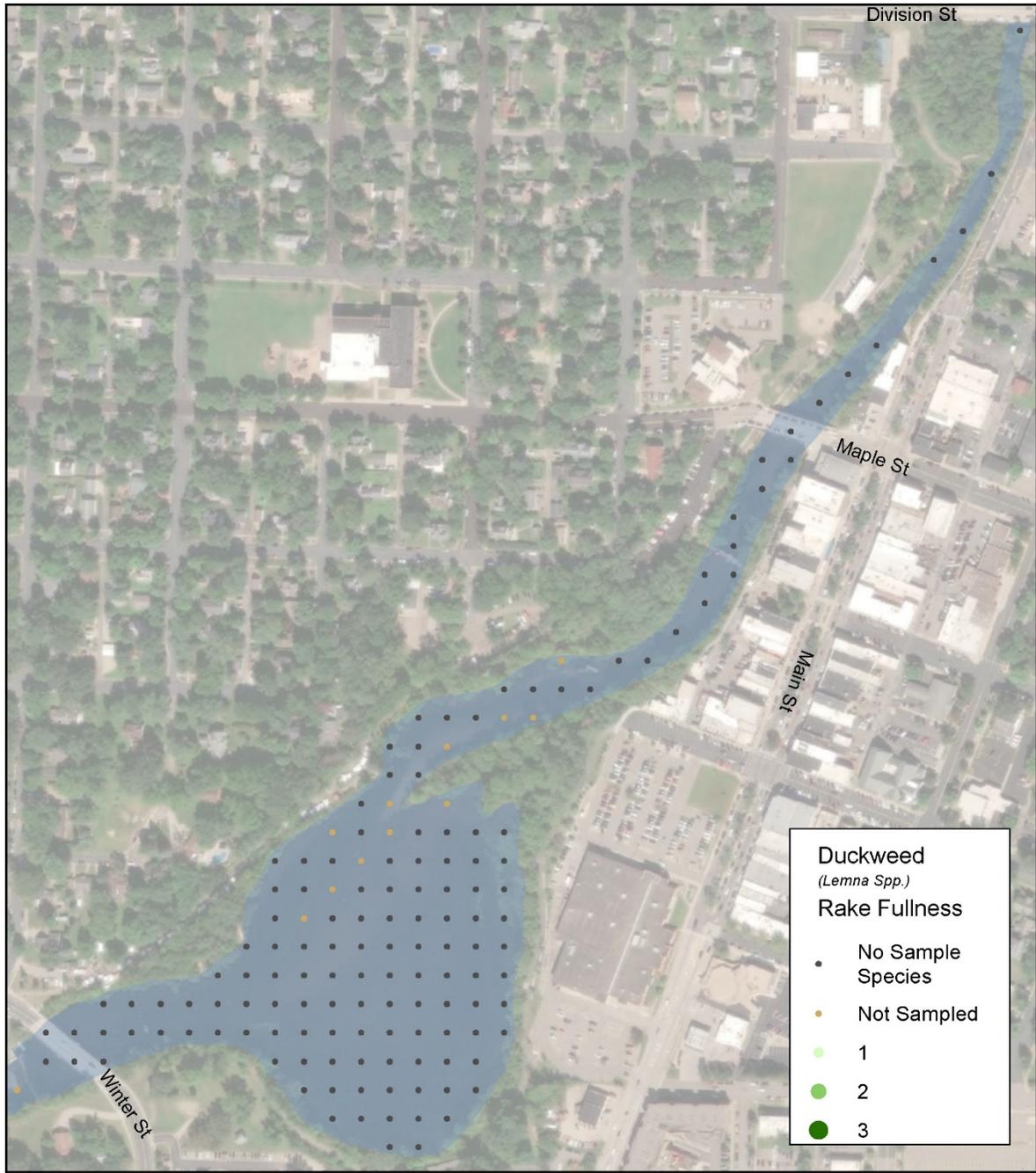


Coordinate System : NAD 1983  
StatePlane Wisconsin Central  
FIPS 4802 Feet



Lake George  
Pierce Co.  
Wisconsin

Figure A-13: Coontail rake fullness for Lake George.



**River Falls Hydroelectric Project  
Aquatic Invasive Species Survey**

Field work conducted on 7/6/2020 - 7/7/2020  
Field team - Garrett Shear and Sean Morrison

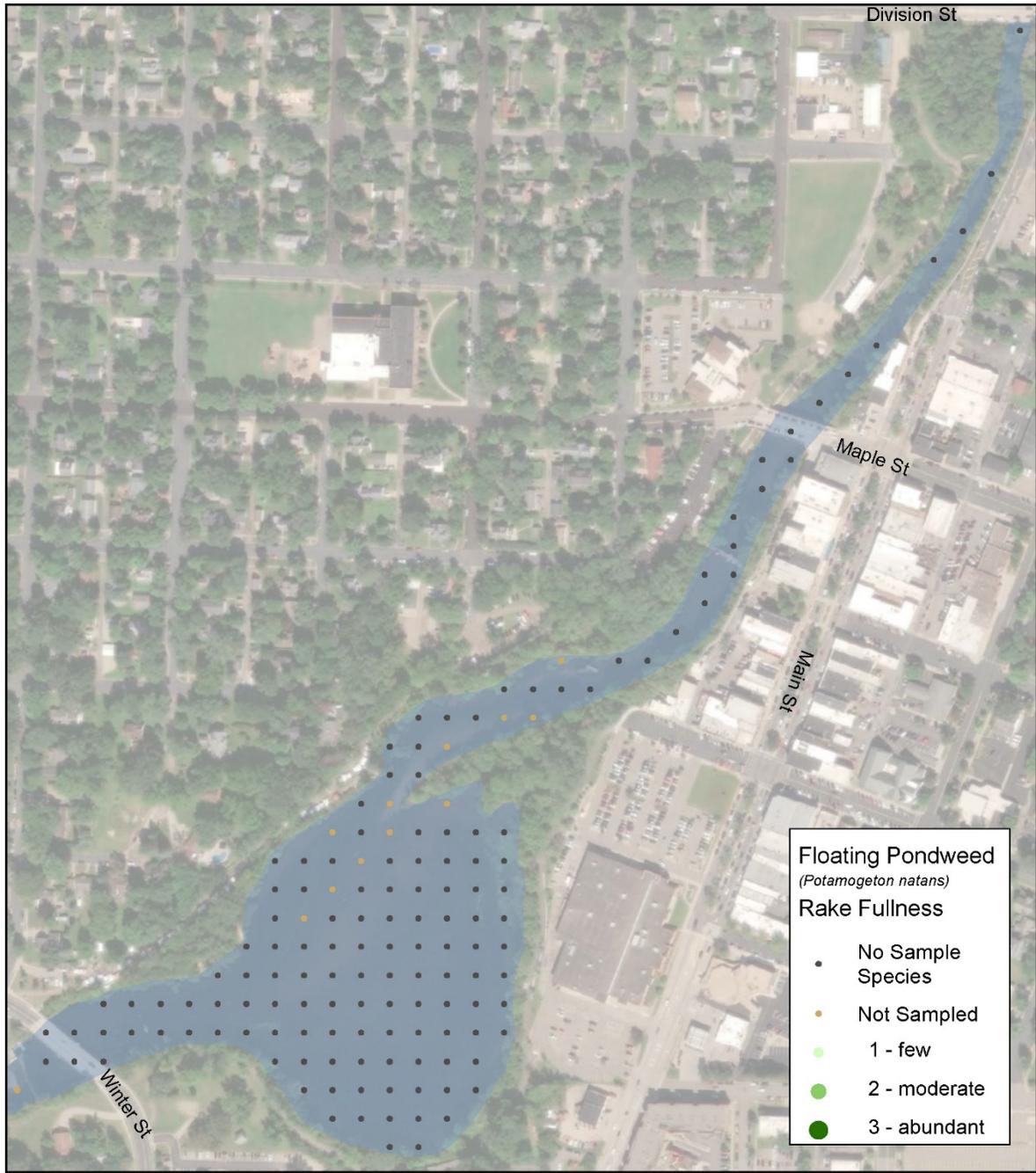


Coordinate System : NAD 1983  
StatePlane Wisconsin Central  
FIPS 4802 Feet



Lake George  
Pierce Co.  
Wisconsin

Figure A-14: Duckweed rake fullness for Lake George.



**River Falls Hydroelectric Project  
Aquatic Invasive Species Survey**

Field work conducted on 7/6/2020 - 7/7/2020  
Field team - Garrett Shear and Sean Morrison

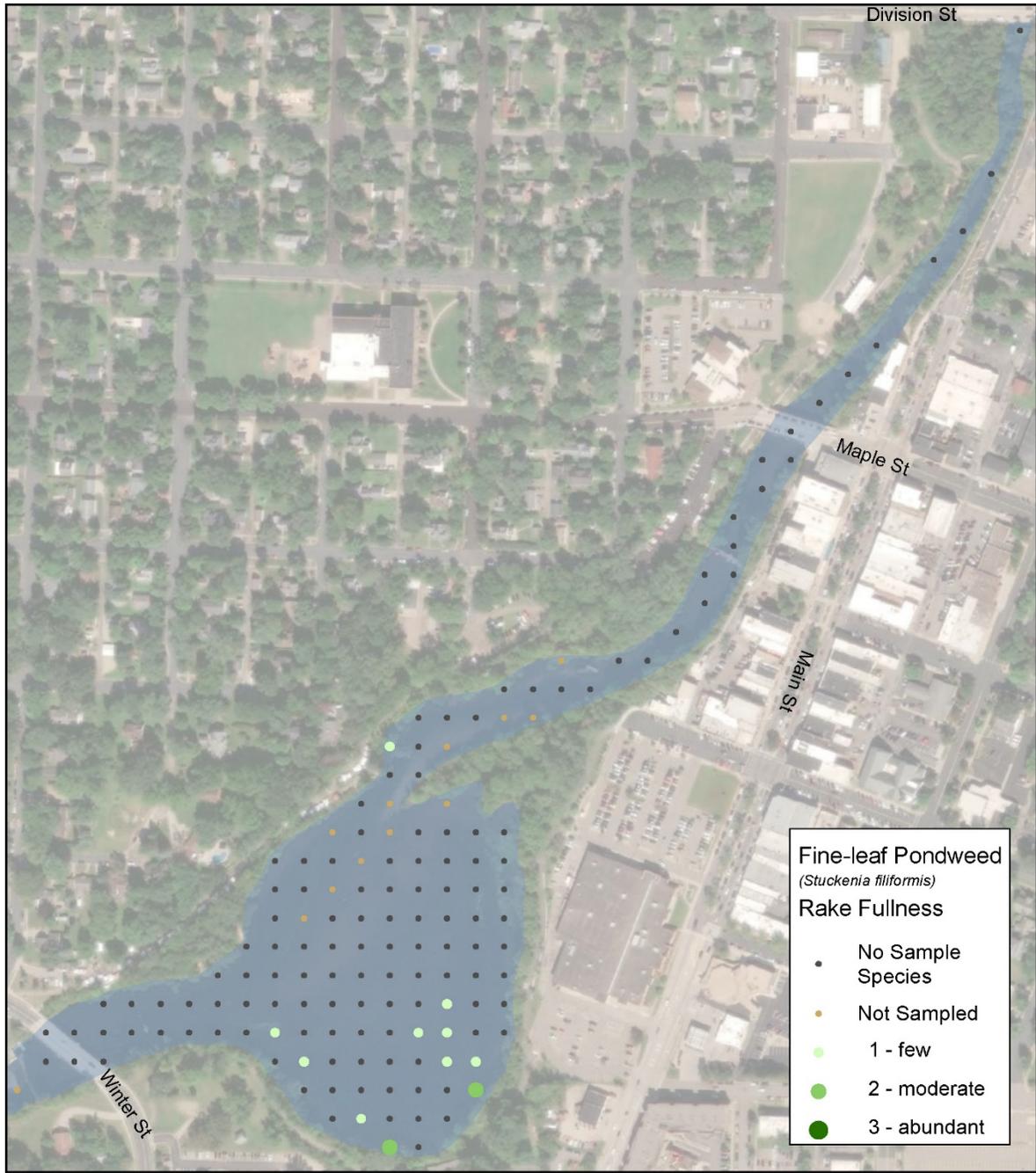


Coordinate System : NAD 1983  
StatePlane Wisconsin Central  
FIPS 4802 Feet



Lake George  
Pierce Co.  
Wisconsin

Figure A-15: Floating pondweed rake fullness for Lake George.



**River Falls Hydroelectric Project  
 Aquatic Invasive Species Survey**

Field work conducted on 7/6/2020 - 7/7/2020  
 Field team - Garrett Shear and Sean Morrison



Coordinate System : NAD 1983  
 StatePlane Wisconsin Central  
 FIPS 4802 Feet



Lake George  
 Pierce Co.  
 Wisconsin

Figure A-16: Fine-leaf pondweed rake fullness for Lake George.

## Appendix B

# STATS

**Lake** Lake George and Lake Louise  
**County** Pierce  
**WBIC** None  
**Survey** 7/6/2020-7/7/2020

**Date**

## INDIVIDUAL SPECIES STATS:

	Total vegetation	<i>Potamogeton crispus</i> , Curly- leaf pondweed	<i>Ceratophyllum demersum</i> , Coontail	<i>Elodea canadensis</i> , Common waterweed	<i>Lemna</i> Spp. Duckweed	<i>Potamogeton natans</i> , Floating-leaf pondweed	<i>Stuckenia filiformis</i> , Fine- leaved pondweed	<i>Stuckenia pectinata</i> , v Sago pondweed
<b>Frequency of occurrence within vegetated areas (%)</b>	50.76	24.87	43.65	3.55	0.51	6.09	65.48	
<b>Frequency of occurrence at sites shallower than maximum depth of plants</b>	32.15	15.76	27.65	2.25	0.32	3.86	41.48	
<b>Relative Frequency (%)</b>	26.0	12.8	22.4	1.8	0.3	3.1	33.6	
Relative Frequency (squared)	0.25	0.07	0.02	0.05	0.00	0.00	0.11	
<b>Number of sites where species found</b>	100	49	86	7	1	12	129	
<b>Average Rake Fullness</b>	1.64	1.29	1.53	1.16	1.00	1.17	1.43	
<b># visual sightings</b>								
<b>present (visual or collected)</b>	x	x	x	x	x	x	x	

## SUMMARY STATS:

<b><u>Total number of sites visited</u></b>	<b>311</b>
<b><u>Total number of sites with vegetation</u></b>	<b>197</b>
<b><u>Total number of sites shallower than maximum depth of plants</u></b>	<b>311</b>
<b><u>Frequency of occurrence at sites shallower than maximum depth of plants</u></b>	<b>63.34</b>
<b><u>Simpson Diversity Index</u></b>	<b>0.75</b>
<b><u>Maximum depth of plants (ft)**</u></b>	<b>-</b>
<b><u>Number of sites sampled using rake on Rope(R)</u></b>	<b>291</b>
<b><u>Number of sites sampled using rake on Pole(P)</u></b>	<b>0</b>
<b><u>Average number of all species per site (shallower than max depth)</u></b>	<b>1.23</b>
<b><u>Average number of all species per site (veg. sites only)</u></b>	<b>1.95</b>
<b><u>Average number of native species per site (shallower than max depth)</u></b>	<b>0.91</b>
<b><u>Average number of native species per site (veg. sites only)</u></b>	<b>1.51</b>
<b><u>Species Richness</u></b>	<b>7</b>
<b><u>Species Richness (including visuals)</u></b>	<b>0</b>

# STATS

Lake Lake George  
 County Pierce  
 WBIC None  
 Survey 7/6/2020-7/7/2020

Date

## INDIVIDUAL SPECIES STATS:

	Total vegetation	<i>Potamogeton crispus</i> , Curly- leaf pondweed	<i>Ceratophyllum demersum</i> , Coontail	<i>Elodea canadensis</i> , Common waterweed	<i>Lemna</i> Spp. Duckweed	<i>Potamogeton natans</i> , Floating-leaf pondweed	<i>Stuckenia filiformis</i> , Fine- leaved pondweed	<i>Stuckenia pectinata</i> , Sago pondweed
Frequency of occurrence within vegetated areas (%)	50.00	43.48	45.65			11.96	46.74	
Frequency of occurrence at sites shallower than maximum depth of plants	30.87	26.85	28.19			7.38	28.86	
Relative Frequency (%)	25.3	22.0	23.1			6.0	23.6	
Relative Frequency (squared)	0.22	0.06	0.05	0.05		0.00	0.06	
Number of sites where species found	46	40	42			11	43	
Average Rake Fullness	1.77	1.35	1.60	1.21		1.18	1.37	
# visual sightings present (visual or collected)	x	x	x			x	x	

## SUMMARY STATS:

<u>Total number of sites visited</u>	<u>149</u>
<u>Total number of sites with vegetation</u>	<u>92</u>
<u>Total number of sites shallower than maximum depth of plants</u>	<u>149</u>
<u>Frequency of occurrence at sites shallower than maximum depth of plants</u>	<u>61.74</u>
Simpson Diversity Index	0.78
Maximum depth of plants (ft)**	-
<u>Number of sites sampled using rake on Rope(R)</u>	<u>138</u>
<u>Number of sites sampled using rake on Pole(P)</u>	<u>0</u>
<u>Average number of all species per site (shallower than max depth)</u>	<u>1.34</u>
<u>Average number of all species per site (veg. sites only)</u>	<u>2.12</u>
<u>Average number of native species per site (shallower than max depth)</u>	<u>0.94</u>
<u>Average number of native species per site (veg. sites only)</u>	<u>1.64</u>
<u>Species Richness</u>	<u>5</u>
Species Richness (including visuals)	0

# STATS

**Lake** Lake Louise  
**County** Pierce  
**WBIC** None  
**Survey** 7/6/2020-7/7/2020

**Date**

## INDIVIDUAL SPECIES STATS:

	Total vegetation	<i>Potamogeton crispus</i> , Curly- leaf pondweed	<i>Ceratophyllum demersum</i> , Coontail	<i>Elodea canadensis</i> , Common waterweed	<i>Lemna</i> Spp. Duckweed	<i>Potamogeton natans</i> , Floating-leaf pondweed	<i>Stuckenia filiformis</i> , Fine- leaved pondweed	<i>Stuckenia pectinata</i> , Sago pondweed
<b>Frequency of occurrence within vegetated areas (%)</b>	48.65	8.11	39.64	6.31	0.90	0.90	77.48	
<b>Frequency of occurrence at sites shallower than maximum depth of plants</b>	33.33	5.56	27.16	4.32	0.62	0.62	53.09	
<b>Relative Frequency (%)</b>	26.7	4.5	21.8	3.5	0.5	0.5	42.6	
Relative Frequency (squared)	0.30	0.07	0.00	0.05	0.00	0.00	0.18	
<b>Number of sites where species found</b>	54	9	44	7	1	1	86	
<b>Average Rake Fullness</b>	1.55	1.24	1.22	1.11	1.00	1.00	1.45	
<b># visual sightings present (visual or collected)</b>	x	x	x	x	x	x	x	

## SUMMARY STATS:

<b><u>Total number of sites visited</u></b>	<b>162</b>
<b><u>Total number of sites with vegetation</u></b>	<b>111</b>
<b><u>Total number of sites shallower than maximum depth of plants</u></b>	<b>162</b>
<b><u>Frequency of occurrence at sites shallower than maximum depth of plants</u></b>	<b>68.52</b>
<b>Simpson Diversity Index</b>	<b>0.70</b>
<b>Maximum depth of plants (ft)**</b>	<b>-</b>
<b><u>Number of sites sampled using rake on Rope(R)</u></b>	<b>153</b>
<b><u>Number of sites sampled using rake on Pole(P)</u></b>	<b>0</b>
<b><u>Average number of all species per site (shallower than max depth)</u></b>	<b>1.25</b>
<b><u>Average number of all species per site (veg. sites only)</u></b>	<b>1.82</b>
<b><u>Average number of native species per site (shallower than max depth)</u></b>	<b>0.91</b>
<b><u>Average number of native species per site (veg. sites only)</u></b>	<b>1.41</b>
<b><u>Species Richness</u></b>	<b>7</b>
<b>Species Richness (including visuals)</b>	<b>0</b>

## Appendix C



Curly-leaf Pondweed (*Potamogeton crispus*)



Sago Pondweed (*Stuckenia pectinata*)



Waterweed (*Elodea canadensis*)



Coontail (*Ceratophyllum demersum*)



Duckweed (*Lemna Spp.*)



Floating Pondweed (*Potamogeton natans*)



Fine-leaf Pondweed (*Stuckenia filiformis*)

## Appendix D

sampling point	Latitude (need electronic copy of site locations)	Longitude (need electronic copy of site locations)	Dominant sediment type (M=muck, S=Sand, R=Rock)		Sampled holding rake pole (P) or rake rope (R)?	comments	Total Rake Fullness	<i>Potamogeton crispus</i> ,Curly-leaf pondweed	<i>Ceratophyllum demersum</i> , Coontail	<i>Elodea canadensis</i> , Common waterweed	<i>Lemna</i> Spp. <i>Duckweed</i>	<i>Potamogeton natans</i> , Floating-leaf pondweed	<i>Stuckenia pectinata</i> , Sago pondweed
1	-92.63953	44.850449	R	R	R								
2	-92.639269	44.850647	R	R	R								
3	-92.639008	44.850845	R	R	R								
4	-92.638477	44.85105	M	R	R								
5	-92.638207	44.851056	M	R	R		2	1	2				2
6	-92.637937	44.851062	M	R	R		2	1		1	1	2	2
7	-92.639565	44.851216	M	R	R		1					1	1
8	-92.639295	44.851223	M	R	R		2					2	2
9	-92.639025	44.851229	M	R	R		2	2				1	1
10	-92.638755	44.851235	M	R	R								
11	-92.638486	44.851241	M	R	R		2	1				2	2
12	-92.638216	44.851248	M	R	R		1	1				1	1
13	-92.637946	44.851254	M	R	R		1					1	1
14	-92.637676	44.85126	M	R	R		2					2	2
15	-92.637406	44.851266	M	R	R		1		1	1			
16	-92.637137	44.851273				terrestrial							
17	-92.639843	44.851402	M	R	R		2			1		2	2
18	-92.639573	44.851408	M	R	R		1			1		1	1
19	-92.639304	44.851415	M	R	R		2	1	1			2	2
20	-92.639034	44.851421	M	R	R		1	1				1	1
21	-92.638764	44.851427	M	R	R		2	2					
22	-92.638494	44.851433	M	R	R		2	1	1	1			
23	-92.638225	44.85144	M	R	R		1	1	1	1			
24	-92.637955	44.851446	M	R	R		1	1	1				
25	-92.637685	44.851452	M	R	R		1					1	1
26	-92.637415	44.851458	M	R	R		2					2	2
27	-92.637145	44.851464	M	R	R		2		1			2	2
28	-92.636876	44.851471	M	R	R		3	1	3	1		1	1
29	-92.640122	44.851588	M	R	R		1	1				1	1
30	-92.639852	44.851594	M	R	R		1		1			1	1
31	-92.639582	44.8516	M	R	R		1					1	1
32	-92.639312	44.851607	M	R	R		1		1				

33	-92.639043	44.851613	M	R	2	2		1			1
34	-92.638773	44.851619	M	R	1	1					
35	-92.638503	44.851625	M	R							
36	-92.638233	44.851631	M	R							
37	-92.637964	44.851638	M	R	2	2		1			1
38	-92.637694	44.851644	M	R	2	2					2
39	-92.637424	44.85165	M	R	1						1
40	-92.637154	44.851656	M	R	1	1		1			
41	-92.636884	44.851663	M	R	1	1		1			1
42	-92.636615	44.851669	M	R	1	1		1			
43	-92.6404	44.851773	M	R	1			1			
44	-92.640131	44.85178	M	R	2			2			2
45	-92.639861	44.851786	M	R	1	1		1			1
46	-92.639591	44.851792	M	R	2	1		1			2
47	-92.639321	44.851798	M	R	1		1	1			
48	-92.639051	44.851805	M	R	2	1					2
49	-92.638782	44.851811	M	R	1	1					
50	-92.638512	44.851817	M	R							
51	-92.638242	44.851823	M	R							
52	-92.637972	44.85183	M	R							
53	-92.637703	44.851836	M	R	1	1		1			
54	-92.637433	44.851842	M	R	2			1			2
55	-92.637163	44.851848	M	R	1			1			
56	-92.636893	44.851855	M	R	3	1		2			2
57	-92.636623	44.851861	M	R	2	2		1			
58	-92.636354	44.851867	M	R	2			1	1		2
59	-92.640409	44.851965	M	R	1						1
60	-92.640139	44.851972	M	R	1			1			
61	-92.63987	44.851978	M	R	1		1	1			1
62	-92.6396	44.851984	M	R	2						2
63	-92.63933	44.85199	M	R	2	1					2
64	-92.63906	44.851997	M	R	2						2
65	-92.63879	44.852003	M	R	2	2		1			1
66	-92.638521	44.852009	M	R							
67	-92.638251	44.852015	M	R	1	1					
68	-92.637981	44.852022	M	R							
69	-92.637711	44.852028	M	R							
70	-92.637442	44.852034	M	R	1						1
71	-92.637172	44.85204	M	R	1	1		1			
72	-92.636902	44.852046	M	R	1	1	1	1			
73	-92.636632	44.852053	M	R	2	1		2			1
74	-92.636362	44.852059	M	R	2		1	2			1
75	-92.640418	44.852157	M	R	1	1		1			
76	-92.640148	44.852163	M	R	1	1		1			
77	-92.639878	44.85217	M	R	2	1		1			2
78	-92.639609	44.852176	M	R	2	1					2
79	-92.639339	44.852182	M	R	2	1					2
80	-92.639069	44.852188	M	R	2	1					2
81	-92.638799	44.852195	M	R	1	1					1
82	-92.638529	44.852201	M	R	2	2					
83	-92.63826	44.852207	M	R	1	1					
84	-92.63799	44.852213	M	R							

85	-92.63772	44.85222			sand bar						
86	-92.63745	44.852226	M	R							
87	-92.637181	44.852232	M	R		1			1		1
88	-92.636911	44.852238	M	R		2	1				2
89	-92.636641	44.852245	M	R		2	1		1		1
90	-92.636371	44.852251	M	R		2			1		2
91	-92.640157	44.852355	M	R		2	2	1	1		1
92	-92.639887	44.852362	M	R		2	2				1
93	-92.639617	44.852368	M	R		1	1		1		1
94	-92.639348	44.852374	M	R		2	2				1
95	-92.639078	44.85238	M	R		2	2				1
96	-92.638808	44.852387	M	R		1					1
97	-92.638538	44.852393	M	R		1	1				1
98	-92.638268	44.852399	M	R		1	1				1
99	-92.637999	44.852405	M	R							
100	-92.637729	44.852412			Sand bar						
101	-92.637459	44.852418	M	R							
102	-92.637189	44.852424	M	R		1					1
103	-92.63692	44.85243	M	R		2			1		1
104	-92.63665	44.852436	M	R		2					2
105	-92.63638	44.852443	M	R		2	1		1		2
106	-92.638547	44.852585	M	R		1					1
107	-92.638277	44.852591	M	R		1					1
108	-92.638007	44.852597			Sand bar						
109	-92.637738	44.852603	M	R							
110	-92.637468	44.85261	M	R							
111	-92.637198	44.852616	M	R							
112	-92.636928	44.852622	M	R		2					2
113	-92.636658	44.852628	M	R		1					1
114	-92.636389	44.852635	M	R		2			1		2
115	-92.637746	44.852795			sand bar						
116	-92.637477	44.852802	M	R							
117	-92.637207	44.852808	M	R							
118	-92.636937	44.852814	M	R		1					1
119	-92.636667	44.85282	M	R		1					1
120	-92.636397	44.852827	M	R		2					2
121	-92.636128	44.852833	M	R		2					2
122	-92.637485	44.852993	M	R							
123	-92.637216	44.853	M	R							
124	-92.636136	44.853025	M	R		3					3
125	-92.637494	44.853185	M	R							
126	-92.637224	44.853192	M	R		1					1
127	-92.636415	44.85321	M	R		1					1
128	-92.636145	44.853217	M	R		3					3
129	-92.637503	44.853377	M	R							
130	-92.637233	44.853384	M	R							
131	-92.636694	44.853396	M	R		1					1
132	-92.636424	44.853402	M	R							
133	-92.636154	44.853408	M	R		2					2
134	-92.637512	44.853569	S	R							
135	-92.637242	44.853575	S	R		1					1
136	-92.636433	44.853594			sand bar						

137	-92.63752	44.853761	M	R								2
138	-92.637799	44.853947	M	R								1
139	-92.637808	44.854139	M	R					1			
140	-92.637817	44.854331	M	R		2						1
141	-92.637547	44.854337	M	R								
142	-92.637277	44.854343	M	R								
143	-92.638095	44.854516	M	R		2				1		2
144	-92.637825	44.854522	M	R		1						1
145	-92.637556	44.854529	M	R		1	1		1			1
146	-92.637286	44.854535	M	R								
147	-92.637016	44.854541	M	R								
148	-92.636746	44.854547	M	R								
149	-92.638104	44.854708	M	R		2				1		2
150	-92.636485	44.854746	M	R								
151	-92.636215	44.854752	S	R								
152	-92.634327	44.854795	R	R								
153	-92.63001	44.854895	M	R		2		1	1			
154	-92.62974	44.854901	M	R		1			1			1
155	-92.635954	44.85495	S	R								1
156	-92.635684	44.854956	S	R								
157	-92.635415	44.854962	S	R								
158	-92.635145	44.854969	S	R								
159	-92.634875	44.854975										
160	-92.634605	44.854981	R	R								
161	-92.634335	44.854987	R	R								
162	-92.634066	44.854994	M	R								
163	-92.630558	44.855074	M	R		2	1	2	1			
164	-92.630289	44.855081	M	R		3	2	2	1			
165	-92.630019	44.855087	M	R		3	1	2	1			1
166	-92.629749	44.855093	M	R		2	2	2	1			
167	-92.629479	44.855099	M	R		3	1	1	3			
168	-92.634344	44.855179										
169	-92.633535	44.855198										
170	-92.630837	44.85526	M	R		2	1	2	1			
171	-92.630567	44.855266	M	R		2		1	2			
172	-92.630297	44.855273	M	R		2	1	2	1			
173	-92.630028	44.855279	M	R		2	2	2	1			
174	-92.629758	44.855285	M	R		3	2	2	2			
175	-92.629488	44.855291	M	R		1		1	1			
176	-92.629218	44.855297	M	R		2			1			
177	-92.633274	44.855396	M	R								
178	-92.633004	44.855402	M	R								
179	-92.632734	44.855408	M	R								
180	-92.631115	44.855446	M	R		2	2	1				
181	-92.630846	44.855452	M	R		1	1	1	1			
182	-92.630576	44.855458	M	R		2	1	1	1			
183	-92.630306	44.855464	M	R		3	1	3				
184	-92.630036	44.855471	M	R		2		2	1			
185	-92.629766	44.855477	M	R		3		3				
186	-92.629497	44.855483	M	R		2	1	1				
187	-92.629227	44.855489	M	R		3	2	1	1			
188	-92.633283	44.855588	M	R		2	1		1			1

Gravel bar

Bedrock falls  
Bedrock falls

189	-92.633013	44.855594	M	R	1	1						
190	-92.632743	44.8556	M	R	1	1						
191	-92.632473	44.855607	M	R								
192	-92.632203	44.855613	M	R								
193	-92.631934	44.855619	M	R								
194	-92.631664	44.855625	M	R	2	2					2	
195	-92.631394	44.855631	M	R	2	2						
196	-92.631124	44.855638	M	R	1	1		1				
197	-92.630854	44.855644	M	R	1			1			1	
198	-92.630585	44.85565	M	R	1	1		1			1	
199	-92.630315	44.855656	M	R	2	1	2					
200	-92.630045	44.855663	M	R	3	1	2	1				
201	-92.629775	44.855669	M	R	2		2					
202	-92.629505	44.855675	M	R	2	1	1	1				
203	-92.629236	44.855681	M	R	2	1	1	2				
204	-92.628966	44.855687	M	R	3	1	2	2				
205	-92.632752	44.855792	M	R	3	1		1			3	
206	-92.632482	44.855799	M	R	2	1					3	
207	-92.632212	44.855805	M	R								
208	-92.631942	44.855811	M	R								
209	-92.631673	44.855817	M	R	1			1				
210	-92.631403	44.855823	M	R	1						1	
211	-92.631133	44.85583	M	R	1						1	
212	-92.630863	44.855836	M	R	1						1	
213	-92.630593	44.855842	M	R	1						1	
214	-92.630324	44.855848	M	R	1	1					1	
215	-92.630054	44.855854	M	R	1						1	
216	-92.629784	44.855861	M	R	2	1	1				1	
217	-92.629514	44.855867	M	R	2	2	1					
218	-92.629244	44.855873	M	R	1		1	1				
219	-92.628975	44.855879	M	R	2	2		2				
220	-92.631681	44.856009	M	R								
221	-92.631411	44.856015	M	R								
222	-92.631142	44.856022	M	R	1			1				
223	-92.630872	44.856028	M	R	1						1	
224	-92.630602	44.856034	M	R	1						1	
225	-92.630332	44.85604	M	R	1						1	
226	-92.630062	44.856046	M	R	1						1	
227	-92.629793	44.856053	M	R	2	2		1			1	
228	-92.629523	44.856059	M	R	2	1	2	1				
229	-92.629253	44.856065	M	R	2	2	2					
230	-92.628983	44.856071	M	R	3	1	1	3			1	
231	-92.63142	44.856207	M	R								
232	-92.63115	44.856213	M	R								
233	-92.630881	44.85622	M	R	1						1	
234	-92.630611	44.856226	M	R	1						1	
235	-92.630341	44.856232	M	R	1						1	
236	-92.630071	44.856238	M	R	1						1	
237	-92.629801	44.856245	M	R	2	2	1	1				
238	-92.629532	44.856251	M	R	3	2	3	1				
239	-92.629262	44.856257	M	R	2	2	2	1				
240	-92.628992	44.856263	M	R	3	2	2	1				

241	-92.631159	44.856405	S	R							
242	-92.630889	44.856412			sand bar						
243	-92.63062	44.856418	M	R							
244	-92.63035	44.856424	M	R							
245	-92.63008	44.85643	M	R							
246	-92.62981	44.856436	M	R		1					1
247	-92.62954	44.856443	M	R		2	1	1	1		2
248	-92.629271	44.856449	M	R		2	1	2	1		
249	-92.629001	44.856455	M	R		3	1				3
250	-92.631168	44.856597	S	R							
251	-92.630898	44.856603	S	R							
252	-92.630628	44.85661			sand bar						
253	-92.630359	44.856616	M	R							
254	-92.630089	44.856622	M	R							
255	-92.629819	44.856628	M	R		1					1
256	-92.629549	44.856635	M	R		2	1				2
257	-92.629279	44.856641	M	R		2	1				2
258	-92.629009	44.856647	M	R		2			1		2
259	-92.631177	44.856789	S	R		1					1
260	-92.630907	44.856795	S	R							
261	-92.630637	44.856802	S	R							
262	-92.630367	44.856808			sand bar						
263	-92.630097	44.856814	M	R							
264	-92.629828	44.85682	M	R		1					1
265	-92.629558	44.856826	M	R		1					1
266	-92.629288	44.856833	M	R		2		1	1		2
267	-92.629018	44.856839	S	R		3					3
268	-92.630646	44.856993			sand bar						
269	-92.630376	44.857	M	R							
270	-92.630106	44.857006			sand bar						
271	-92.629836	44.857012	M	R		1					1
272	-92.629567	44.857018	M	R		1					1
273	-92.629297	44.857025	M	R		3					3
274	-92.629027	44.857031	M	R		1					1
275	-92.630385	44.857192	S	R							
276	-92.630115	44.857198			sand bar						
277	-92.629575	44.85721			Sand bar						
278	-92.630124	44.85739	S	R							
279	-92.629854	44.857396	M	R							
280	-92.630132	44.857582	S	R		1					
281	-92.629863	44.857588	S	R							
282	-92.629593	44.857594			sand bar						
283	-92.629871	44.85778	M	R							
284	-92.629602	44.857786	M	R		1		1			1
285	-92.629332	44.857792	R	R							
286	-92.629062	44.857798			sand bar						
287	-92.628792	44.857805			Gravel bar						
288	-92.629071	44.85799	M	R							
289	-92.628801	44.857997	M	R							
290	-92.628531	44.858003	M	R							
291	-92.628261	44.858009	M	R							
292	-92.62854	44.858195			Sand bar						

293	-92.628	44.858207	S	R								
294	-92.62773	44.858213	M	R								
295	-92.627469	44.858411	S	R								
296	-92.627208	44.85861	S	R								
297	-92.627217	44.858801	S	R								
298	-92.626947	44.858808	S	R								
299	-92.626956	44.859	S	R								
300	-92.626965	44.859191	M	R								
301	-92.626703	44.85939	M	R								
302	-92.626712	44.859581	S	R								
303	-92.626442	44.859588	S	R								
304	-92.626451	44.85978	M	R								
305	-92.62619	44.859978	M	R								
306	-92.625929	44.860176	M	R								
307	-92.625668	44.860374	S	R		1						1
308	-92.625154	44.860962	S	R								
309	-92.624893	44.86116	S	R								
310	-92.624641	44.86155	S	R								
311	-92.624415	44.862516	S	R								