PINE LAKE AQUATIC PLANT SURVEY

PINE LAKE, HILES WISCONSIN

DECEMBER 2016

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PINE LAKE AQUATIC PLANT SURVEY

An aquatic plant survey was completed on Pine Lake in August 2016. The survey was completed according to the point intercept sampling method described by Madsen (1999) and as outlined in the WDNR draft guidance entitled "Aquatic Plant Management in Wisconsin" (WDNR, 2005).

WDNR research staff determined the sampling point resolution in accordance with the WDNR guidance and provided a base map with the specified sample point locations. The sample resolution and number of pre-determined intercept points are shown in the following table.

Latitude and longitude coordinates and sample identifications were assigned to each intercept point on the grid. Geographic coordinates were uploaded into a global positioning system (GPS) receiver. The GPS receiver was then used to navigate to intercept points. At each intercept point, plants were collected by a specialized rake on a pole that is twisted on the bottom to collect plants. All collected plants were identified to the lowest practicable taxonomic level (e.g., typically genus and species) and recorded on field data sheets. A rating of 1 to 3 was given to each species based on density; 1 is least dense, 3 is most dense. Visual observations of aquatic plants were also recorded. Water depth and, when detectable, sediment types at each intercept point were also recorded on field data sheets.

The point intercept method was used to evaluate the existing emergent, submersed, floating-leaf, and free-floating aquatic plants. If a species was not collected at a specific point, the space on the datasheet was left blank. For the survey, the data for each sample point was entered into the WDNR "Worksheets" (i.e., a data-processing spreadsheet) to calculate the following statistics:

- **Taxonomic richness** (the total number of taxa detected)
- **Maximum depth of plant growth**
- **Community frequency of occurrence** (number of intercept points where aquatic plants were detected divided by the number of intercept points shallower than the maximum depth of plant growth)
- **Mean intercept point taxonomic richness** (the average number of taxa per intercept point)
- **Mean intercept point native taxonomic richness** (the average number of native taxa per intercept point)
- **Taxonomic frequency of occurrence within vegetated areas** (the number of intercept points where a particular taxon (e.g., genus, species, etc.) was detected divided by the total number of intercept points where vegetation was present)
- **Taxonomic frequency of occurrence at sites within the photic zone** (the number of intercept points where a particular taxon (e.g., genus, species, etc.) was detected divided by the total number of intercept points which are equal to or shallower than the maximum depth of plant growth)
- **Relative taxonomic frequency of occurrence** (the number of intercept points where a particular taxon (e.g., genus, species, etc.) was detected divided by the sum of all species' occurrences)
- **Mean density** (the sum of the density values for a particular species divided by the number of sampling sites)
- **Simpson Diversity Index (SDI)** is an indicator of aquatic plant community diversity. SDI is calculated by taking one minus the sum of the relative frequencies squared for each species present. $SDI = 1-(\Sigma(\text{Relative Frequency}^2))$
  Based upon the index of community diversity, the closer the SDI is to one, the greater the diversity within the population.

Floristic Quality Index (FQI) This method uses a predetermined Coefficient of Conservatism (C), that has been assigned to each native plant species in Wisconsin, based on that species' tolerance for disturbance. Non-native plants are not assigned conservatism coefficients. The aggregate conservatism of all the plants inhabiting a site determines its floristic quality. The FQI value is the mean C times the square root of the total number of native species.
FQI = mean C * sqrt N (C= coefficient of conservatism, N= number of native species)
This formula combines the conservatism of the species present with a measure of the species richness of the site.

The survey was carried out August 25, 26 and 27, 2016, and included a total of 828 intercept points. Of the 828 original sample locations, 465 were sampled. The remaining points were either greater than the depth at which vegetation was found growing or could not be accessed due to various reasons including a combination of shallow water, rocks and thick vegetation. The aquatic plant community of the lake included a total of 24 species sampled by rake and 25 species including visuals. The species included floating-leaf, submersed and emergent aquatic vascular plants.

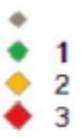
Vegetation was identified to a maximum depth of 12 feet (photic zone). Aquatic vegetation was detected at 75% of photic zone intercept points. A diverse plant community inhabited the lake during 2016. The Simpson Diversity Index value of the community was 0.85, and there was an average of 1.4 species identified at points that were within the photic zone. There was an average of 1.9 species present at points with vegetation present.

The following table lists the aquatic plant survey statistics

	A	B	C	D	H	J	Q	S	AC	AI	AN	AS	BD	BM	BN	BS	BU	CB	CI	CK	CL	CM
1		**STATS**	Total vegetation	*Myriophyllum spicatum* ,Eurasian	Bidens beckii (formerly Megalodonta), Water marigold	Brasenia schreberi, Watershield	Ceratophyllum demersum, Coontail	Chara sp., Muskgrasses	Elodea canadensis, Common waterweed	Heteranthera dubia, Water star-grass	Isoetes sp., Quillwort	Lemna trisulca, Forked duckweed	Najas flexilis, Slender naiad	Nuphar variegata, Spatterdock	Nymphaea odorata, White water lily	Pontederia cordata, Pickerelweed	Potamogeton amplifolius, Large-leaf pondweed	Potamogeton gramineus, Variable pondweed	Potamogeton praelongus, White-stem pondweed	Potamogeton pusillus, Small pondweed	Potamogeton richardsonii, Clasping-leaf pondweed	Potamogeton robbinsii, Fern pondweed
2	**Lake**	PINE LAKE																				
3	**County**	FOREST																				
4	**WBIC**	406900																				
5	**Survey Date**	8/25/16 8/26/16 8/27/16																				
6		**INDIVIDUAL SPECIES STATS:**																				
7		**Frequency of occurrence within vegetated areas (%)**		0.89	7.99	0.59	27.22	3.55	7.99	2.96	0.59	3.55	9.17				5.92	0.30	7.40	0.89	11.24	55.03
8		**Frequency of occurrence at sites shallower than maximum depth of plants**		0.67	6.01	0.45	20.49	2.67	6.01	2.23	0.45	2.67	6.90				4.45	0.22	5.57	0.67	8.46	41.43
9		**Relative Frequency (%)**		0.5	4.2	0.3	14.3	1.9	4.2	1.6	0.3	1.9	4.8				3.1	0.2	3.9	0.5	5.9	28.9
10		Relative Frequency (squared)	0.15	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.08
11		**Number of sites where species found**		3	27	2	92	12	27	10	2	12	31				20	1	25	3	38	186
12		**Average Rake Fullness**	1.83	1.00	1.07	1.00	1.15	1.00	1.07	1.00	1.00	1.00	1.35				1.00	1.00	1.12	1.00	1.03	1.76
13		**#visual sightings**		40	1	3								5	5	2	2		7			1
14		**present (visual or collected)**		present	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present
15																						
16		**SUMMARY STATS:**																				
17		**Total number of sites visited**	**465**																			
18		**Total number of sites with vegetation**	**338**																			
19		**Total number of sites shallower than maximum depth of plants**	**449**																			
20		**Frequency of occurrence at sites shallower than maximum depth of plants**	**75.28**																			
21		**Simpson Diversity Index**	**0.85**																			
22		**Maximum depth of plants (ft)****	**12.00**																			
23		**Number of sites sampled using rake on Rope (R)**	**0**																			
24		**Number of sites sampled using rake on Pole (P)**	**0**																			
25		**Average number of all species per site (shallower than max depth)**	**1.43**																			
26		**Average number of all species per site (veg. sites only)**	**1.91**																			
27		**Average number of native species per site (shallower than max depth)**	**1.42**																			
28		**Average number of native species per site (veg. sites only)**	**1.91**																			
29		**Species Richness**	**22**																			
30		**Species Richness (including visuals)**	**25**																			
31																						
32		****SEE "MAX DEPTH GRAPH" WORKSHEET TO CONFIRM**																				

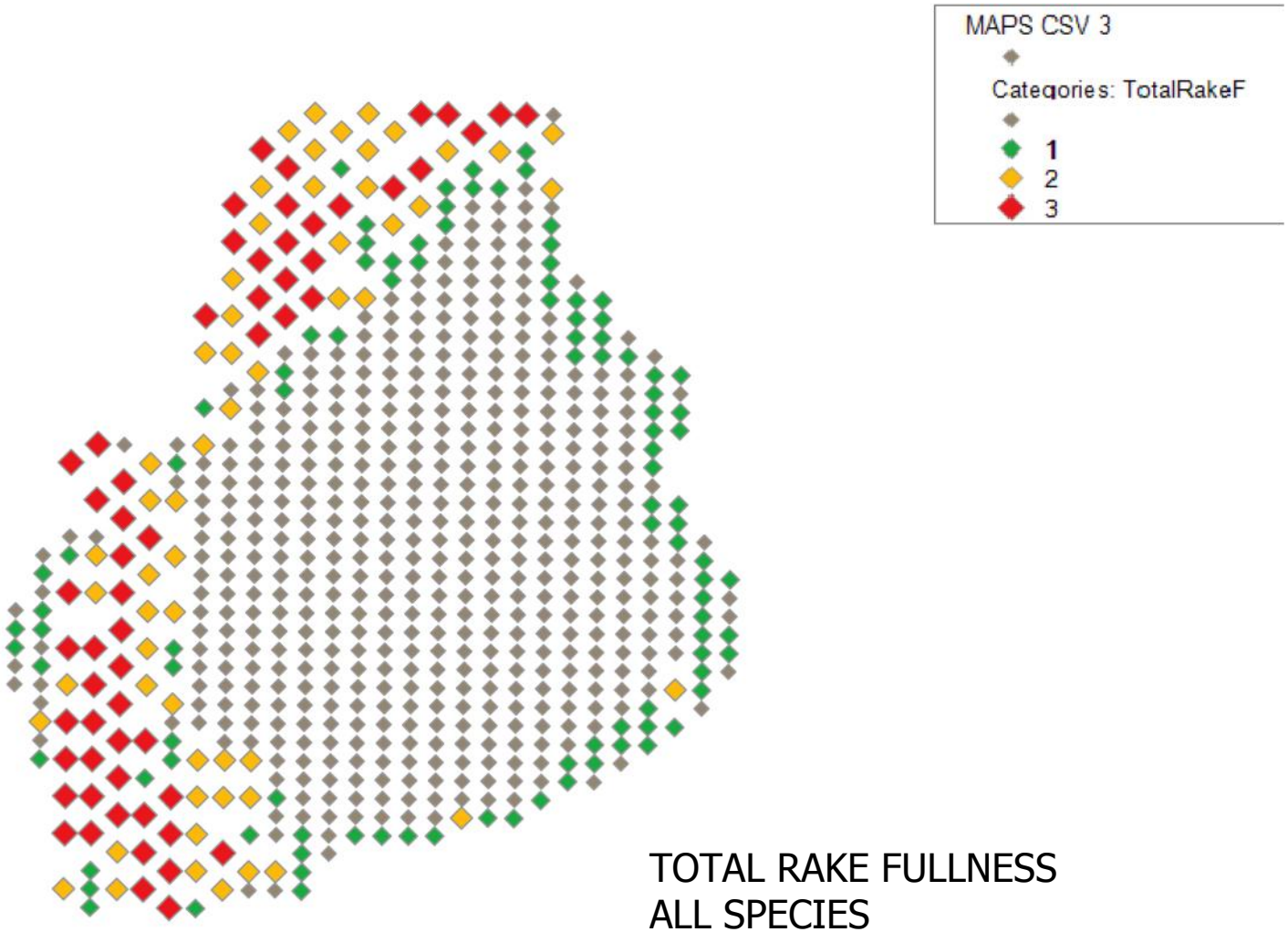
	B	CO	CQ	CR	DG	ED	EE	EN	EZ
1	**STATS**	Potamogeton strictifolius, Stiff pondweed	Potamogeton zosteriformis, Flat-stem pondweed	Ranunculus aquatilis, White water crowfoot	Schoenoplectus tabernaemontani, Softstem bulrush	Utricularia vulgaris, Common bladderwort	Vallisneria americana, Wild celery	Filamentous algae	
2	PINE LAKE								
3	FOREST								
4	406900								
5	8/25/16 8/26/16 8/27/16								
6	**INDIVIDUAL SPECIES STATS:**								
7	**Frequency of occurrence within vegetated areas (%)**	1.48	6.80	0.30	1.48	0.89	34.32	1.18	
8	**Frequency of occurrence at sites shallower than maximum depth of plants**	1.11	5.12	0.22	1.11	0.67	25.84	0.89	
9	**Relative Frequency (%)**	0.8	3.6	0.2	0.8	0.5	18.0		
10	Relative Frequency (squared)	0.00	0.00	0.00	0.00	0.00	0.03		
11	**Number of sites where species found**	5	23	1	5	3	116	4	
12	**Average Rake Fullness**	1.00	1.04	1.00	1.00	1.00	1.16	1.00	
13	**#visual sightings**		3		14				
14	**present (visual or collected)**	present	present	present	present	present	present	present	
15									
16	**SUMMARY STATS:**								
17	**Total number of sites visited**								
18	**Total number of sites with vegetation**								
19	**Total number of sites shallower than maximum depth of plants**								
20	**Frequency of occurrence at sites shallower than maximum depth of plants**								
21	**Simpson Diversity Index**								
22	**Maximum depth of plants (ft)****								
23	**Number of sites sampled using rake on Rope (R)**								
24	**Number of sites sampled using rake on Pole (P)**								
25	**Average number of all species per site (shallower than max depth)**								
26	**Average number of all species per site (veg. sites only)**								
27	**Average number of native species per site (shallower than max depth)**								
28	**Average number of native species per site (veg. sites only)**								
29	**Species Richness**								
30	**Species Richness (including visuals)**								
31									
32	****SEE "MAX DEPTH GRAPH" WORKSHEET TO CONFIRM**								

Following are maps showing the location of the various species and plant communities. The following rating system is shown on the maps:



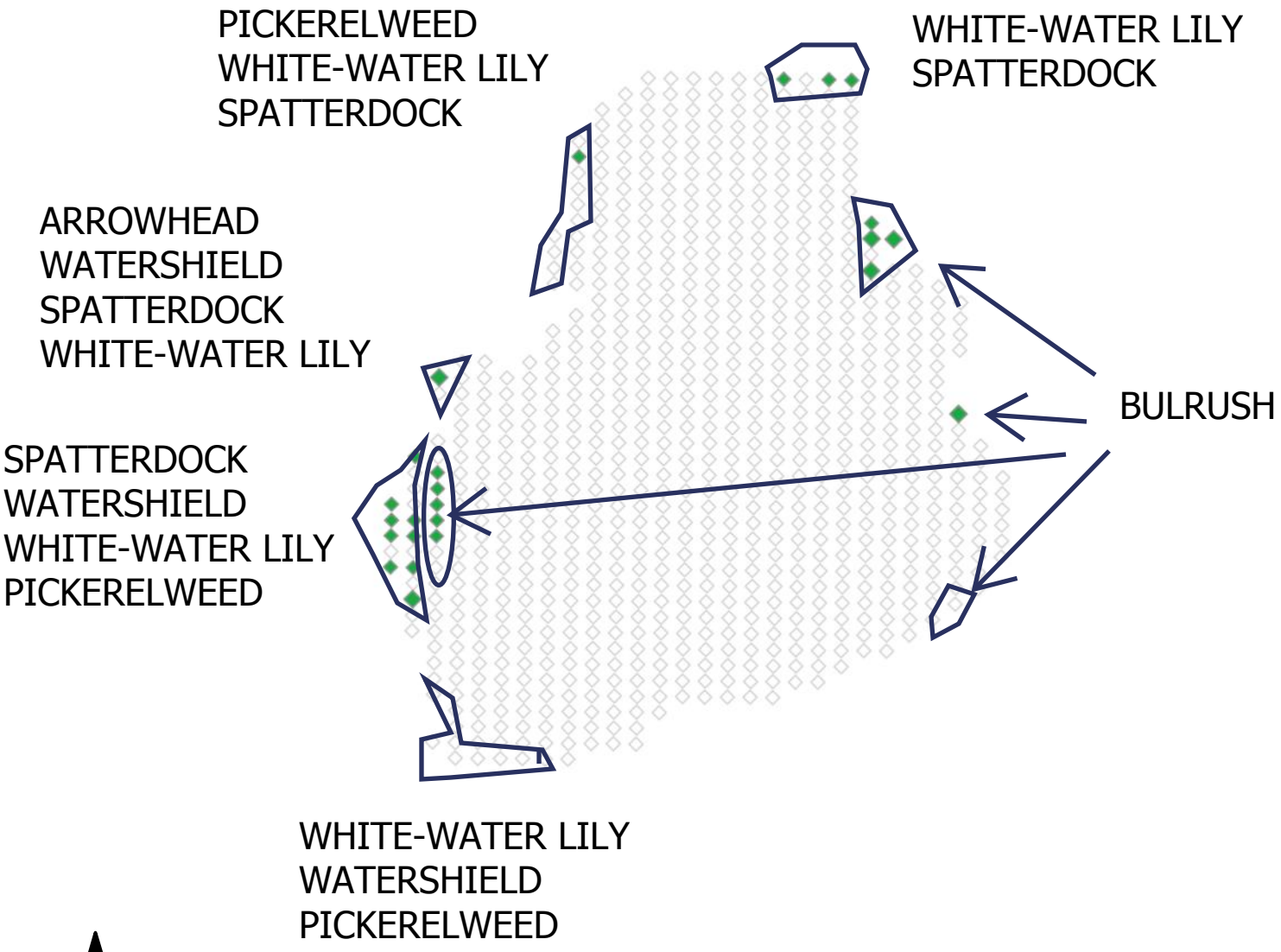
The WDNR determined point grid is attached.

PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016

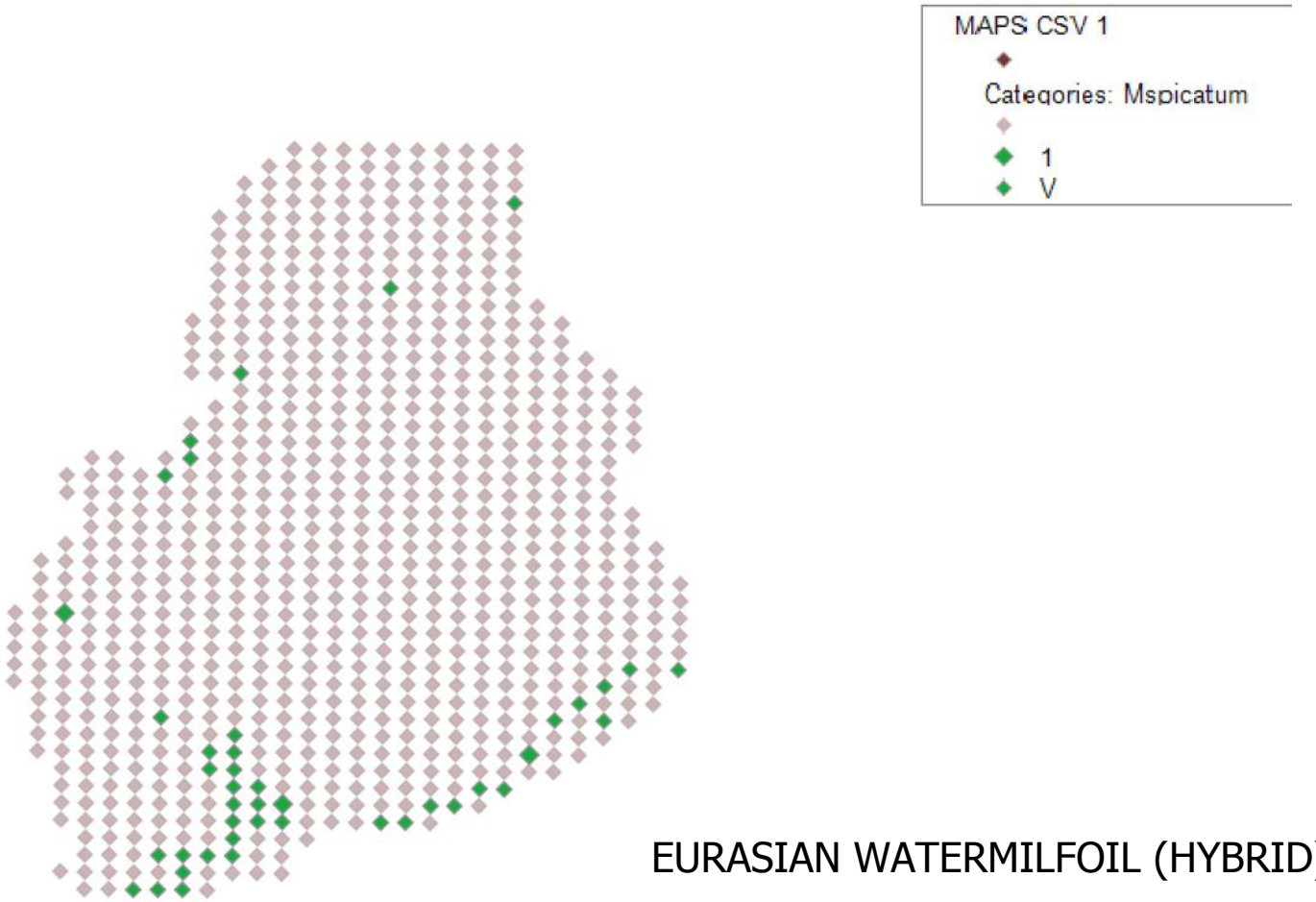


PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016

FLOATING LEAF AND EMERGENT VEGETATION

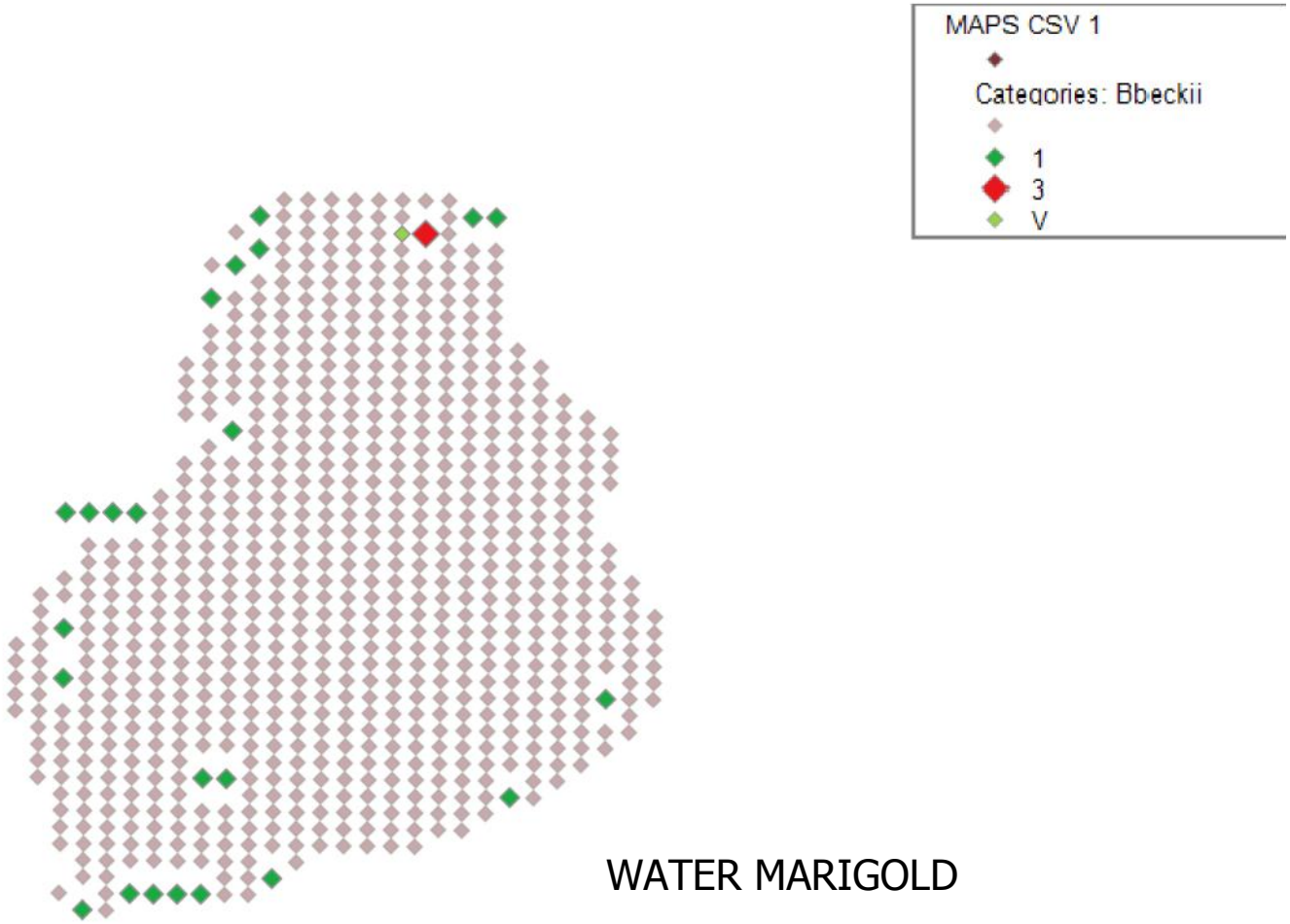


PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016

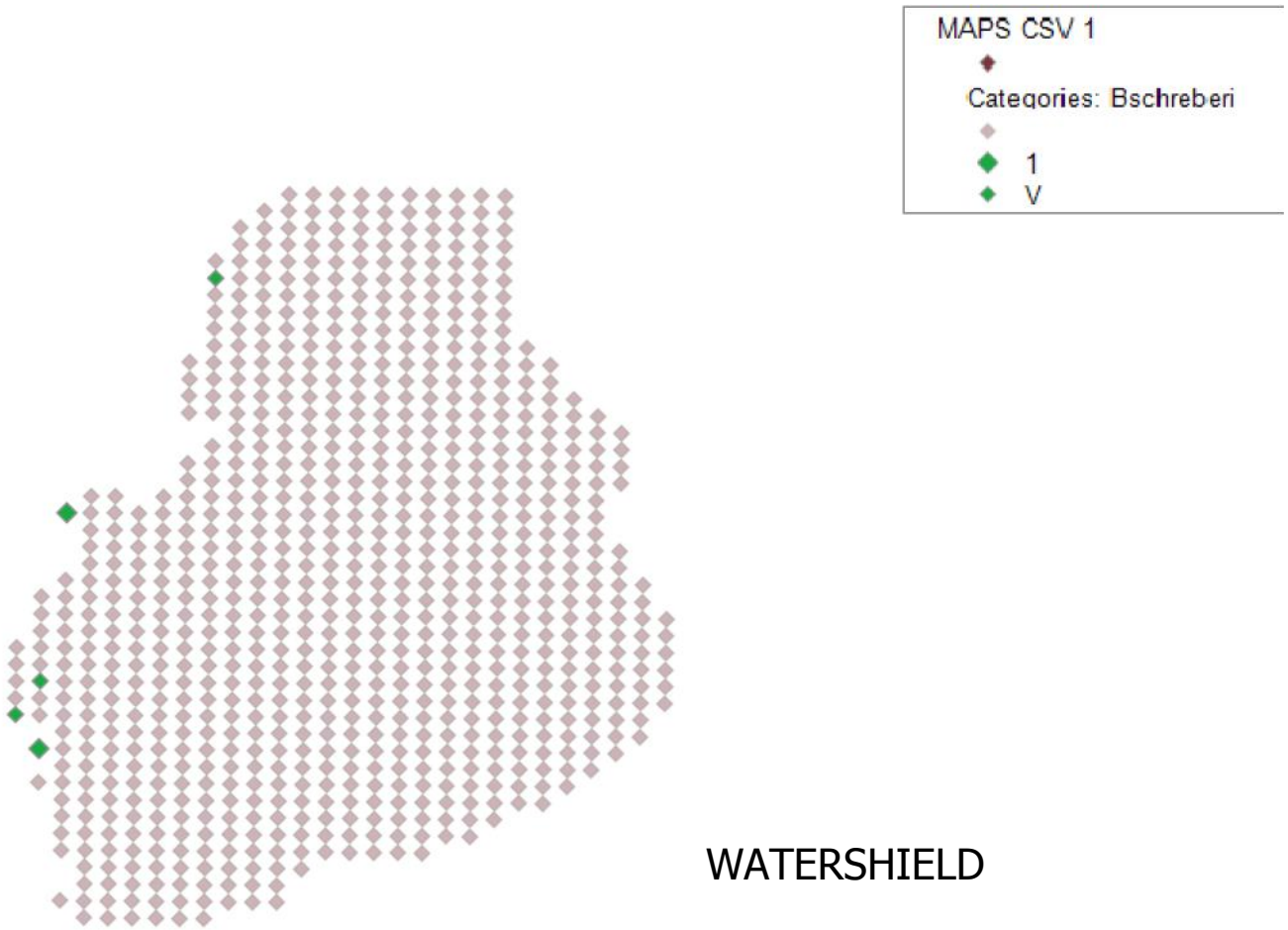


EURASIAN WATERMILFOIL (HYBRID)

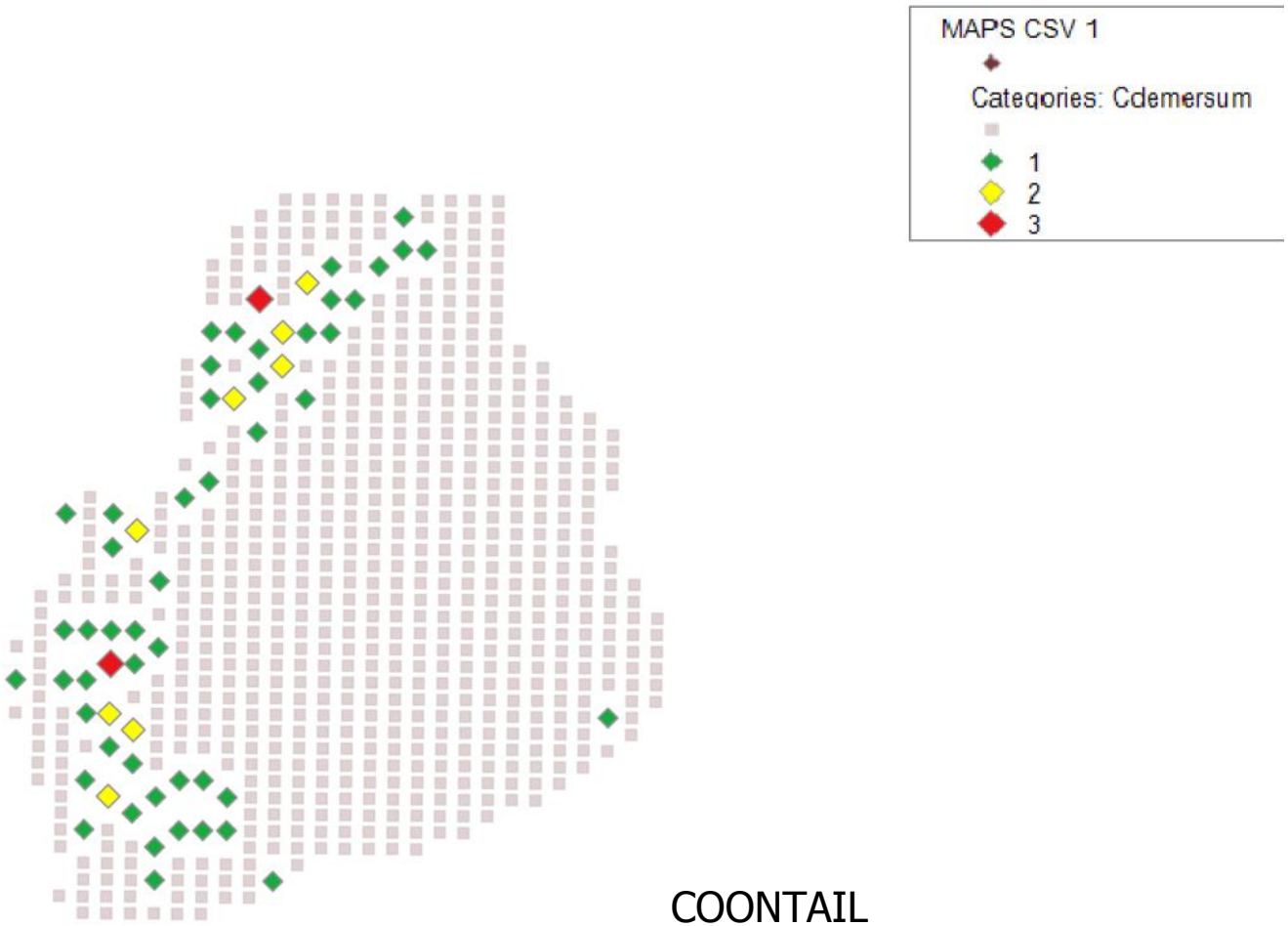
PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016



PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016

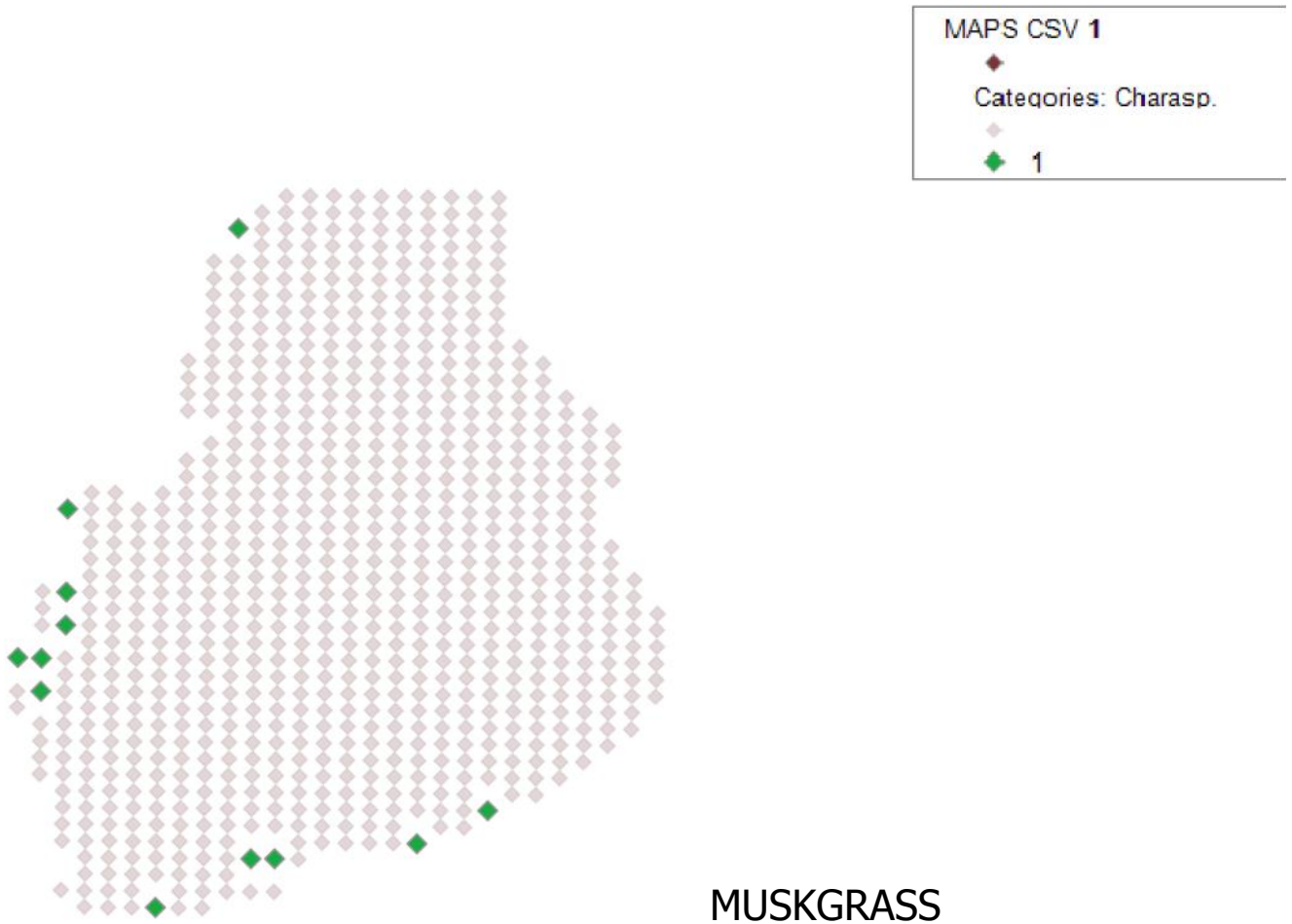


PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016



COONTAIL

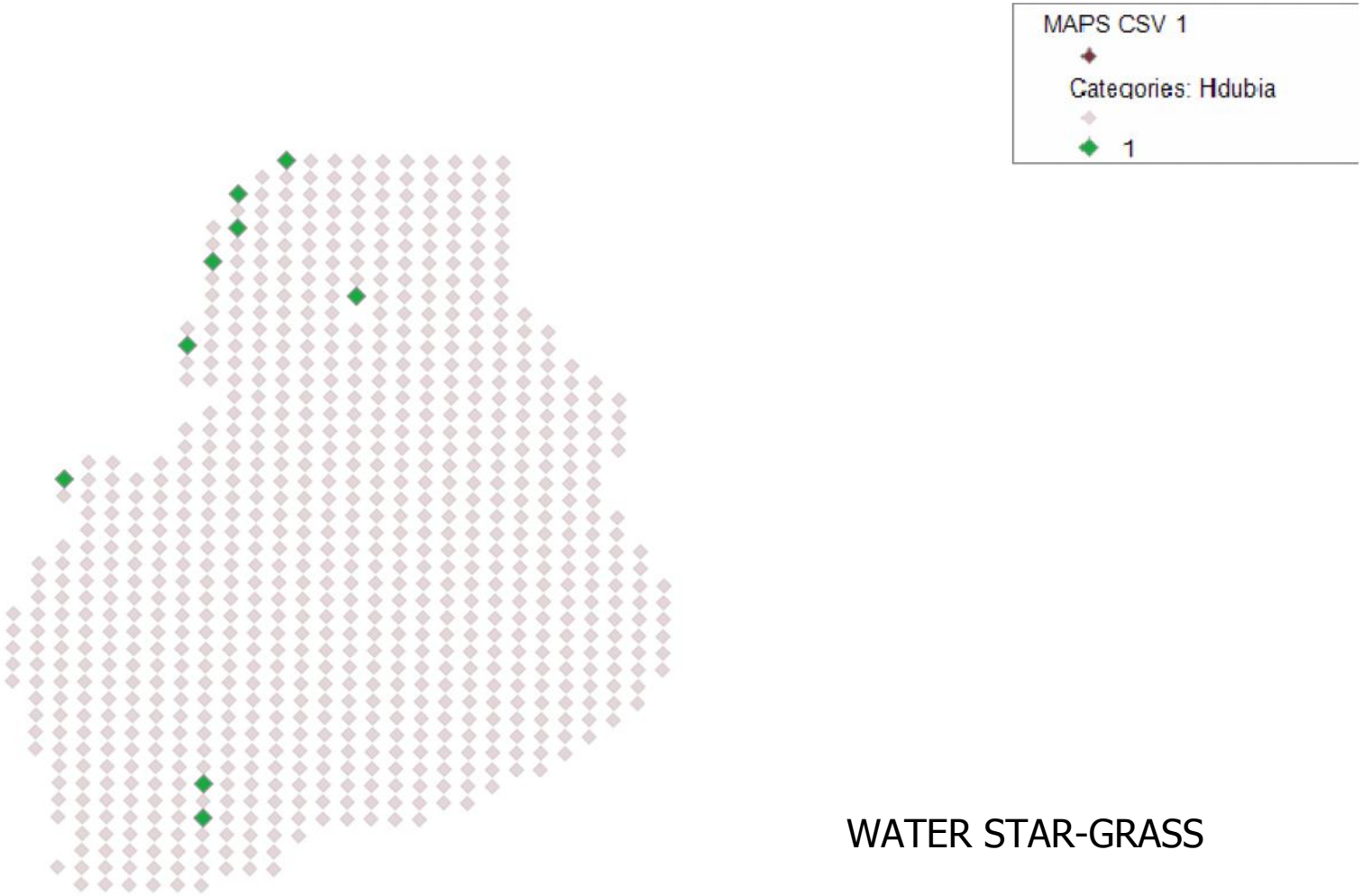
PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016



PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016

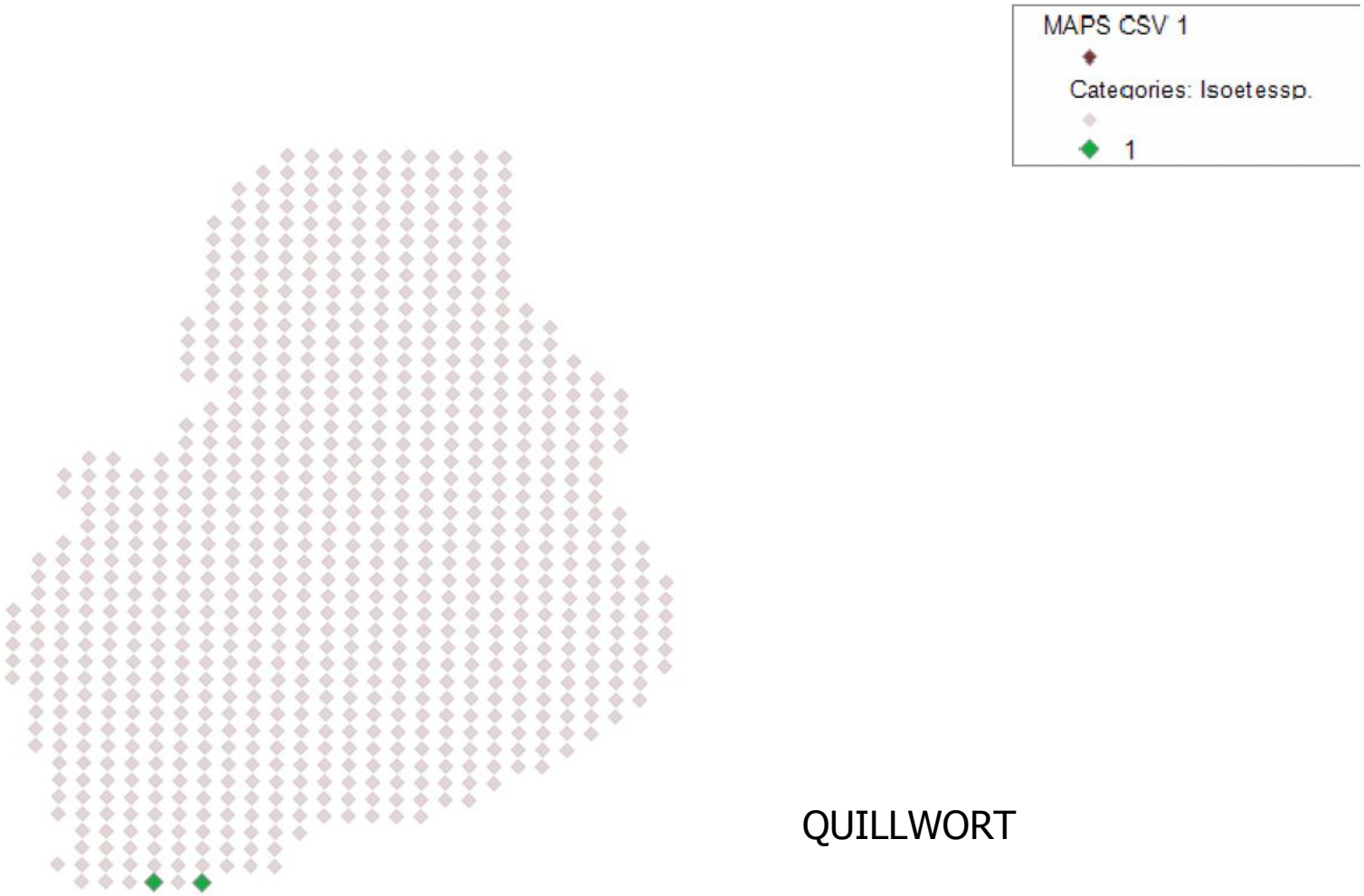
ELODEA

PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016



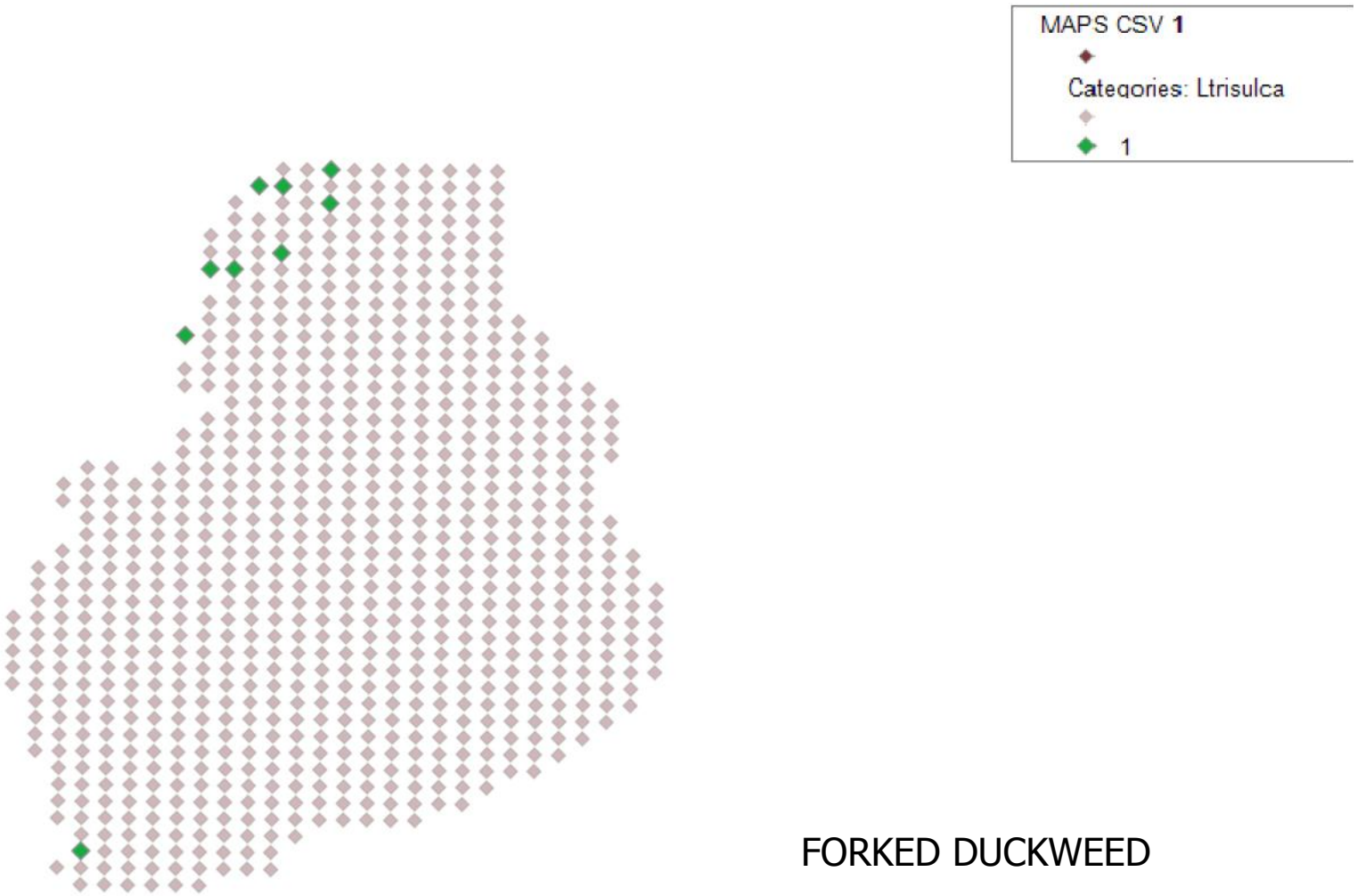
WATER STAR-GRASS

PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016



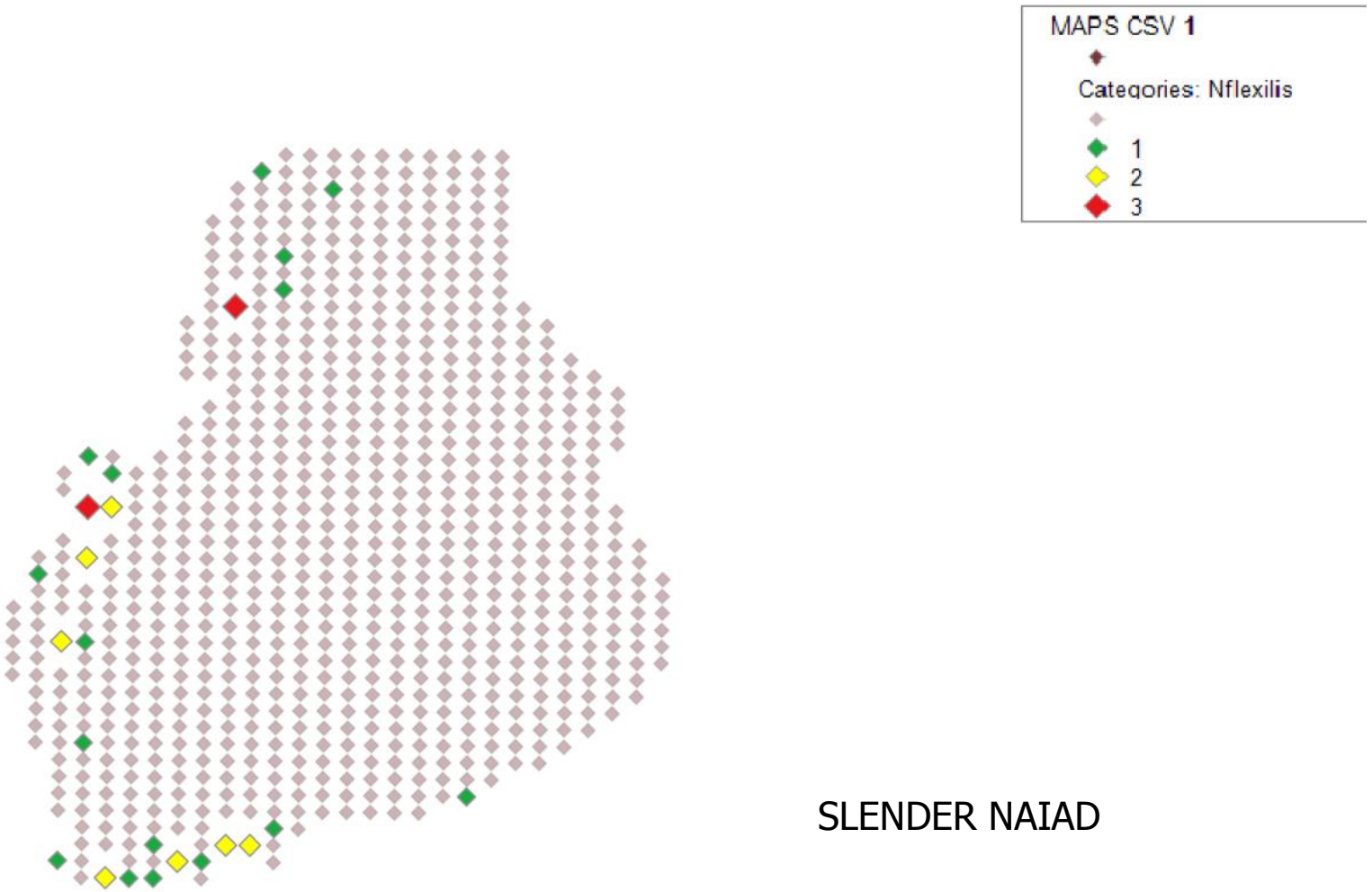
QUILLWORT

PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016



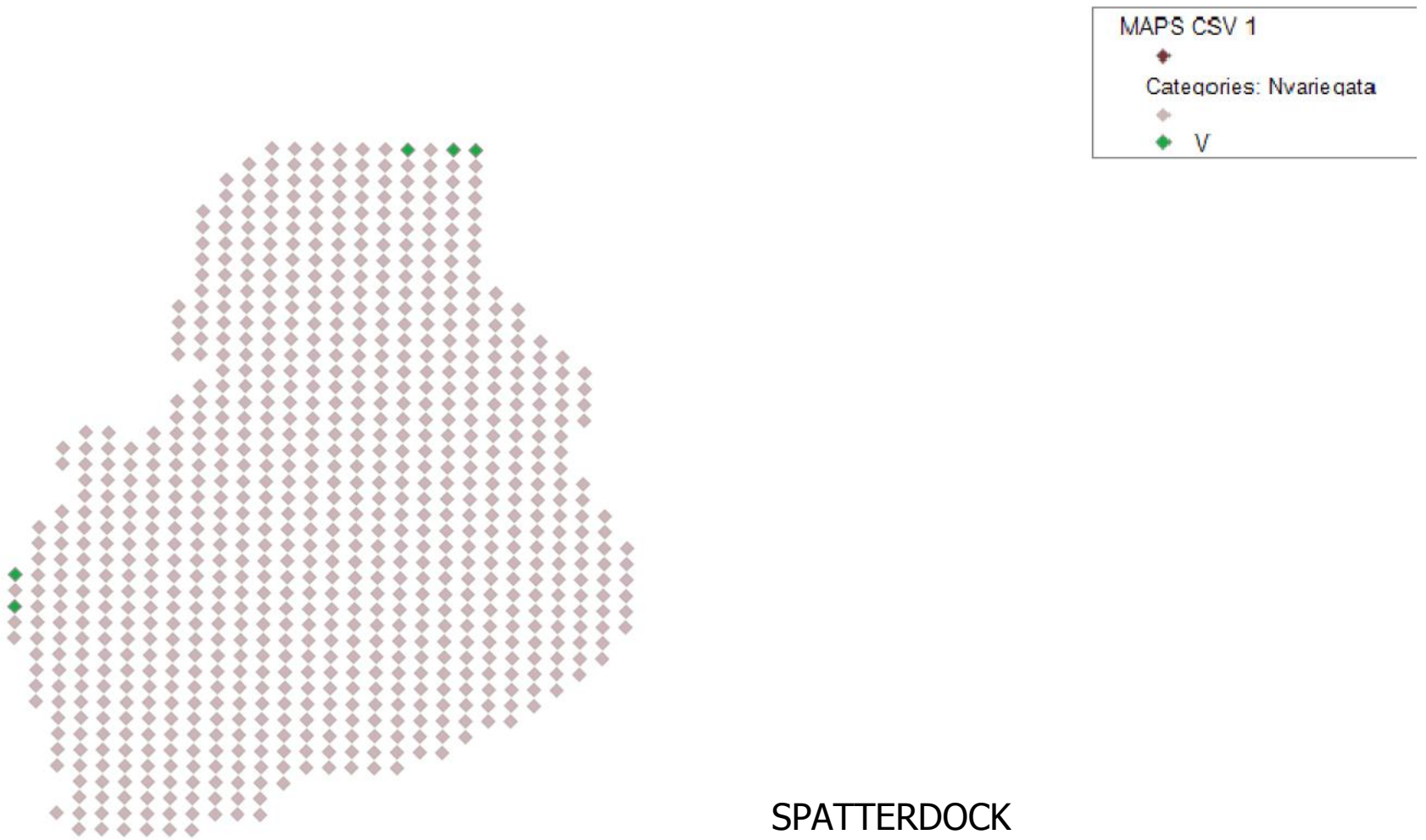
FORKED DUCKWEED

PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016

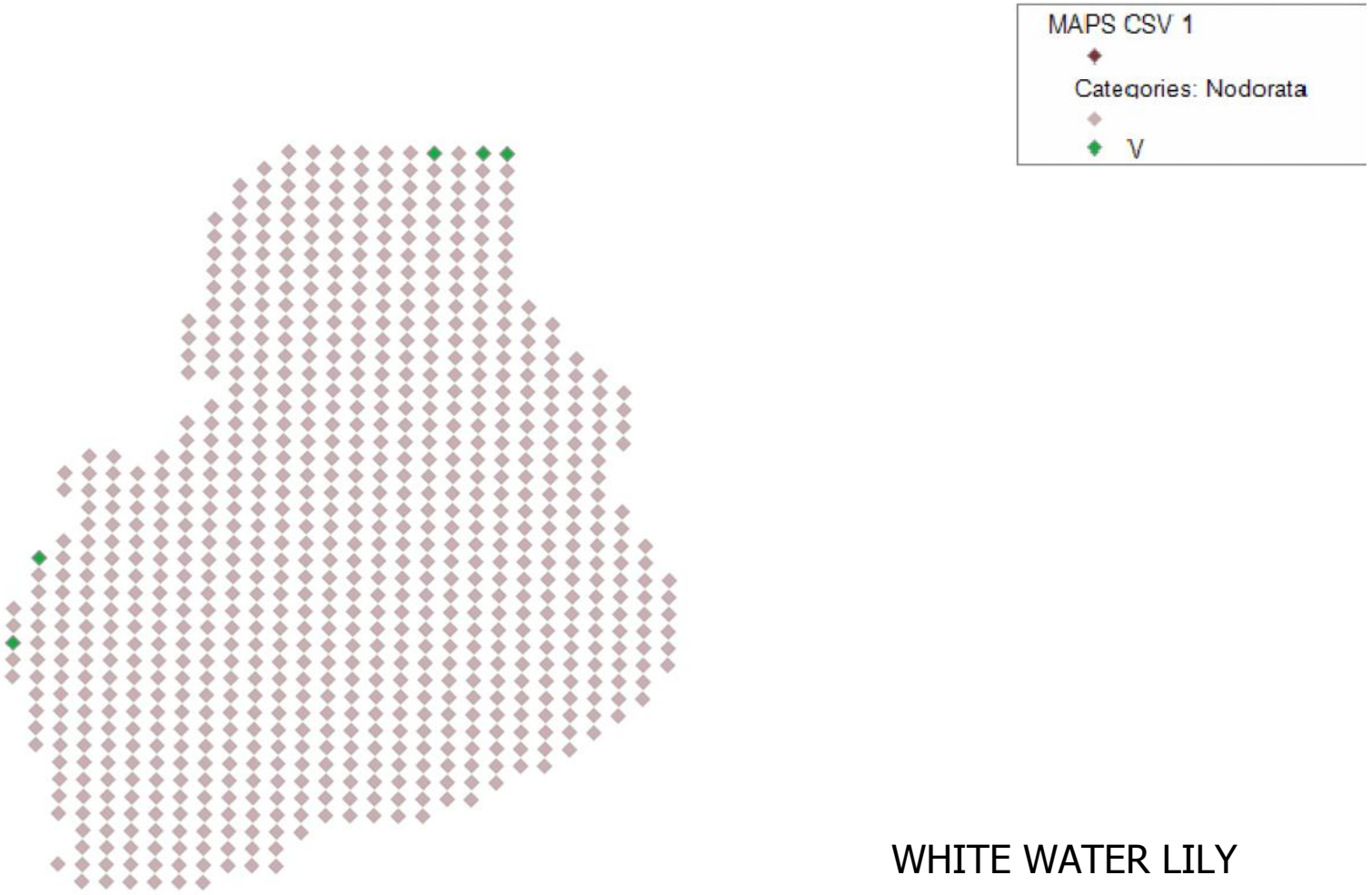


SLENDER NAIAD

PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016

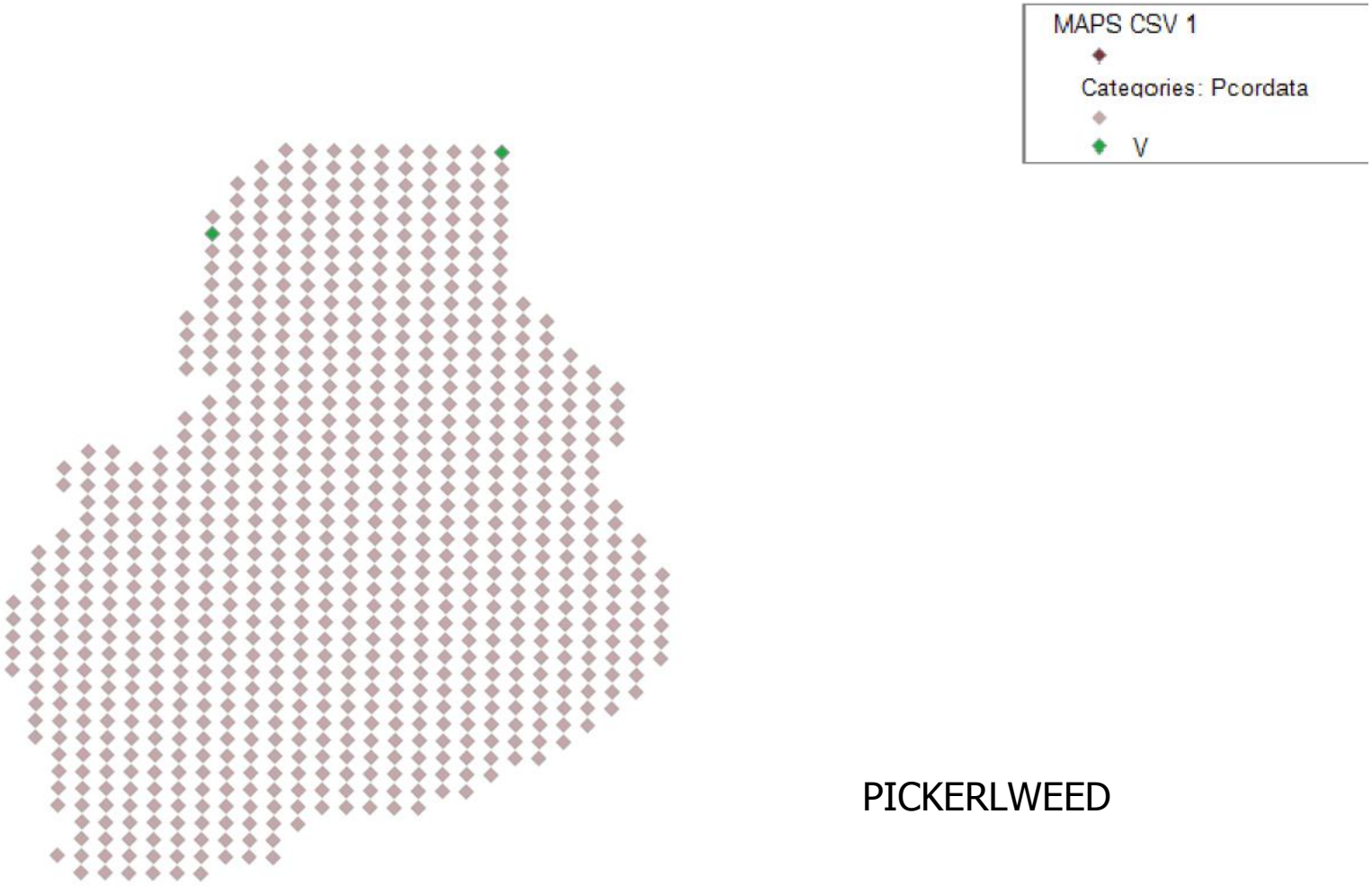


PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016

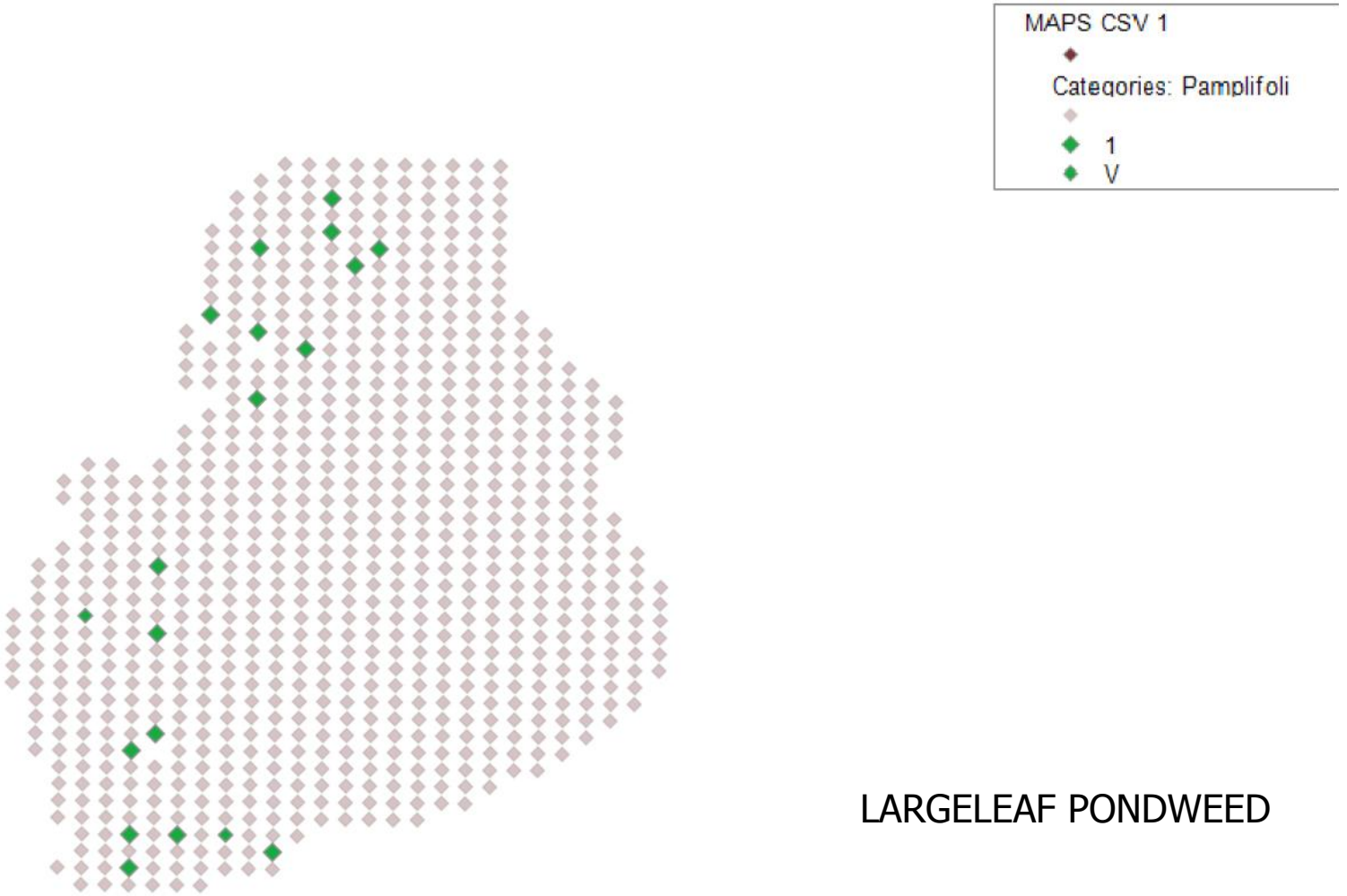


WHITE WATER LILY

PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016

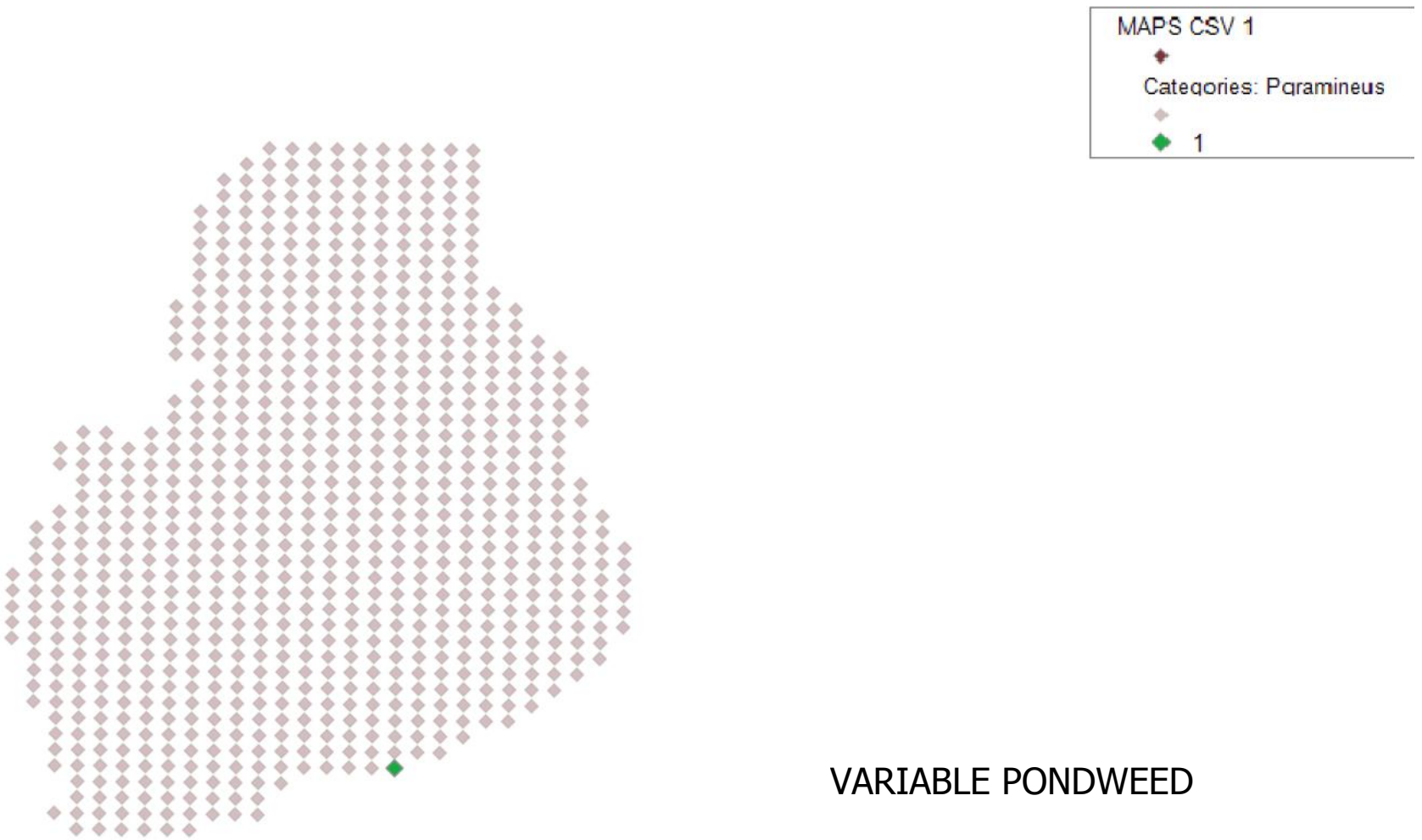


PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016

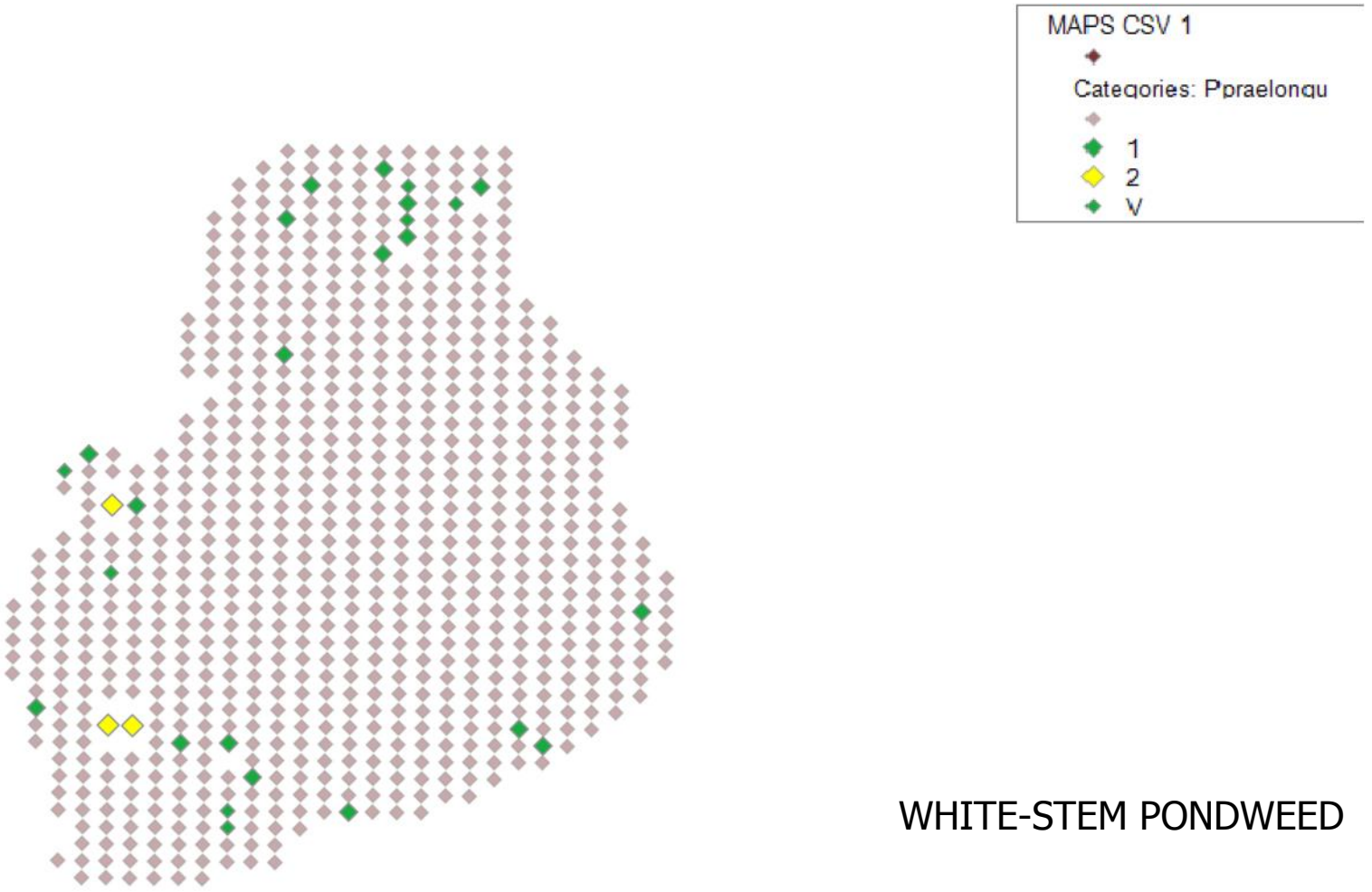


LARGELEAF PONDWEED

PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016



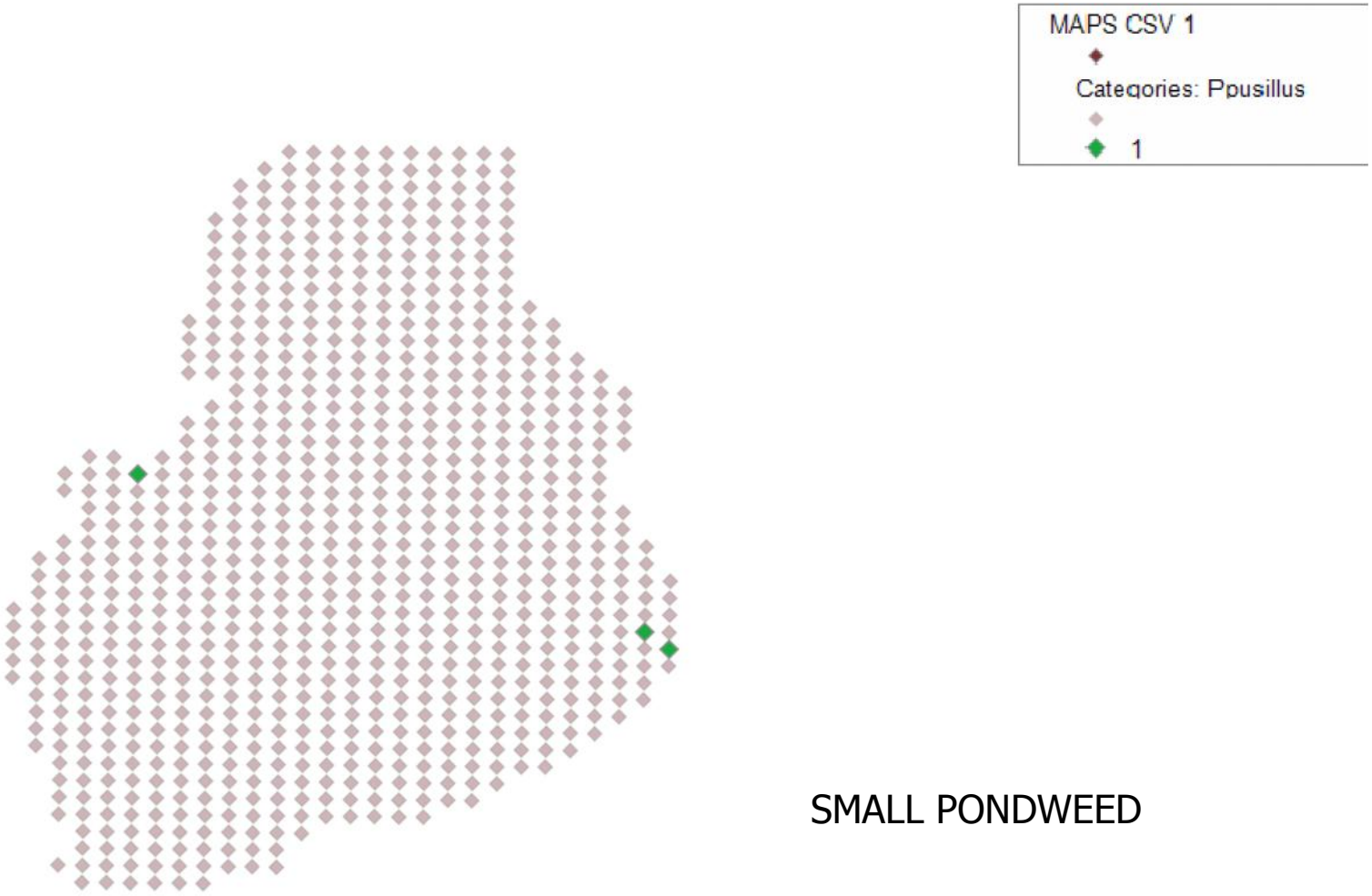
PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016



WHITE-STEM PONDWEED

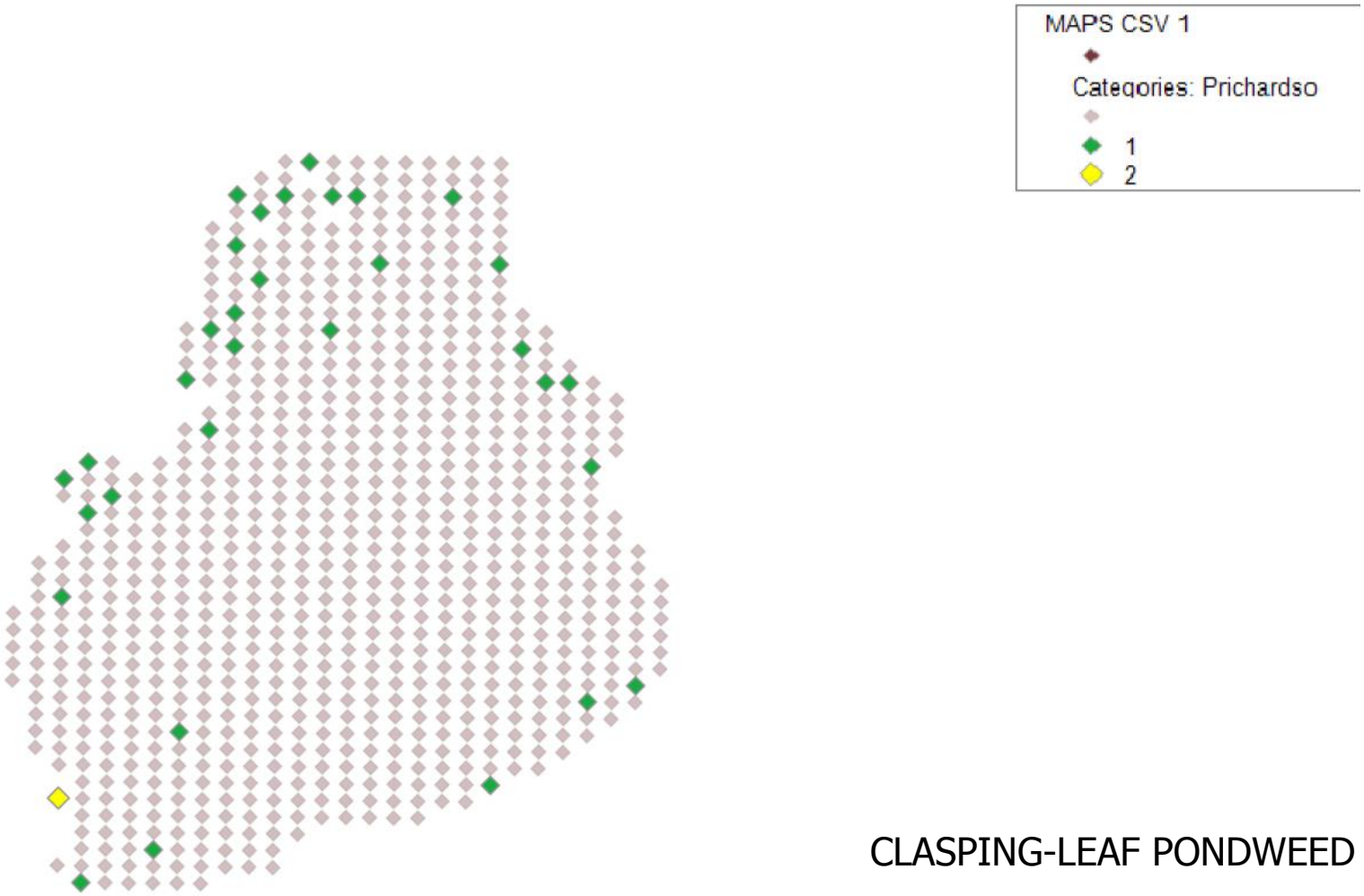
N

PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016



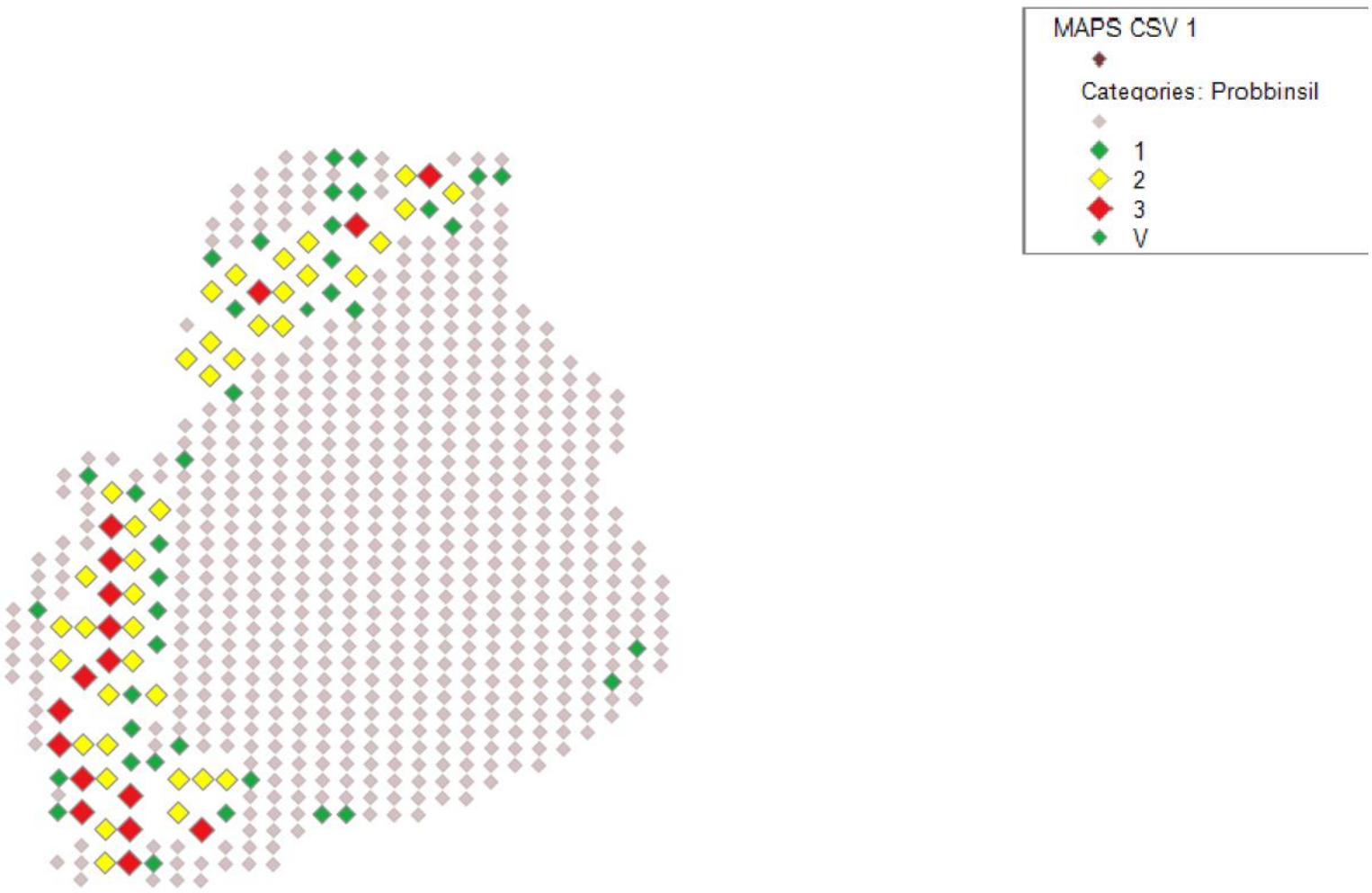
SMALL PONDWEED

PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016



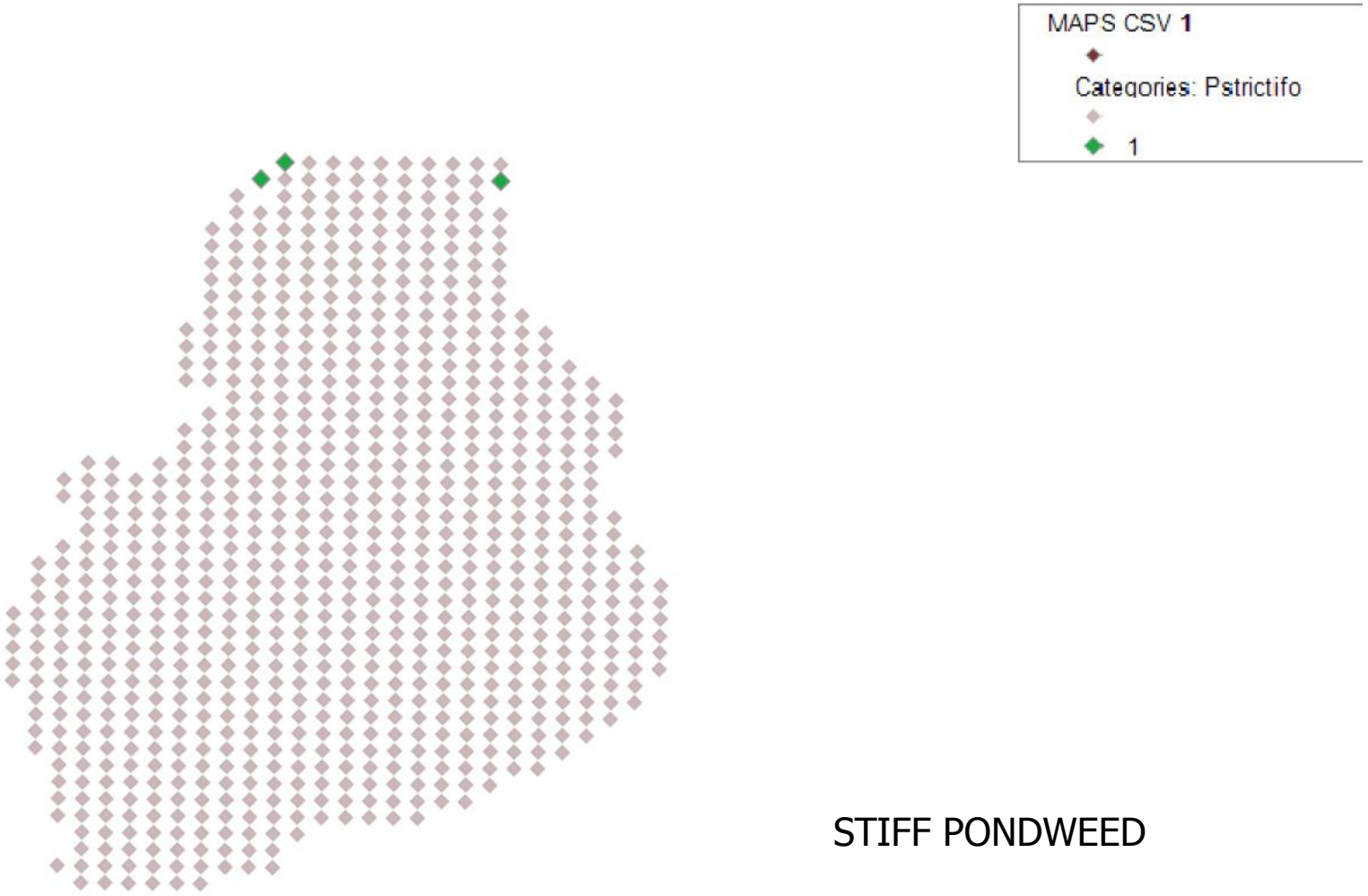
CLASPING-LEAF PONDWEED

PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016



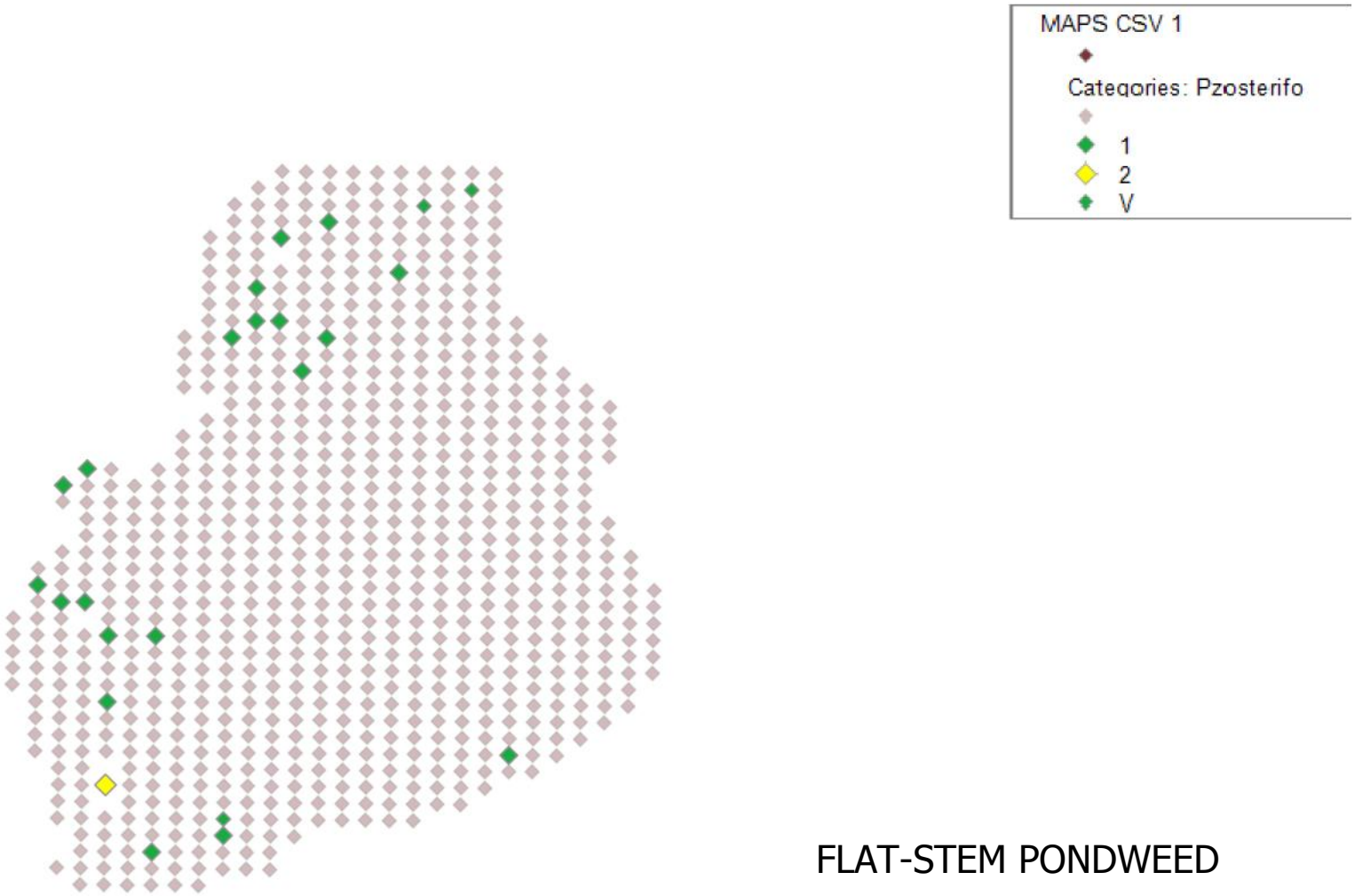
FERN PONDWEED

PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016



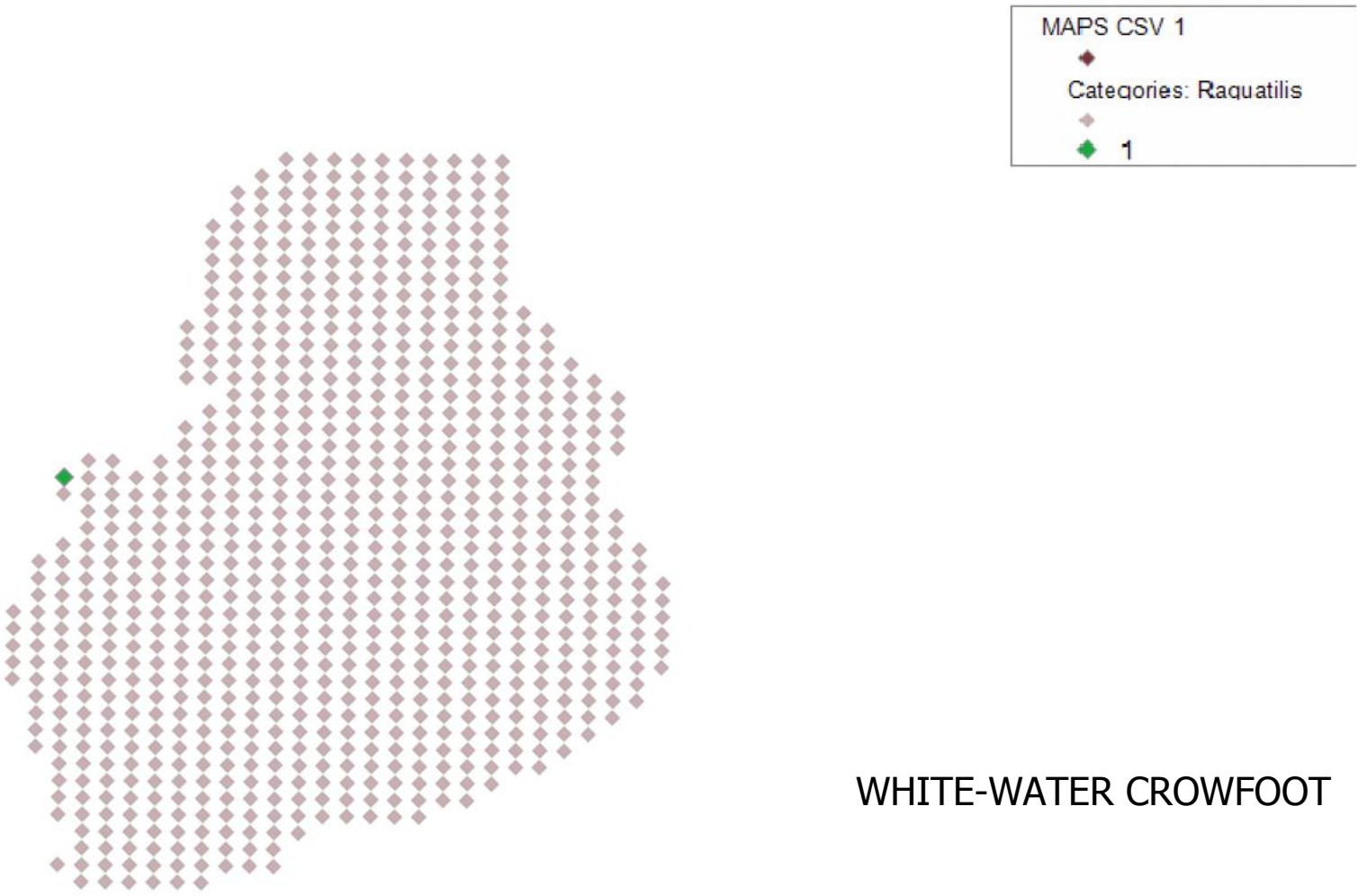
STIFF PONDWEED

PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016



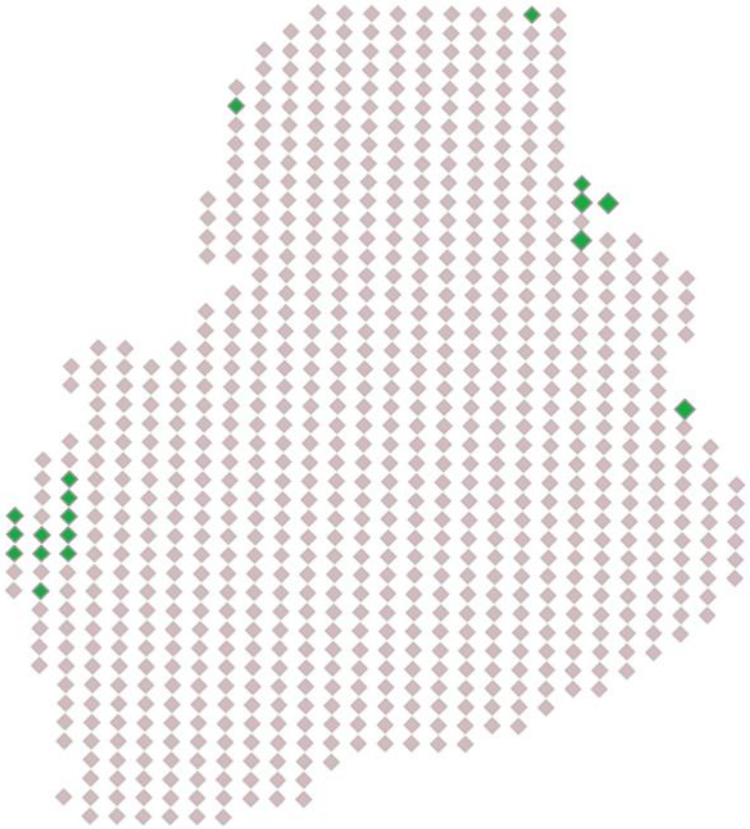
FLAT-STEM PONDWEED

PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016



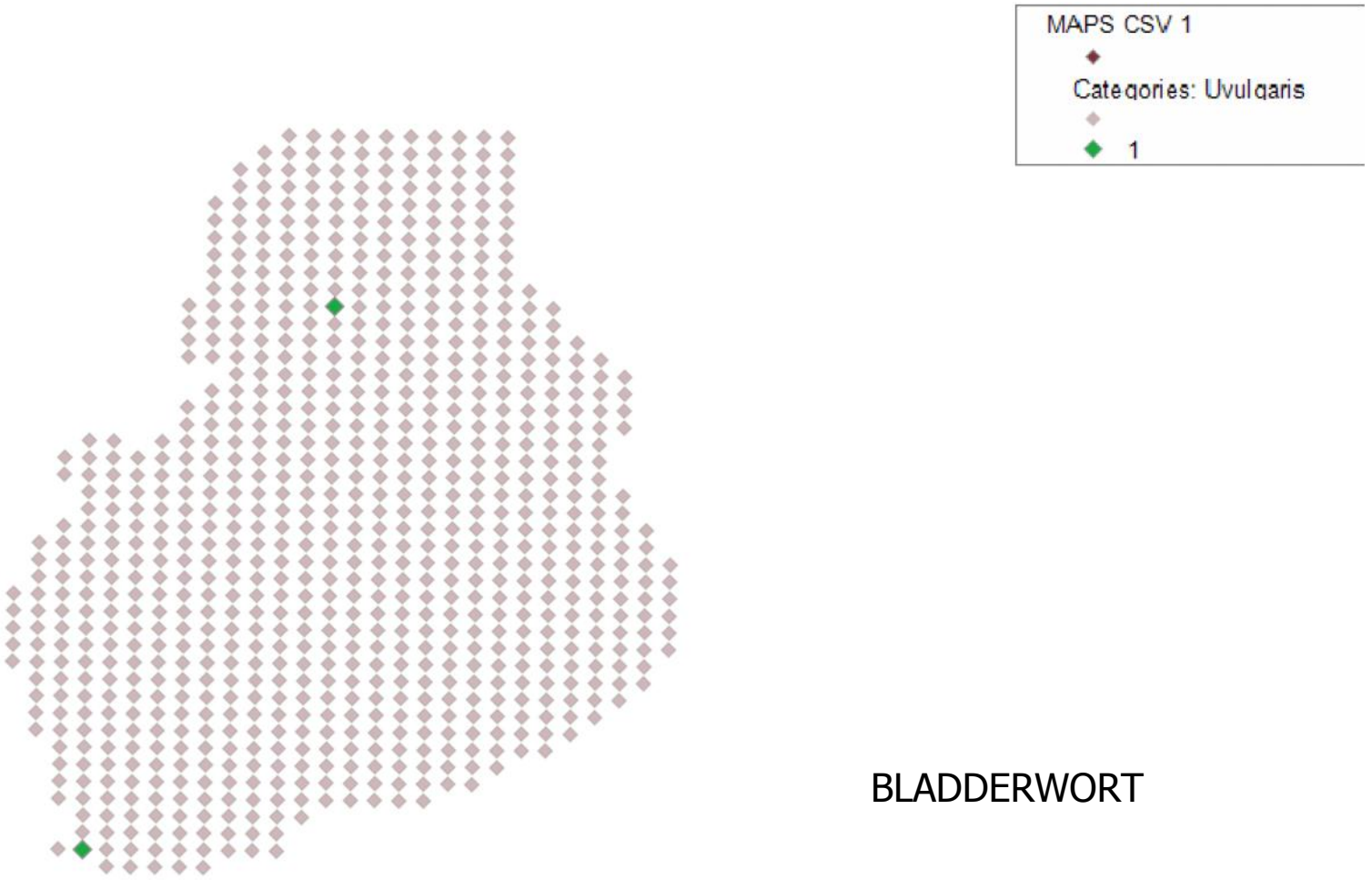
WHITE-WATER CROWFOOT

PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016



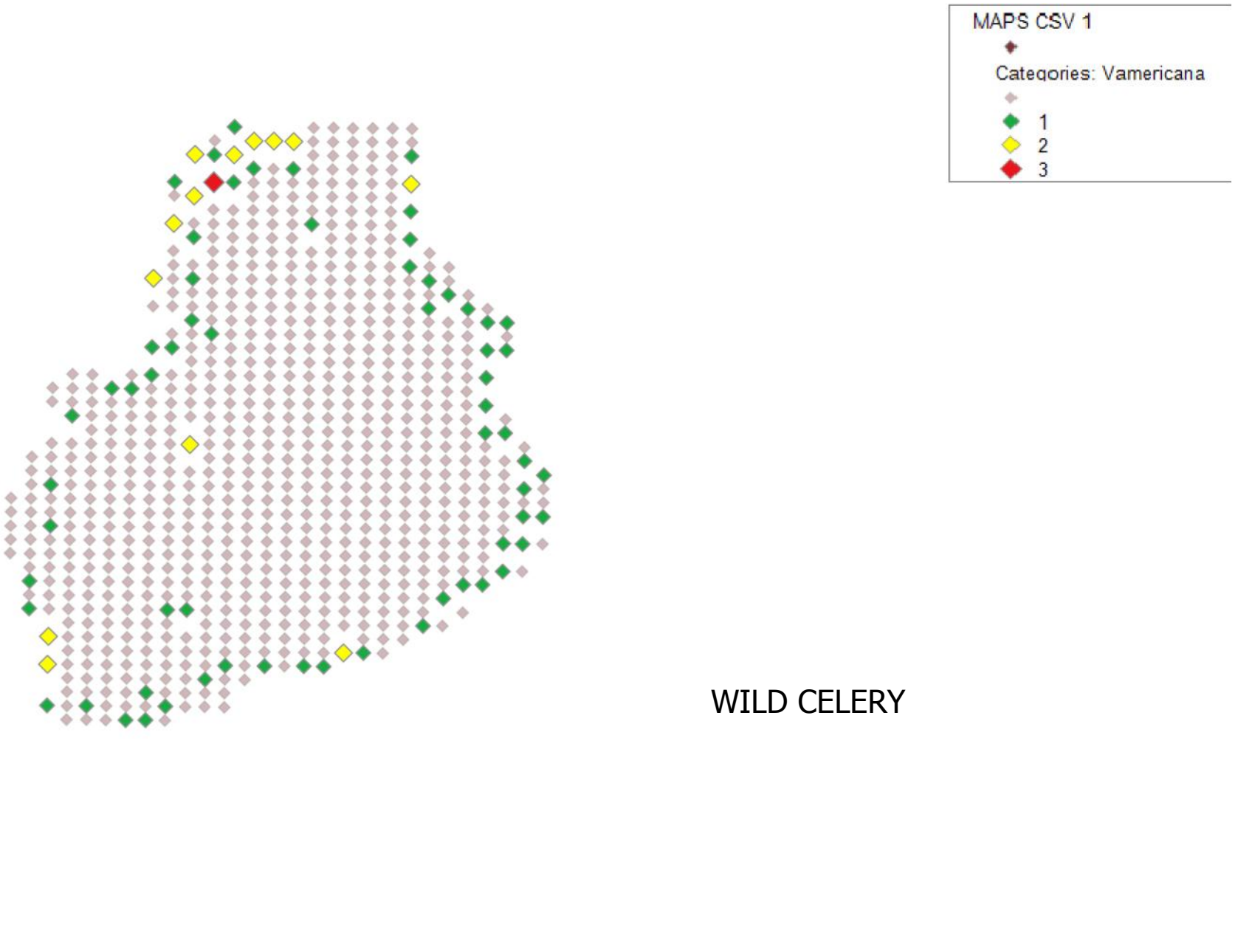
BULRUSH

PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016



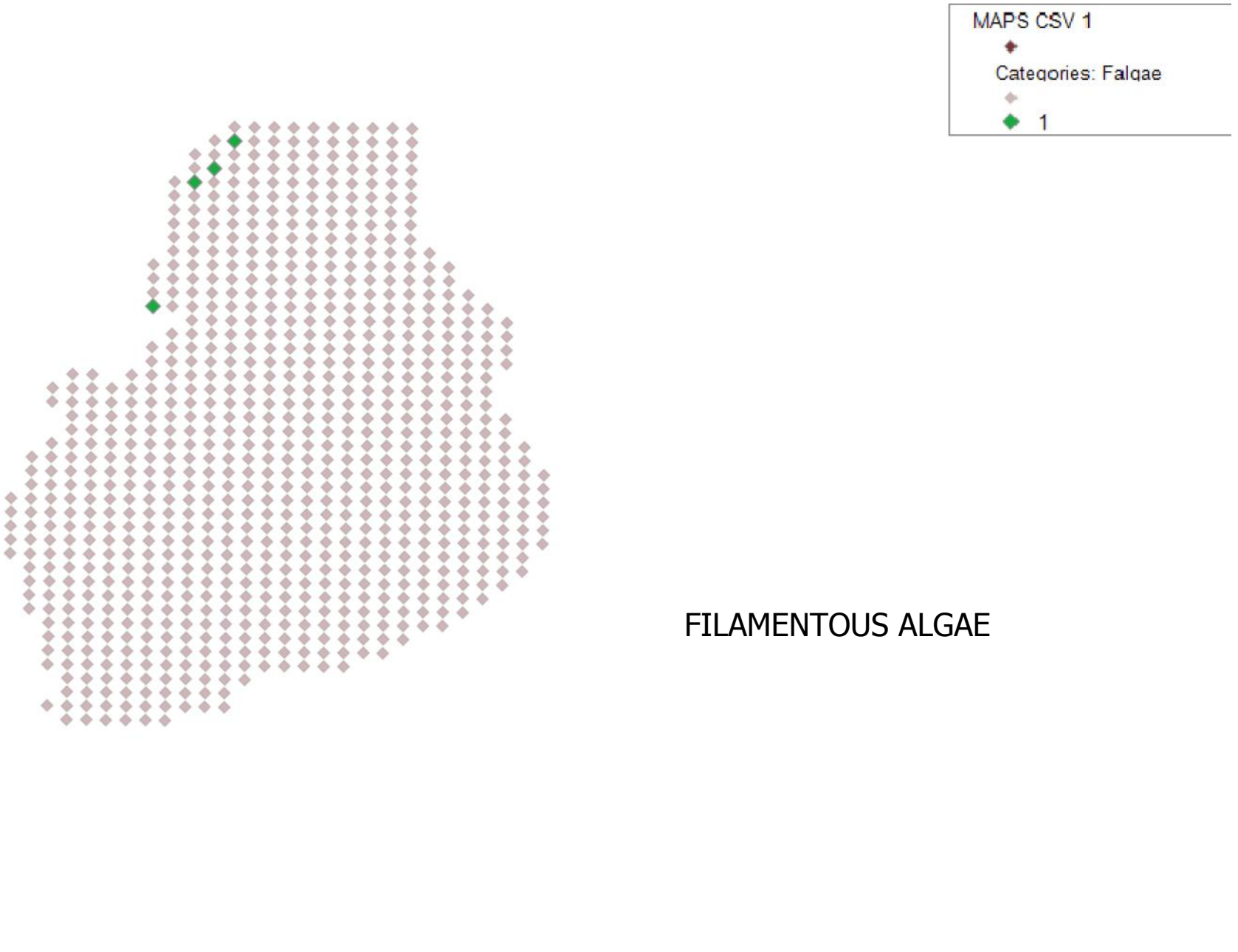
BLADDERWORT

PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016

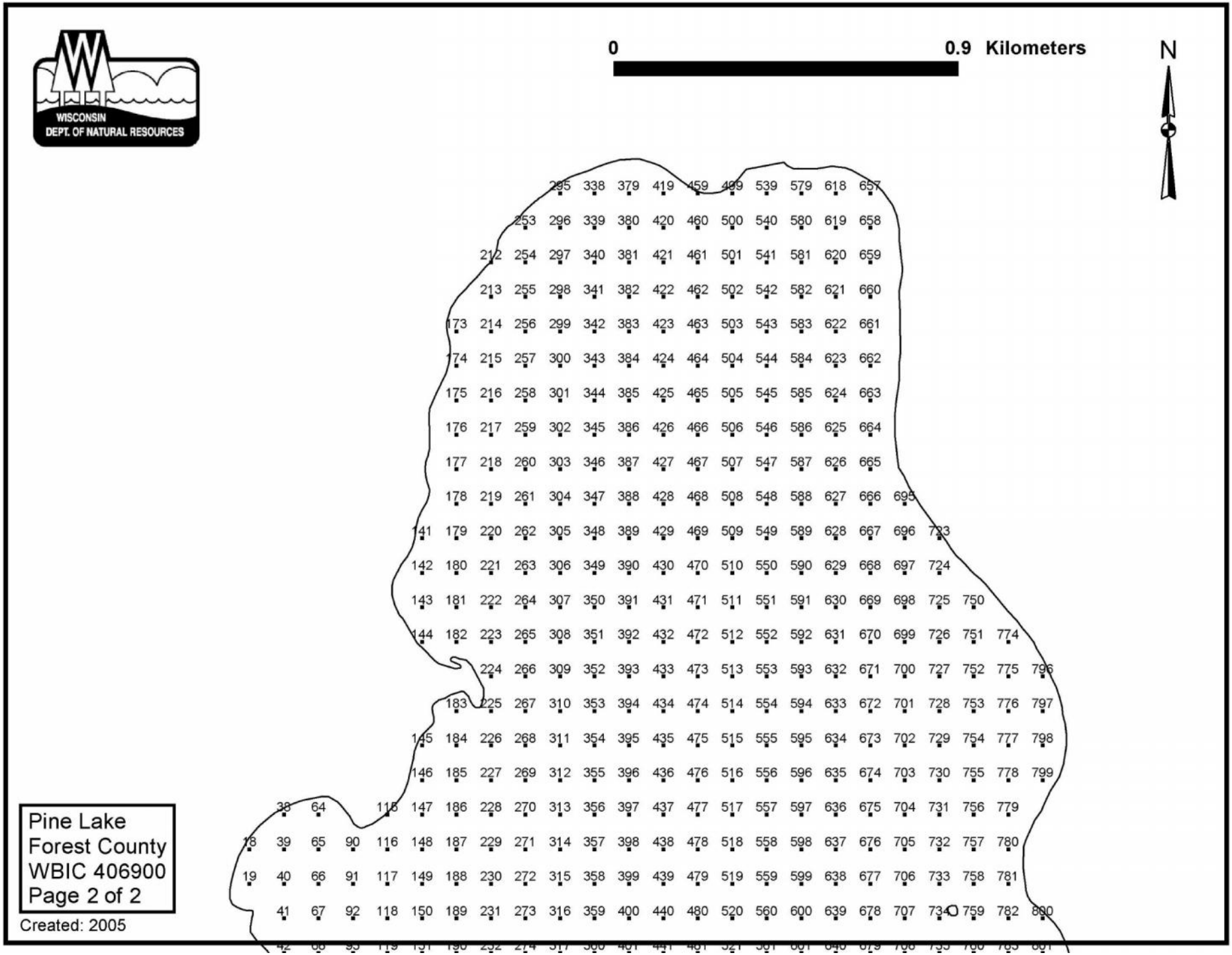


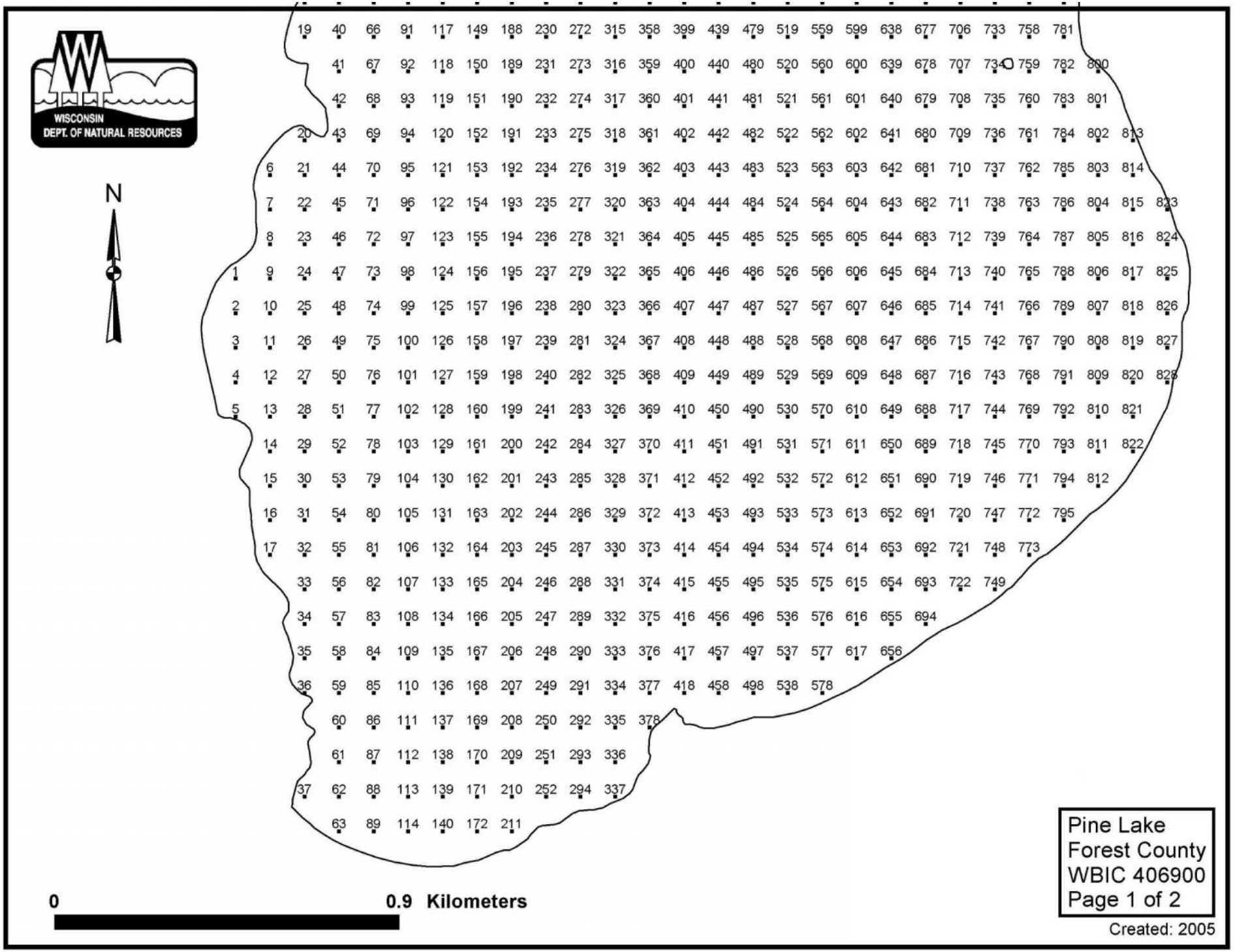
WILD CELERY

PINE LAKE AQUATIC VEGETATION SURVEY
AUGUST 2016



FILAMENTOUS ALGAE


WISCONSIN
DEPT. OF NATURAL RESOURCES
0
0.9 Kilometers
N
Pine Lake
Forest County
WBIC 406900
Page 2 of 2
Created: 2005


WISCONSIN
DEPT. OF NATURAL RESOURCES
N
0
0.9 Kilometers
Pine Lake
Forest County
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Page 1 of 2
Created: 2005