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# **BEAR LAKE 2009 SUMMER AQUATIC VEGETATION SURVEY RESULTS**

**A SURVEY OF  
AQUATIC VEGETATION IN  
BEAR LAKE  
MANISTEE COUNTY, MICHIGAN**

**SEPTEMBER, 2009**

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SURVEY RESULTS**

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MANISTEE COUNTY, MICHIGAN**

**SEPTEMBER, 2009**

**Prepared for:** Bear Lake Improvement Board  
C/o Don Brisbin, Chair  
Bear Lake, MI 49614

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## **A SUMMER 2009 SURVEY OF AQUATIC VEGETATION IN BEAR LAKE MANISTEE COUNTY, MICHIGAN**

**September, 2009**

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### **1.0 EXECUTIVE SUMMARY**

This report describes the current distribution of native and exotic submersed, floating-leaved, and emergent aquatic plants, including the exotic species, Eurasian Watermilfoil (*Myriophyllum spicatum*) within Bear Lake, Manistee County, Michigan. Bear Lake (N 44° 26.232, W 86° 09.311) is located in sections 4 - 6 of Bear Lake Township, (T.23N, and R.15W) and sections 28 - 29, and 31 - 33 of Pleasanton Township (T.24N, R.15W) in Manistee County, Michigan. During the original feasibility study, Bear Lake was found to be previously infested with approximately 330 acres of *M. spicatum* that was concentrated around the west and south portions of the lake, and in the two smaller bays. However, during the spring of 2008, approximately 163 acres of *M. spicatum* was located and treated with the systemic aquatic herbicide 2,4-D in offshore areas and with the systemic herbicide Renovate OTF<sup>®</sup> in nearshore bay areas on 12 June, 2008 as permissible by the Michigan Department of Environmental Quality (MDEQ). An additional 60 acres of *M. spicatum* that germinated later in the season (July) was treated with the systemic herbicide 2,4-D on 16 July, 2008 in order to stop further spread of the plant through the growing season. During the fall 2008 grid survey, it was estimated that approximately 126 acres of semi-viable *M. spicatum* were found (7.4% of the total 1,800 acres containing EWM); however, the results of the June grid survey which assessed 558 GPS grid points (more than the usual 486), demonstrated that only 11 acres of *M. spicatum* infested Bear Lake. These areas included a 7-acre bed located at the southwest portion of the lake (Appendix A) as well as the west and east bays. The two bays were successfully treated with Triclopyr (Renovate OTF<sup>®</sup>) due to shallow well restrictions and the southwest portion of the lake with granular 2,4-D. A recent follow-up grid survey in early September revealed that all of the previously treated *M. spicatum* has died and no new growth has been located. The native pondweed population has

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flourished throughout the bays and in the main portion of the lake. In particular, species such as White-stem Pondweed (*Potamogeton praelongus*), Illinois Pondweed (*Potamogeton illinoensis*), and Small-Leaf Pondweed (*Potamogeton pusillus*) have expanded in areas previously dominated by the exotic *M. spicatum*. A total of 25 native aquatic plant species currently thrive within and around Bear Lake.

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## 2.0 AQUATIC PLANT SURVEY METHODS

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The aquatic plant sampling methods used for lake surveys of macrophyte communities commonly consist of shoreline surveys, visual abundance surveys, transect surveys, AVAS surveys, and Point-Intercept Grid surveys. Other less common and more costly surveys that involve bioacoustic monitoring and/or side-scan sonar imaging are used to determine biomass density in very large bodies of water (i.e. Chesapeake Bay, US). The Michigan Department of Environmental Quality (MDEQ) prefers that an Aquatic Vegetation Assessment Site (AVAS) Survey, or a GPS Point-Intercept survey (or both) be conducted on most inland lakes following large-scale aquatic herbicide treatments to assess the changes in aquatic vegetation structure and to record the relative abundance and locations of native aquatic plant species. Due to the large size and shallow mean depth of Bear Lake, a bi-seasonal GPS Point-Intercept grid matrix survey is preferred to assess all aquatic species, although emergent and floating-leaved species are also included as well.

### 2.1 The GPS Point-Intercept Method

While the MDEQ AVAS protocol considers sampling vegetation using visual observations in areas around the littoral zone, the Point-Intercept Grid Survey method is meant to assess vegetation throughout the entire surface area of a lake (Madsen et al. 1994; 1996). This method involves conducting measurements at Global Positioning Systems (GPS)-defined locations that have been pre-selected on the computer to avoid sampling bias. Furthermore, the GPS points are equally spaced on a map. The points should be placed together as closely and feasibly as possible to obtain adequate information of the aquatic vegetation communities throughout the entire lake. At each GPS Point location, two rake tosses are conducted and the aquatic vegetation species presence and abundance are estimated. In between the GPS points, any additional species and their relative abundance are also recorded using visual techniques. This is especially important to add to the Point-Intercept method, since *M. spicatum* and other invasive plants may be present between GPS points but not necessarily at the pre-selected GPS points.

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Once the aquatic vegetation communities throughout the lake have been recorded using the GPS points, the data can be placed into a Geographic Information System (GIS) software package to create maps showing the distribution and relative abundance of particular species. The GPS Point-Intercept method is particularly useful for monitoring aquatic vegetation communities through time and for identification of nuisance species that could potentially spread to other previously uninhabited areas of the lake.

The GPS Point-Intercept method survey consisted of 558 equidistantly-spaced grid points on Bear Lake, using a Humminbird® 50-satellite GPS WAAS-enabled unit (accuracy within 2 feet). A combination of rake tosses and visual data accounted for each point and the distance between points for the survey.

### **3.0 SUMMER 2009 AQUATIC PLANT SURVEY RESULTS**

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The summer 2009 aquatic vegetation surveys of Bear Lake was necessary to record the relative abundance and locations of native aquatic plant species present and to record the current distribution of *M. spicatum* within the lake. A late summer/fall aquatic vegetation survey was also conducted and water quality samples are also being collected and analyzed. Water quality data (including algal analyses) will be included as an addendum to this report.

#### **3.1 Bear Lake Exotic Aquatic Plant Species (June & September, 2009)**

The June survey revealed approximately 11 acres of *M. spicatum*, which was present at the southwest corner of the lake and in both the west and east bays. The selection of extra GPS grid points (i.e. points 543-558) allows for extra precision in guiding the aquatic herbicide contractor back to the milfoil location area to be treated during the treatment. Although these areas were both previously treated with systemic herbicides during the summer of 2008, it is not unlikely that *M. spicatum* seeds present in the seed bank were able to germinate well after the treatment was conducted. In other words, milfoil seeds had already been contributed to the seed bank prior to the treatment and had

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germinated early this summer. Other exotic species such as Curly-leaf Pondweed (*Potamogeton crispus*) and Purple Loosestrife (*Lythrum salicaria*) were not found during this survey. Thus at this time, the only exotic species present in Bear Lake is *M. spicatum* (Table 1).

<i>Macrophyte Species and Code</i>	<i>Common Name</i>	<i>Plant Growth Form</i>
<i>Myriophyllum spicatum</i> , 1	Eurasian Watermilfoil	Submersed; Rooted

Table 1. Exotic aquatic plant species present within Bear Lake (June, 2009)



Figure 1. Eurasian Watermilfoil (*M. spicatum*) whorled leaves and leaflets. © Superior Photique



Figure 2. Eurasian Watermilfoil with seed head and lateral branches. © Superior Photique

Eurasian Watermilfoil (*M. spicatum*; Figures 1 and 2) is a non-native (i.e. exotic), invasive, submersed, perennial aquatic plant which was introduced into the United States in the 1880's (Reed 1997), although other reports (Couch and Nelson 1985) suggest it was discovered in the 1940's. Exotic aquatic plants are not native to a particular site, but are introduced by some biotic (living) or abiotic (non-living) vector. Such vectors include the transfer of aquatic plant seeds and fragments by boats and trailers (especially if the lake has public access sites), waterfowl, or by wind dispersal. In addition, exotic species may be introduced into aquatic systems through the release of aquarium or water garden plants into a water body. An aquatic exotic species may have profound impacts on the aquatic ecosystem. *M. spicatum* has since spread to thousands of inland lakes in various states through the use of boats and trailers, waterfowl, seed dispersal, and intentional introduction for fish

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habitat. *M. spicatum* is a major threat to the ecological balance of an aquatic ecosystem through causation of significant declines in favorable native vegetation within lakes (Madsen et al. 1991), and may limit light from reaching native aquatic plant species (Newroth 1985; Aiken et al. 1979). The aquatic plant frequently forms dense surface canopies on inland lakes. Additionally, *M. spicatum* can alter the macroinvertebrate populations associated with particular native plants of certain structural architecture (Newroth 1985). Since the introduction of *M. spicatum*, many nuisance aquatic plant management techniques such as chemical herbicides, biological control, and in extreme cases, mechanical harvesting, have been implemented.

### **3.2 Bear Lake Native Aquatic Plant Species (June & September, 2009)**

Based on the June and September 2009 aquatic vegetation surveys, Bear Lake contained 18 native submersed, 3 floating-leaved, and 4 emergent aquatic plant species (Table 2), for a total of 25 native aquatic plant species. The Pondweeds were the most abundant submersed aquatic plant taxa, with Fernleaf Pondweed (*Potamogeton robbinsii*; Figure 3) as the most abundant throughout the lake, followed by White-Stem Pondweed (*Potamogeton praelongus*; Figure 4), Illinois Pondweed (*Potamogeton illinoensis*; Figure 5), Small-leaf Pondweed (*Potamogeton pusillus*), and Variable-leaved Pondweed (*Potamogeton gramineus*; Figure 6). *P. gramineus* is a small pondweed which grows close to the lake bottom and serves as adequate cover for smaller fish. *P. illinoensis* is a large pondweed that grows tall in the water column and serves as excellent cover for macroinvertebrates and fish. It is best distinguished by its reddish leaves with slightly curled leaf margins and the presence of a prominent seed head that rises above the lake surface. *P. pusillus* is a small pondweed with bright green, delicate, thin leaves that appears to have recovered greatly in areas that were once dominated by *M. spicatum*. Southern Naiad (*Najas guadalupensis*) and the macroalga, *Chara* sp. were also present at many of the sampling sites throughout the lake.

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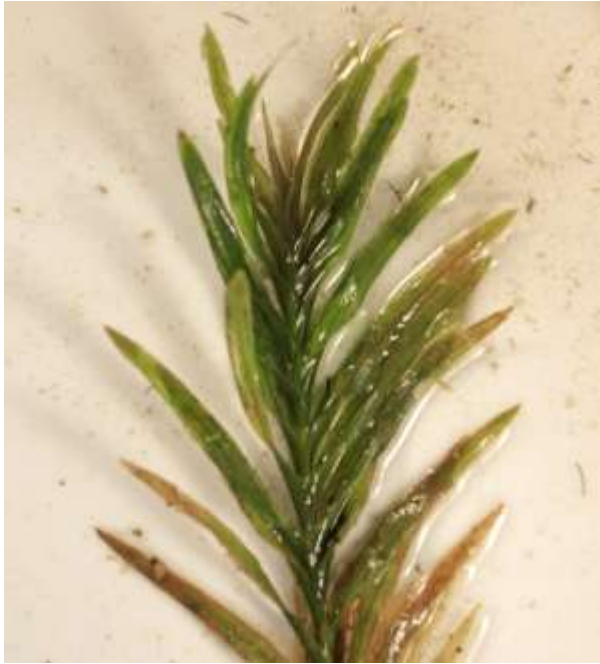


Figure 3. Fernleaf Pondweed (*Potamogeton robbinsii*) © Superior Photique



Figure 4. White-Stem Pondweed (*Potamogeton praelongus*) © Superior Photique



Figure 5. Illinois Pondweed (*Potamogeton illinoensis*) © Superior Photique



Figure 6. Southern Naiad (*Najas guadalupensis*) © Superior Photique

<i>Macrophyte Species and Code</i>	<i>Common Name</i>	<i>Plant Growth Form</i>
<i>Chara vulgaris</i> (macroalga), 3	Muskgrass	Submersed; Rooted
<i>Stuckenia pectinatus</i> , 4	Sago Pondweed	Submersed; Rooted
<i>Potamogeton zosteriformis</i> , 5	Flat-stem Pondweed	Submersed; Rooted
<i>Potamogeton gramineus</i> , 7	Variable-leaved Pondweed	Submersed; Rooted
<i>Potamogeton robbinsii</i> , 6	Fern-leaf Pondweed	Submersed; Rooted
<i>Potamogeton illinoensis</i> , 10	Illinois Pondweed	Submersed; Rooted
<i>Potamogeton pusillus</i> , 29	Small-leaf Pondweed	Submersed; Rooted
<i>Potamogeton natans</i> , 13	Floating-leaved Pondweed	Submersed; Rooted
<i>Potamogeton amplifolius</i> , 11	Large-leaf Pondweed	Submersed; Rooted
<i>Potamogeton praelongus</i> , 8	White-stem Pondweed	Submersed: Rooted
<i>Vallisneria americana</i> , 15	Wild Celery	Submersed; Rooted
<i>Najas guadalupensis</i> , 25	Southern Naiad	Submersed; Rooted
<i>Najas, flexilis</i> , 28	Slender Naiad	Submersed; Rooted
<i>Elodea canadensis</i> , 21	Common Waterweed	Submersed; Rooted
<i>Ceratophyllum demersum</i> , 20	Coontail	Submersed; Non-rooted
<i>Myriophyllum tenellum</i> , 33	Leafless Watermilfoil	Submersed; Rooted
<i>Utricularia minor</i> , 44	Small Bladderwort	Submersed; Non-rooted
<i>Utricularia vulgaris</i> , 22	Common Bladderwort	Submersed; Non-rooted
<i>Nymphaea odorata</i> , 30	White Waterlily	Floating-Leaved
<i>Nuphar variegata</i> , 31	Yellow Waterlily	Floating-Leaved
<i>Brasenia schreberi</i> , 32	Watershield	Floating-leaved
<i>Typha latifolia</i> , 39	Cattails	Emergent
<i>Scirpus acutus</i> , 40	Bulrushes	Emergent
<i>Iris versicolor</i> , 41	Blueflag Iris	Emergent
<i>Decodon verticillatus</i> , 42	Swamp Loosestrife	Emergent

Table 2. Native aquatic plant species present within Bear Lake (June & September, 2009)

## **4.0 2010 BEAR LAKE MANAGEMENT RECOMMENDATIONS**

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The use aquatic chemical herbicide is regulated by the MDEQ under Part 33 (Aquatic Nuisance) of the Natural Resources and Environmental Protection Act, P.A. 451 of 1994, and requires a permit. The permit contains a list of approved herbicides for a particular body of water, as well as dosage rates, treatment areas, and water use restrictions. Wherever possible, it is preferred to use a systemic herbicide for longer-lasting plant control. There are often restrictions with usage of some systemic herbicides around shoreline areas that contain shallow drinking wells. Systemic herbicides such as 2, 4-D and Triclopyr could also be used to selectively treat *M. spicatum*, while preserving other favorable, native aquatic plant species. The systemic aquatic herbicides 2,4-D and Renovate OTF<sup>®</sup> both have continuously offered very successful spot-treatment control of *M. spicatum* while preserving the native pondweeds and other diverse native flora within Bear Lake. The use of both aquatic herbicides to spot-treat any newly located areas of *M. spicatum* is encouraged to reduce the invasion potential of *M. spicatum* and to protect the native aquatic plant species and other non-target flora.

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**APPENDIX A**

**BEAR LAKE AQUATIC VEGETATION SURVEY GPS GRID  
POINT SURVEY TABLE**

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<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
1	10b,7c,40b,42b,30b (In September 15b,29b)
2	22a,10a (In September 10b,6b)
3	4c,15a,22b
4	10b,15b
5	10b
6	10b
7	10b,1b (In September 25b, 22a, 21c)
8	10b,22b,1b (In September 7b, 11b)
9	None
10	6d,10b,7b,4c,20a,22a,42b,31b
11	31b,6c
12	4c,6c,10b,7b (In September 15b)
13	6b,10b,11b,7b,22a
14	10b,7b,22b,1c (In September 15b)
15	10b,22b,3b,7b
16	10b,13b,6b
17	1c,7b,6c,13b,15b
18	10b,6b,22a
19	31b,10b,42c
20	40d,31b,13b,15b
21	10b,6c,15b
22	10b,6b,15b
23	None
24	None
25	10b,8b

<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
26	39c
27	None
28	8b,10b
29	40b
30	10b (In September 4b,3b)
31	10b,7b,3b,25a
32	3b,10b
33	13b,10b,8b
34	3b
35	3b
36	3b,7b,25b
37	3a
38	None
39	3a
40	3b
41	None
42	None
43	None
44	None
45	None
46	10b,3b
47	3b,10b
48	10c,3b,11b,6b,7b,25b (In September 4b)
49	10b,7b,3b
50	3b
51	10c,7c,6b,3b,25b
52	21d,3d,25c,6b,10c,32c,30b,40b,22b

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<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
53	30d,1b,6d,32b
54	21d,1b,10b
55	5b,30c,4b,21d,22b,42b
56	1c,4b,6d,42b,1c,13d
57	1c,10c,8c,6d,4b,22d,13c,21d
58	1c,8b,30d,32b,6d,22b,10c,13c,21d
59	3b,7b,6b
60	10b
61	10b,8a
62	10b,8b,7b,25b
63	None
64	3b,7a
65	3b,7a
66	3b
67	3b,7b
68	3b,7b
69	3b
70	3a,7a
71	3b
72	3b
73	3a
74	None
75	None
76	3a
77	3a
78	3a

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<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
79	None
80	3a
81	3b,7b
82	3a
83	3b,7b
84	None
85	None
86	None
87	None
88	3b
89	3b,7b
90	4b,10b,8a,11b
91	10b,4b,7b
92	6b,4b,10b
93	3b,7b
94	None
95	None
96	None
97	6b,10b,3b
98	10b,6b,3b
99	10b,8b,7b,3b
100	10b,8b,7b
101	10b,8b
102	None
103	None
104	None

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<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
105	None
106	None
107	None
108	None
109	None
110	None
111	None
112	3a (In September, 7b, 10b)
113	3a
114	10b,3b
115	None
116	None
117	None
118	None
119	None
120	None
121	None
122	3b,7b,10b,11a
123	None
124	10b,11b,7b,6b
125	1a
126	1c,11b,10b,7b,3b,22b,32a,4b,29b,30d,42c,39b,31b,21d
127	1c,11b,10b,7b,3b,22b,32a,4b,29b,30d,42c,39b,31b,21d
128	3b,10c,8b,3b (In September, 4c,21c,20b)
129	3b
130	10b,7b,29b,4b (In September, 21b)

<i>Quadrant Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
131	8b,6c,5c,11b,21c,10b,3b,25b,4c,29c
132	8b,6b,5b,11b,21b,29b,10b,25b,7b,3b,40b,30c,22b
133	3b
134	3b
135	3b,10b,11b,6a
136	10b
137	None
138	None
139	None
140	None
141	None
142	3b (In September, 7b, 25b)
143	None
144	None
145	None
146	None
147	None
148	3b,25b
149	3b,8a,25b
150	3b,25b
151	3b
152	3a
153	3b,25b,8b (In September, 6b)
154	25a
155	None
156	None
157	29b,11b,10b,6b



<i>Quadrant Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
158	3b,29b,10b,8b,25b,21b
159	3b,6b,3b,10b,11b,29c
160	3b,25b,40b,7b
161	3b,25a,7a,40b
162	3b,25b
163	6d,7b,10b,11b,29b,5b,25b,3c
164	11b,10b,8b,3c,6b,5b
165	10b,29c,11b,6c,8b,13b,3c
166	3b,25b
167	None
168	None
169	None
170	None
171	None
172	3b
173	3b
174	3b
175	3b (In September, None)
176	None
177	None
178	None
179	None
180	None
181	None
182	None
183	3b,25a,10a
184	3b,7a

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<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
185	3b,7a,10b
186	3b
187	3b,10b,8b,11b,29c,13a
188	3a
189	None
190	None
191	None
192	None
193	None
194	None
195	None
196	None
197	None
198	None
199	None
200	None
201	None
202	None
203	None
204	None
205	None
206	None
207	None
208	10b,29c,5b,6b,8c,3b,25c,11a,7b,22a
209	3b,11b,10c,8c,6c,7b (In September, 10b, 8b, 4a)
210	10b,7b,3b,25b
211	10b

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<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
212	3b,7b,25a,40a
213	3b,7a,40b,15b
214	15b,10b,3b,6c
215	10d,11b,6b
216	10c,11b,3b
217	6d,10c,11c,5b,13b
218	3b,7b
219	10b,13b,8b,11b
220	None
221	None
222	None
223	None
224	None
225	None
226	None
227	None
228	None
229	None
230	3b,25b
231	3a
232	3a
233	3b,10b,8b
234	3b,7b,10b,8b,25b
235	3b,7b,25b
236	3b,7b,40a
237	3b,7a

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<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
238	3b
239	3a
240	None
241	None
242	None
243	None
244	None
245	None
246	None
247	None
248	None
249	None
250	None
251	None
252	None
253	None
254	10d,11b,8b,3b,5b,6c (In September, 15b, 29b)
255	10c,3b,11b,13b (In September, 15b, 29b)
256	13b,10c,11b,8c,3b
257	10b,4c,11c,6c,13a
258	10b,6b,7b,3b,29c
259	7b,3b,25b,6b,29b
260	7b,40a,3b
261	3b,7b,25a,40a,29b,11b
262	6b,10b,3b
263	6b,10b

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<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
264	3b,7b
265	6b,8b,10b,13b
266	6b,8b,10b,13b
267	6b,8b,10b,13b
268	6b,8b,10b,13b,29c
269	6b,8b,10b,13b
270	6b,8b,10b,13b,29b
271	6b,8b,10b,13b,29b
272	6b,8b,10b,13b,29b
273	6b,8b,10b,13b
274	8c,10b,6c,7b,25b,29b
275	8b,10b,6b,25a,29c
276	8b,10b,6b
277	8b,10b,6c,7a,29b
278	3b,10b,8b,6c,25a
279	3b,8b,10b
280	None
281	None
282	None
283	None
284	None
285	None
286	None
287	None
288	None
289	None

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<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
290	None
291	None
292	None
293	None
294	None
295	None
296	None
297	None
298	None
299	None
300	None
301	None
302	None
303	None
304	None
305	3b,6b
306	6b,7c
307	3b,7b
308	3b,10b,7b (In September, 25b)
309	3b,10b
310	None
311	None
312	None
313	None
314	None
315	None

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<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
316	None
317	None
318	None
319	None
320	None
321	None
322	None
323	None
324	None
325	None
326	None
327	None
328	None
329	8c,10b,6c
330	8c,10b
331	8c,10b,6c
332	8c,10b
333	8c
334	8c,10b
335	8c,10b,6b
336	8b,6c,7b,13b,3b,10b
337	6c,10b,7b,8b
338	6c,10b,8b,13b
339	6c,10b,13b,8b
340	8c,10b,13b,11b,7b,3a
341	8b,10b,6c,7b,3b

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<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
342	8b,6c,10b,7b,3b,25b
343	8b,10b,6c,3b,7b
344	8b,6c,3b
345	3b
346	3b,6b,10c
347	3b,10b
348	3b
349	8b,10b,6c,3b,21b,25b
350	6c,8c,13b,11b,3b
351	6c,8b,10b,13c
352	6c,8b,10a
353	6c,8b,10b,13b,1c
354	6c,8b,10b,13b,1c
355	8b,10b
356	None
357	None
358	None
359	None
360	None
361	None
362	None
363	None
364	None
365	None
366	None
367	None

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<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
368	None
369	None
370	None
371	None
372	None
373	None
374	None
375	None
376	None
377	None
378	None
379	None
380	None
381	None
382	None
383	None
384	3b
385	None
386	None
387	None
388	None
389	None
390	None
391	None
392	None
393	1c

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<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
394	1c
395	1c
396	None
397	None
398	None
399	1c
400	None
401	None
402	None
403	None
404	None
405	None
406	None
407	None
408	None
409	None
410	None
411	None
412	6b,3b,11b,10c,7a (In September, 4b)
413	6b,7c,8c,10c
414	13b,6b,10c,7a,8c
415	13b,6b,10b,7b,8b
416	6c,8b,10b
417	6c,10b,8b
418	6b
419	None

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<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
420	3b,6b
421	3b,8b,10b,6c
422	6b,10b,8b
423	6c,10b,7b
424	6c,10b
425	8b,10b,6c
426	8b,10b,11b,7b,6c,13b (In September, 4b, 21b)
427	None
428	None
429	None
430	8b,6c
431	8b,6b,10b
432	8b,6b,10b
433	8b,6c,10b,7a
434	10b
435	10b,6b
436	None
437	None
438	None
439	None
440	None
441	None
442	None
443	None
444	None
445	None

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<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
446	None
447	None
448	None
449	None
450	None
451	None
452	None
453	None
454	6b
455	3b
456	8b,3b
457	3b
458	None
459	None
460	None
461	None
462	None
463	None
464	None
465	None
466	None
467	None
468	None
469	None
470	None
471	None

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<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
472	None
473	None
474	None
475	None
476	None
477	8b,10b,6b,3b
478	8b,10b,6c,7b
479	8b,10b,6c,13b,7b,25b,3b
480	8b,6b
481	None
482	None
483	10b,8c,6c,13b,25b
484	8c,10b,6c,13b,3b
485	8c,10b,6c,13b
486	3b
487	8c,10b,6c,13b,3b
488	8c,10b,6c,13b,3b
489	8c,10b,6c,13b,3b
490	8b,6b,7b
491	8b,10b
492	6c,10b,20b,7b,8b
493	3b,7b
494	3b,7b
495	3b,20a,7b,8b,10b,6c
496	3b,6b,7b,8b,10b,20a,25a
497	10b,6b,8b
498	10b,6b,8b,4b

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<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
499	8c,10b,6b,13b,20b,3b
500	8b,10b,6b,13b,3b
501	8b,10b,6b,3b
502	None
503	8c,10b,6c,13b,20b,21a,7b
504	None
505	None
506	None
507	None
508	None
509	None
510	None
511	None
512	None
513	None
514	None
515	None
516	None
517	None
518	None
519	3b,7b
520	3b,7b,20a
521	3b,6a
522	3b,6b,7a
523	3b,6b
524	3b,6a
525	6a,7b

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<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
526	6b,10a,7b
527	10b,6b
528	10b,6b
529	3b,6b
530	10b
531	3b,7b
532	10b,6b
533	3b
534	None
535	None
536	6a,3b
537	3b,6b,7a
538	3b
539	3b,25b
540	3b,10b,7a
541	3b
542	3b
543	1c-big bed at SW corner
544	1c “ “
545	1b” “
546	1b” “
547	1b” “
548	1b” “
549	1b” “
550	1b” “
551	1c” “
552	1b” “

<i>Quadrat Location Pt.</i>	<i>Macrophyte Species and Abundance Present</i>
553	1c” “
554	1b” “
555	1b” “
556	1b” “
557	1b” “
558	1b” “



**APPENDIX B**

**BEAR LAKE AQUATIC VEGETATION SURVEY GPS GRID  
POINT SURVEY MAP**

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