Spatial Survey of

Aquatic Plants in Charlie Lake

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by

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BACKGROUND

Following a public meeting organized by the Charlie Lake Conservation Society on June 26, 2014, there was interest in putting some efforts in documenting the extent of aquatic vegetation in Charlie Lake. Up to that point, the only known informal survey made of aquatic plants, was done by Mr. Bob Ohland, a long time resident and avid fisherman, now deceased. In the mid-1990's users of the lake commented that there was very little aquatic vegetation in Charlie Lake, compared to earlier years. The prevalent hypothesis was that the higher water levels, as a result of a weir built by the City at the outlet for drinking water withdrawals purposes, had placed the emergent aquatic vegetation under water, increased sedimentation and eventually eliminated the vegetation. At the time there was concern that the loss of aquatic vegetation would translate in a reduction of cover and forage habitat for fish, and eventually impact fish production.

In recent years, aquatic vegetation appears to have increased to the point that lake users are much more aware of it, and reporting their concerns that the vegetation is impacting recreational activities near shore. In an effort to document the current extent of the emergent aquatic plants in Charlie Lake, staff from the Ministry of Forests, Lands and Natural Resources Operations (FLNRO) along with members of the Charlie Lake Conservation Society conducted a shoreline cruise. Using an iPad with a GPS-enabled app and maps of the lake, we navigated at slow speed along the outer edge of floating, emergent aquatic plant beds and periodically recorded waypoints along the route. The data was then imported into Arcmap and a map was created and included here. Google Earth files were also created to facilitate sharing with other interested people.

RESULTS AND DISCUSSION

The conditions on the day of the survey were perfect, with sunny skies, negligible breeze and very good visibility. Water clarity was measured with a Secchi disc and the depth was 2.1 meters. After some trial and error on the best methodology, we found that the edge of the emergent plant beds was easily spotted because it created a buffer between rippled and still water. Starting at the south end of the lake, we drove the boat along the shore at slow speed, periodically marking waypoints on the GPS. No waypoints were recorded where there was no vegetation. The survey time ranged approximately from 09:30 to 14:00h PDT. The waypoints showing the edge of the aquatic plants are shown in Figure 1. One small additional patch of plants was observed near the Lakepoint Golf course after the survey was done, so no waypoints are recorded but it is indicated on the map. Figures 2 to 4 show zoomed-in areas of the lake. For comparative purposes, a map of aquatic plants distribution drawn by Bob Ohland pre-1980

is shown in Figure 5. However, there is no documentation on how the data was collected, so a direct comparison with our data is difficult, but it does provide some context for the many complaints we had received at the Ministry office in the mid-1990's that aquatic plant density was lower than in the 1980's. Currently, people are reporting that densities of aquatic plants are much higher than the past. The wide range of observation reported by the public, with no supporting evidence, reinforces the need for people to get involved in organized observation and data collection, as promoted by the Charlie Lake Conservation Society and the Provincial Ministries. Two examples of such programs are the recording of dates associated with beginning and end of ice cover in Charlie Lake, and water quality sampling, both delivered by members of the CLCS.

There are 5 major species of aquatic plants in Charlie Lake. Samples have been collected previously and identified by Dennis Einarson, an Impact Biologist with the Ministry of Environment. These are:

- *Potamogeton berchtoldii* (Small Pondweed)
- *Potamogeton praelongus* (White Stemmed Pondweed)
- *Potamogeton robbinsii* (Robbins' Pondweed)
- *Callitriche palustris* (Vernal Water-starwort)
- *Myriophyllum sibiricum* (Northern Water milfoil)

During the survey we collected a previously-undocumented plant that was subsequently identified by Dennis as:

- *Potamogeton zosteriformis* (Flat–stem pondweed)

All of these are native to the area, and there were no invasive plants identified. Photos of these plants are shown in Figure 6. The most abundant species of plant we observed appears to be the White Stemmed Pondweed, but Northern Water milfoil was also abundant in certain locations.

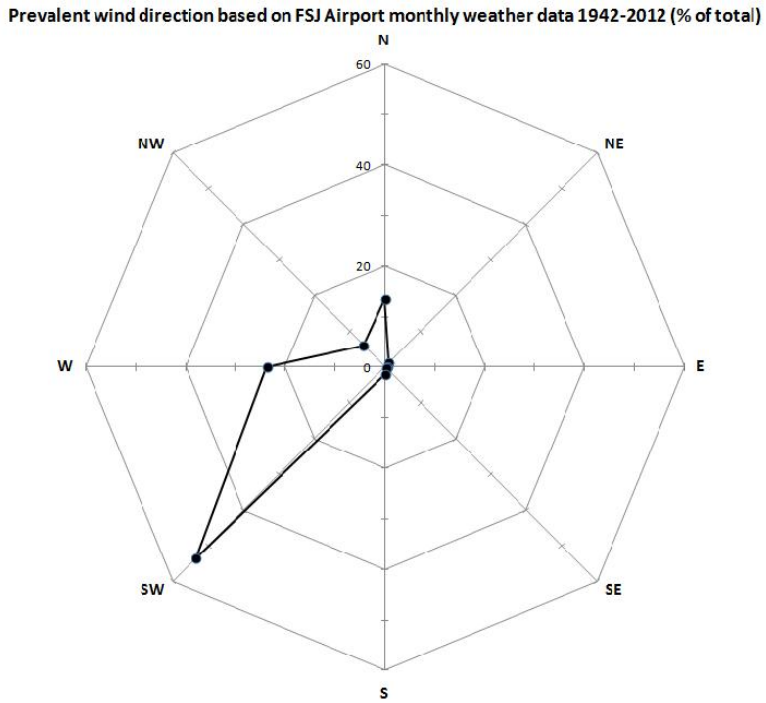
The current distribution of aquatic plants suggests a possible hypothesis on the contributing factors and mechanisms. The greatest proportion of dense growth of the plants is in the southern half of the lake, and within that section, a greater proportion is along the eastern shore. The growth of aquatic plants, just like their terrestrial cousins, is driven by nutrients. Charlie Lake is naturally very rich in nutrients which are stored in bottom sediments and redistributed throughout the water column by mixing by wind-generated currents during the open water season.

However land development has very likely contributed additional nutrients through various sources, such as increased siltation from development activities, inadequate septic systems, runoff from fertilized lawns etc. High nutrient levels, coupled with a high proportion of shallow water and fast warming rates, provide ideal conditions for aquatic plants to thrive. It is interesting to note that the eastern shore of the southern half of the lake has the most continuous and abundant occurrence of vegetation. Given the alignment and width of the southern half of Charlie Lake it is possible that wind creates wave action and currents that concentrate aquatic vegetation and nutrients along this shore.

Weather data recorded at the Ft. St. John Airport, obtained from Environment Canada's website for the summer periods from 1942 to 2012, indicates that the direction of maximum wind gusts, measured in 10 degrees intervals from 0 to 360, is by far from a S.W. direction (53.5 % of the total), as shown in the table below:

Direction	Frequency(#)	%
N	85	13.3
NE	7	1.1
E	3	0.5
SE	2	0.3
S	9	1.4
SW	341	53.5
W	151	23.7
NW	39	6.1
Totals	637	100.0

From these data we can construct a wind rose (see below), which is a graphical representation of the relative magnitude of wind direction.



When we superimpose lines showing the direction of the prevalent winds onto a map of Charlie Lake, it's apparent that the fetch, which is the distance that the wind blows across the water, is greater in the southern half of the lake, compared to the northern half. In the southern half, most of the fetch is greater than 1 km (average = 2.7 km), while in the northern half most of the fetch is approximately 1 km. Or less (average = 1.1 km.).

The aspect of the two halves of the lake may also magnify the effect of the prevailing winds. The southern half of the lake is aligned approximately along a North-South axis, while the northern half lies along a Northwest axis. This would reduce the fetch from the prevailing winds.

CONCLUSIONS

The aquatic plants found in Charlie Lake are native to the area thus should not be treated as invasive. They do provide important fish habitat for a variety of species and life stages, and they also provide an ecological pathway for nutrient. Dense emergent vegetation may provide some inconvenience as people move their boats from shore to open water, but these plants also do provide a buffer for waves generated by wind and by recreational motorized vehicles on the lake, reducing the force of the waves against a shoreline that has been impacted by development.

ACKNOWLEDGEMENTS

We are very appreciative of the plant identification done by Dennis Einarson, with the Ministry of Environment in Vernon BC. We also thank Sanjay Tewari with FLNRO, and Bess Legault with the Charlie Lake Conservation Society for their help in the field. Thanks to Kevin Wagner with BC Parks for the use of their boat.

Figure 1: Map of Charlie Lake showing the edges of dense, emergent aquatic plants.

Figure 2: South end of lake.

Figure 3: Mid-section of lake.

Figure 4: North section of lake.

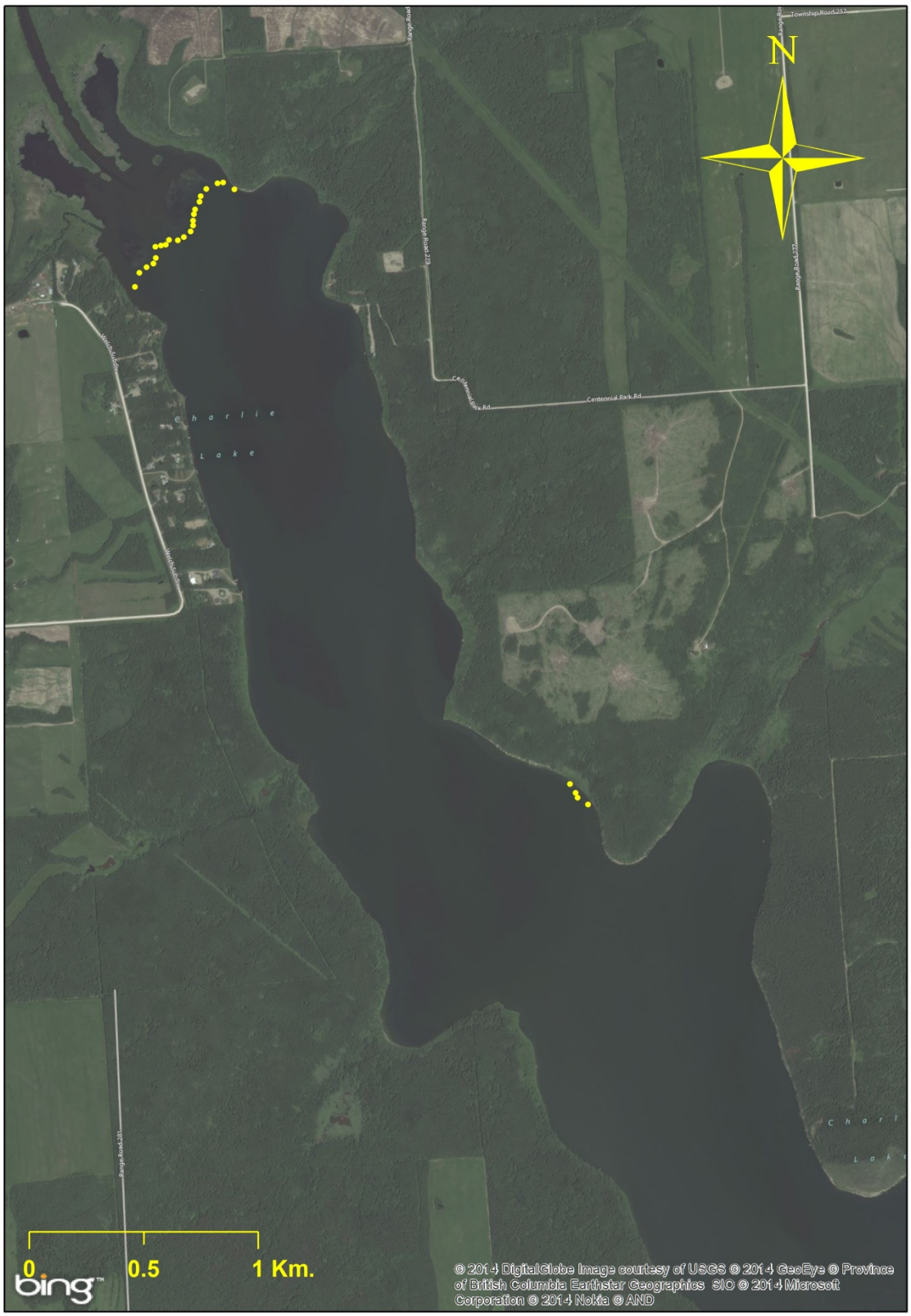
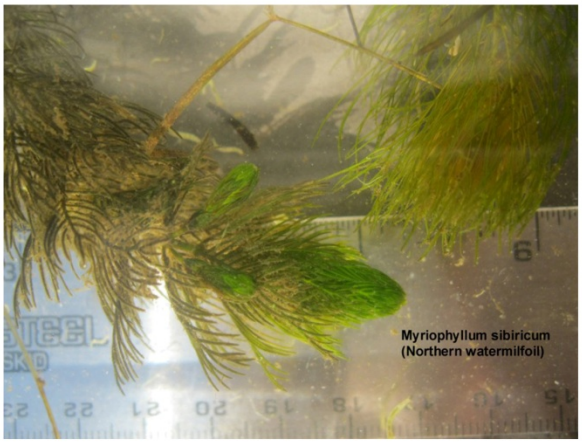
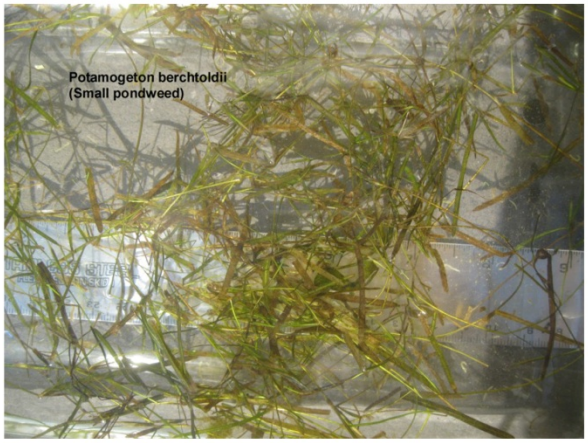


Figure 5: Pre-1980 aquatic plants distribution as mapped by Bob Ohland.

Figure 6: Samples of aquatic plants from Charlie Lake.





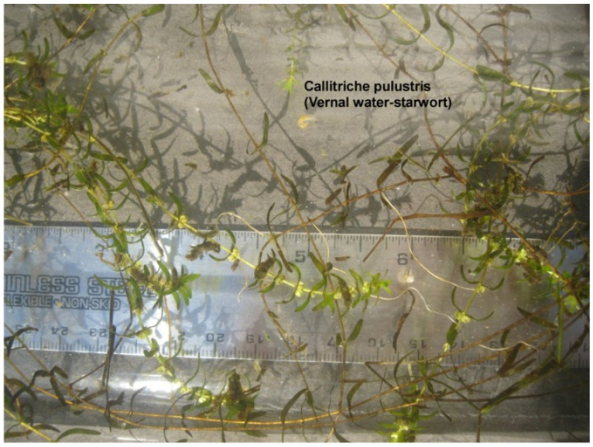


Figure 7: Direction of prevailing winds based on historical weather data.

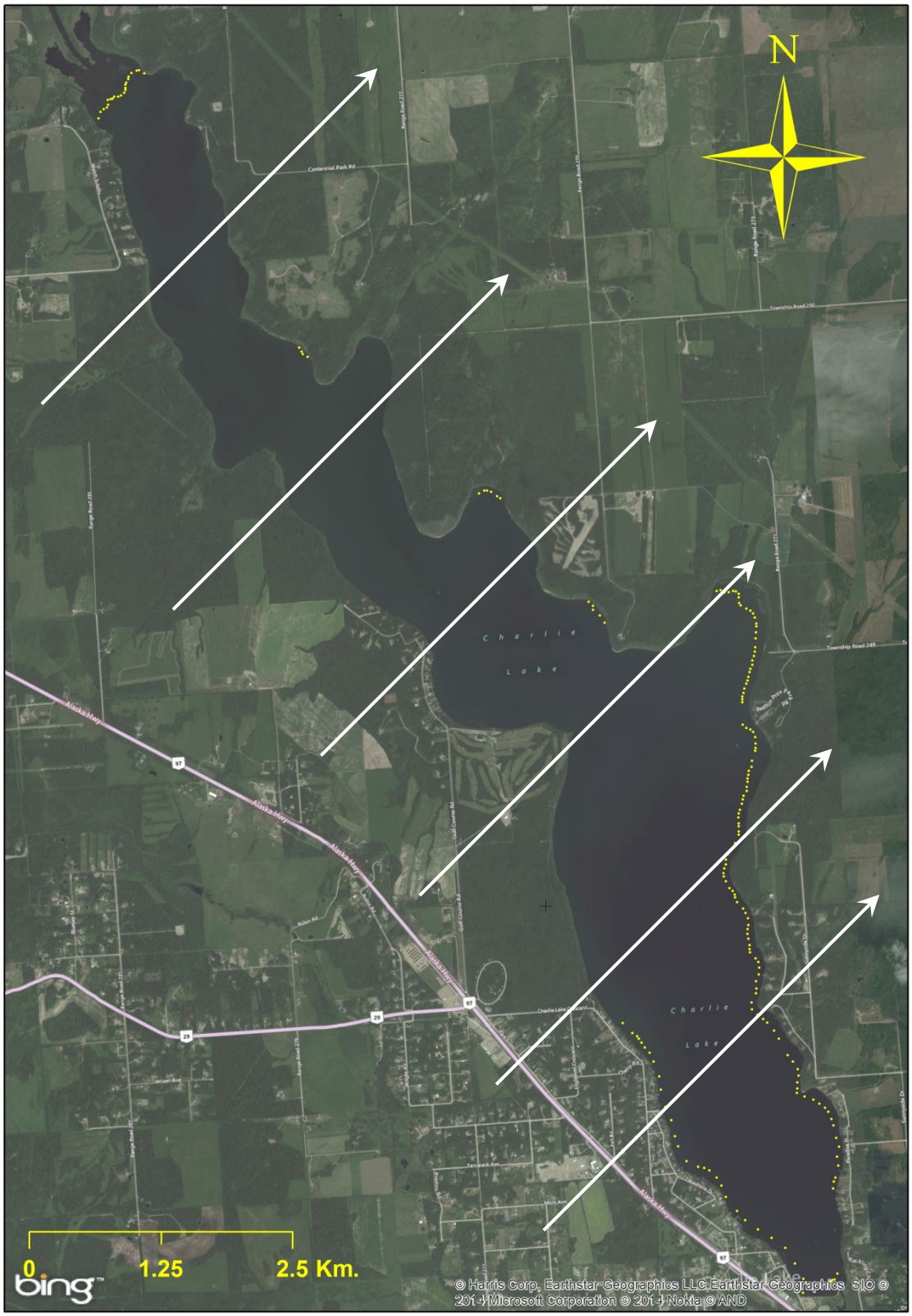


Figure 8: Aquatic plants near the south end boat launch.

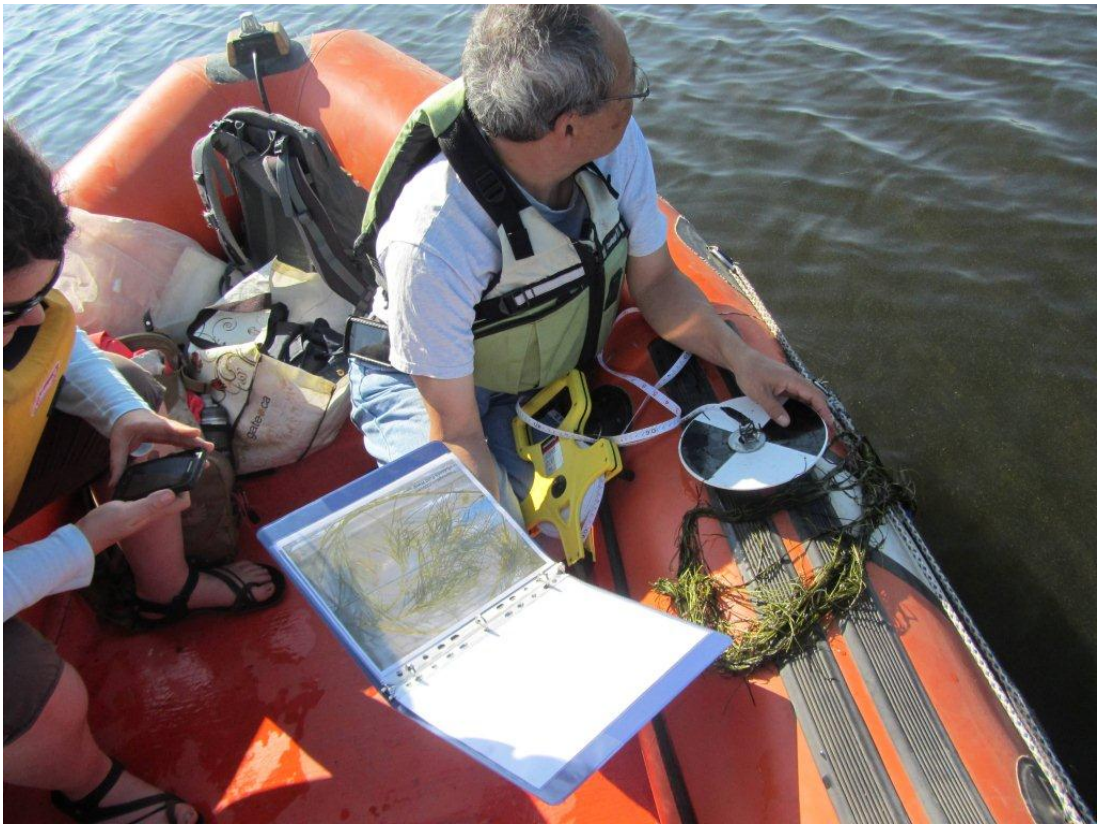



Figure 9: Bruce about to take a Secchi Disc reading to measure water clarity.