Aquatic Macrophytes of the St. Croix/Gordon Flowage, Douglas County, Wisconsin March 2008

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Objective

Evaluate the overall health of the aquatic macrophyte community and determine any limitations relating to macrophyte management.

Abstract

The St. Croix/Gordon Flowage is a 1,913 acre impoundment of the St. Croix River. It is located just west of Gordon in Douglas County. Just below this impoundment is the beginning of the St. Croix National Scenic Riverway. An aquatic macrophyte survey was conducted to assess the health of the flowage's macrophyte community. Aquatic macrophytes play a significant role in a reservoir's ecosystem. They provide habitat for the fishery and other aquatic organisms, stabilize the sediment, reduce erosion, buffer temperature changes and waves, infuse oxygen into the water, and utilize nutrients that may otherwise be used by algae. The survey was conducted using DNR protocol. In total 744 sites were surveyed. Fifty-six aquatic macrophyte species were collected and identified in the survey conducted in July/August 2007. Additional data analysis included Frequency of Occurrence (FO), Simpson Diversity Index (SDI), and Floristic Quality Index (FQI) assessments. Two aquatic invasive species (AIS), curly leaf pondweed (CLP) and Eurasian water milfoil (EWM), were identified in relatively small abundance in the flowage. Through this survey and citizen involvement a management plan will be developed to best fit the needs and expectations of the flowage.

Like many Northern Wisconsin Flowages it:
- **is relatively shallow (Fig. 5)**
- **consists of a predominantly muck substrate (Fig. 3)**

It is home to a healthy aquatic plant community including some rare species such as spiny hornwort and small bladderwort. In addition to the above points it also has:
- **soft water**
- **a balanced phosphorus load**
- **little shoreline development (reducing sediment and P inputs)**
- **light recreational boating reduces the erosion of substrate and re-suspension of sediments**

Methods

The survey was accomplished using the Wisconsin Department of Natural Resources (WDNR) aquatic macrophyte point-intercept sampling protocol (Huxwell, et. al, 2004).

- **The GPS coordinates for the grid which consisted of 894 sites was provided by the WDNR.**
- **A boat with three survey members was used during this survey. Volunteers drove the boats while staff from the UWSP CWSE raked, identified, and recorded aquatic plants.**
- **Kayaks were used to access as many of the shallow points as possible. CLP was surveyed by volunteers in June 2007 using air photos and a handheld GPS units to record the location of CLP beds.**

Aquatic Invasive Species

The flowage's two AIS have yet to become a major problem. This may be due to the good health and balance of the plant community.

- **Recently EWM was identified and preliminary steps to control it were taken by the lake association in fall 2007.**
- **A June survey found numerous CLP beds which were all located in the western end of the flowage (Figure 1). Beds ranged from 0.2 to 4.5 acres, totaling 18.5 acres.**

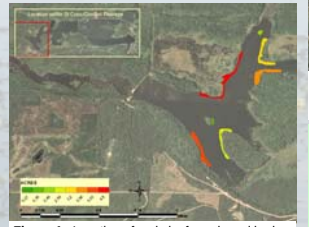

Figure 1. Location of curly-leaf pondweed beds in the western portion of the St. Croix/Gordon Flowage, June 2007.

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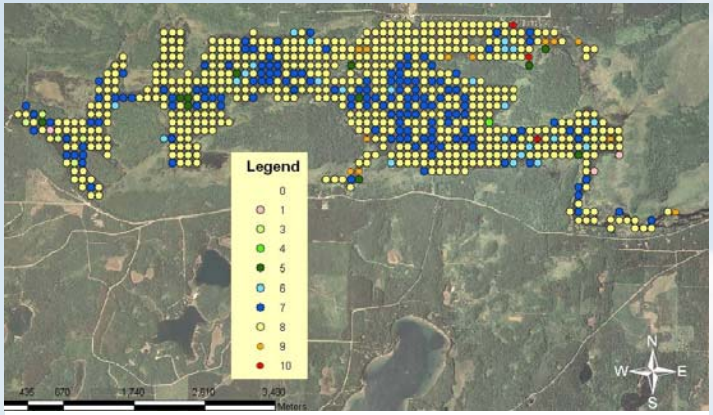

Figure 2. Maximum Coefficient of Conservatism value found at each sample site in the St. Croix/Gordon Flowage.

Floristic Quality Index

FQI evaluates the closeness of a plant community to undisturbed conditions. Each plant is assigned a coefficient of conservatism (c value) that reflects its sensitivity to disturbance and these numbers are used to calculate the FQI (Figure2).

- **c values range from 0 to 10, the higher the number, the more intolerant of disturbance.**
- **a zero c value is assigned to exotic and most nonvascular species.**
- **spiny hornwort, floating bur-reed, and small bladderwort all have c values of 10.**

	Median species #	Median average c value	Median FQI
St. Croix/Gordon Flowage	**41**	**6.1**	**38.4**
Statewide	13	6	22.2
NLFF	23.5	6.2	28.3

Nichols, et al. 1998

Table 1. Median floristic quality indices for St. Croix/Gordon Flowage, statewide, and Northern Lakes Forest Flowages.

Figure 3. Dominant sediment type at each sample site in the St. Croix/Gordon Flowage. The flowage is dominated by muck substrate providing excellent nutrients for abundant plant growth

Problematic Species

Although northern water milfoil, NWM, had the 5th highest FO it is one of the more noticeable species on the flowage.

- **NWM can demonstrate growth patterns similar to its invasive counterpart EWM; however, it does not usually spread as rapidly as EWM.**
- **In these same locations NWM grows to the surface and may be considered a recreational nuisance.**

Simpson Diversity Index

SDI quantifies biodiversity by multiplying the mean c value times the square root of the total # of species at each site. Values range from 0-1. (Table 2)

Table 2. The St. Croix/Gordon Flowage ranked number one out of nine northern Wisconsin flowages surveyed in 1994 with a score of 0.92; a score of 0.92 was also recorded in this study.

Reservoir	SDI
St. Croix	**0.92**
Willow*	0.90
Caldron Falls	0.90
Spirit Reservoir*	0.89
Minong	0.87
Wissota	0.82
Brule	0.69
Rainbow*	0.67
Gile*	0.39
Big Eau Pleine*	0.02

* reservoir is subject to fluctuating water levels (Weber, 1999)

Frequency of Occurrence

FO is the percent of points sampled with specific species present . The FO for the entire St Croix/Gordon Flowage was 92.9%. (Figure 4)

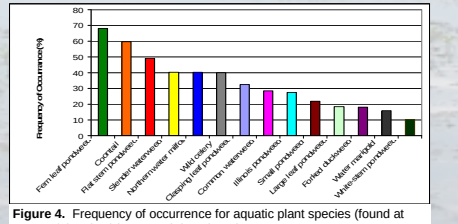

Figure 4. Frequency of occurrence for aquatic plant species (found at >10% of the sites) in St. Croix/Gordon Flowage.

Results

- **744 sites were accessible using the WDNR's point-intercept protocol.**
- **Ninety-three percent (691) of the sites had vegetative growth.**
- **The deepest depth at which aquatic plant growth was found was 17.1 ft.**
- **Fifty-six aquatic plant species were collected and identified in the survey conducted in July/August 2007.**
- **The FQI for the Flowage was 38.4; this is higher than the median FQI for statewide lakes and reservoirs and northern lakes and forest flowages (NLFF) (Table 1).**
- **30% of the species found in St. Croix/Gordon Flowage had a c value of 8 or greater indicating the good health of the aquatic plant community.**
- **The species with the highest frequency of occurrence was fern-leaf pondweed; it has a c value of 8. Fern-leaved pondweed occurred at 68% of the sites.** .

Conclusions

- **The Flowage has a very healthy and diverse aquatic plant community that is unlike many in Wisconsin.**
- **Aquatic plants play a critical role in the aquatic ecosystem providing quality habitat and food for fish, invertebrates, birds, and mammals and tying up nutrients which may otherwise be available to algae.**
- **Aquatic plant growth is abundant in the flowage due to the shallow depth of water and rich sediments delivered from the St Croix River watershed.**

Recommendations

Northern Water Milfoil may be a nuisance in parts of the flowage; management may be considered where it is limiting access to docks.

- **Curly-leaf pondweed should be monitored in June; management should be considered to control additional spread.**
- **Mechanical harvest should not be used in areas which have c values greater than 8 (Figure 2) or in depths of 3 feet or less (Figure 5).**
- **Any management activities should be planned to minimize the disturbance of native species.**
- **Activities at the boat launches should be continued through the Clean Boats/Clean Waters program.**

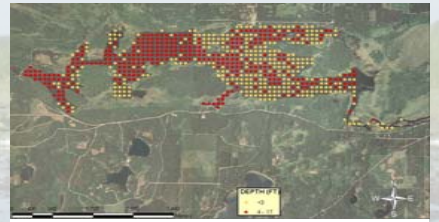

Figure 5. Depths as they relate to mechanical harvesting on the St. Croix/Gordon Flowage. 47% of the sites surveyed are 3 feet or less.

Works Cited

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