Lake Monitoring for Aquatic Invasive Species in 2006
A Report to the Town of Plum Lake, Vilas County

By Bill Sloey, Monitoring Coordinator
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Field collection Kits for sampling aquatic plants and crayfish were assembled in May and early June. Three plant sampling kits were assembled along with three crayfish sampling kits. The lists of equipment, supplies and sampling protocols for each are appended. A total of nine people volunteered to assist in the sampling. A training session was held in the shelter at Centennial Park on 26 June and sampling commenced immediately. Unfortunately, very hot weather in July hampered sampling efforts. Sampling terminated at the end of August (the crayfish become more lethargic), so, it was a very short sampling season.

Lake Selection

The Town of Plum Lake has some 37 lakes within it's boundary. In order to maximize our efforts in the lakes most likely to be invaded, we established a five-rank classification as follows:

A) Lakes already invaded by rusty crayfish include Star, Plum and Little Star lakes. Crayfish will not be trapped on these lakes for fear of transporting eggs to other lakes. Rusty crayfish feed heavily on aqautic plants, so special studies of the vegetation will be conducted on these lakes to ascertain the degree of damage and to help design possible management scenerios.

B) High impact public access lakes receiving intensive use to be sampled every year - these include Irving, Ballard, White Birch, Partridge, Razorback, Escanaba, Nebish, Crystal and Laura lakes.

C) Low impact public-access lakes to be sampled every 2-3 years - these include Starrett, Lone Tree, Aurora, Camp 10, Stewart, and Nixon lakes.

D) Limited public-access lakes to be sampled every 3-4 years - these include Pallette, Mystery, Frank, Spruce, Allequash Springs, Wharton, Dorothy Dunn, Salsich, Blueberry, Wilson, Alva, Jean, Eloise, Dad's and Snider lakes.

E) No public-access lakes to be sampled when we are allowed - these include Nineweb, Decker and Monohan lakes.

Crayfish

In spite of the short available time frame, we sampled nine lakes and Star Creek (above Plum Lake) for crayfish. For fear of contaminating the field equipment with fertile rusty crayfish eggs, we did not trap crayfish from Star or Plum Lakes. We trapped a total of

116 trap/days from the smaller lakes and caught a total of 221 crayfish. Most of these were taken from Escanaba Lake. **Jeff Maxted from the center for Limnology at the UW in Madison identified both *O. virilis* and *O. rusticus* (rusty crayfish) in the Escanaba sample. This is the first report of *O. rusticus* in Lake Escanaba**. **Lake. Escanaba's future certainly appears to be in question.** In spite of the overwhelming dominance of *O. rusticus* in Star and Plum lakes, only *O. virilis* was identified from Star Creek samples taken between Star and Plum Lakes. We plan to re-sample both Escanaba Lake and Star Creek in 2007 to make certain that samples were not accidentally switched. The crayfish collected from each lake sampled are listed in table 1.

Table 1

Crayfish collected during the 2006 season from lakes in the Town of Plum Lake

Lake	No. crayfish collected	Species
Dorothy Dunn	**0**	
Escanaba	**195**	***O. rusticus, O. virilis***
Pallette	**0**	
Ballard	**8**	***O. virilis***
Razorback	**6**	***O. virilis, O. propinquus***
Partridge	**0**	
***Laura**	**?**	
Star Creek	**10**	***O. virilis***
Blueberry	**0**	
Lone Tree	**0**	
Nebish	**2**	***O. virilis***
Total	***221**	

- All specimens were sent to the UW-Madison Limnology Laboratory for positive identification. A breakdown of species occurrences will not be available until we receive a report back from them.

* Because the UW-Madison Limnolgy Dept. was conducting an undergraduate crayfish study on Laura Lake, we chose not to sample ourselves, but to await their data.

Aquatic Plants

We sampled eleven lakes for aquatic plants. We sampled a total of 115 sampling sites and collected 145 plant specimens for identification. Most importantly, **except for purple loosestrife along the shore of Star Lake**, **we found no invasive aquatic plant species!** The number sites sampled and plants collected from each lake are listed in Table 2.

Table 2
The number sites sampled and aquatic plants collected during the 2006 season from lakes in the Town of Plum Lake

	Lake	No. Sites	No. Samples
	Dorothy Dunn	**10**	**14**
	Nebish	**12**	**8**
	Aurora	**1**	**1**
	Escanaba	**15**	**11**
	Pallette	**6**	**9**
	Laura	**6**	**16**
	Partridge	**10**	**28**
	Lone Tree	**14**	**6**
	Razorback	**8**	**8**
	Blueberry	**3**	**2**
	Plum	**14**	**13**
	Star	**17**	**30**
Total	**11**	**115**	**145**

Plant Species present in Individual Lakes

The long-term goal of this study is to monitor the same sites repeatedly over an undetermined, but significant, number of years to determine how species composition varies over the time. It should also give us an early warning if an aggressive exotic appears. The field data sheets list the individual species at each of the ten or so sites sampled. For the sake of brevity in this report, however, we will simply list the species found in each lake sampled.

Dorothy Dunn Lake

*Emergent and Floating Leafed Plants
water shield (*Brasenia schreberi)*
pickerel weed (*Pontederia cordata)*

White water lily (*Nymphea odorata)*
Spike rush *(Eleocharis Robbinsii)**
* It should be noted that emergents and floating-leafed plants were not sampled as intensively as the submergents in any of the lakes listed.

Submergent Plants
Water weed (*Elodea canadensis)**
Wild celery (*Vallisneria americana)**
Musky weed (*Potomageton amplifolius)**
Fern pondweed *(P. Robbinsii)*
Musk grass (Chara sp.)
* Indicates plants who's identity has been vouchered by Dr. N. Harriman at the UW-O Herbarium where these plants remain on file.

Aurora Lake
Emergents and floating-leafed Plants

Wild rice *(Zizania aquatica)*

- Only one site was sampled in Aurora Lake because the wild rice was too dense to allow for launching a boat.

Escanaba Lake
Emergents and Floating Leafed Plants
None sampled

Submergents
Water Bulrush (*Scirpus subterminalis*)
Ribbon-leaf pondweed (*P. epihydrus*)*
Musky weed (*P. amplifolius*)
Waterweed (*Elodea canadensis*)*
Wild celery (*Vallisneria americana*)*
Naja sp.
- 11 of 15 sites sampled had no vegetation

In 1978, Kempinger and Carline reported the following species of macrophytes in Escanaba:

Emergents

Arrowhead (*Sagittaria latifolia)*
Dwarf arrowhead (*Sagittaria teres)*
Hardstem bulrush (*Scirpu acutus)*
Pickerel weed (*Pontederia cordata)*
Smartweed (*Polygonum natans)*
White water lily (*Nymphia odorata)*
Yellow water lily *(Nuphar variegatum)*

Submergents

Musky weed (*P. amplifoius*)
Variable pondweed (*P. gramineus)*
Small pondweed (*P*. pusillus)
Bushy pondweed (*Najas flexilis)*
Wild celery (*Vallisneria americana*)

Pallette Lake

Emergents and floating leafed

Hard-stem bulrush (*Scirpus acutus)**
Smartweed (*Polygonum amphibium)**
Floating-leaf bur-reed (*Sparganium fluctuans)**
Blue-flag iris (*Iris versicolor)**
Purple false foxglove (A*galinis purpurea)**
Three-way sedge (*Dulichium arundinaceum)**

Submergents

Dwarf water milfoil (*Myriophyllum tenellum)**
Pipewort (*Eriocaulon aquaticum*)*
Golden pert (*Gratiola aurea*)* submersed form only

- Pallette lake is oligotrophic and has little aquatic vegetation

Nebish Lake

Emergents and floating-leafed

Yellow water lily (*Nuphar variegatum*)*
Spike rush (*Eleocharis erythrapoda)**

Submergents

Quill wort (*Isoetes sp.)*
Green alga
Pipewort (*Eriocaulon aquaticum)*

- Nebish Lake is oligotrophic and devoid of vegetation.

Partridge Lake

Emergents and floating-leafed

Yellow water lily (*Nuphar vareigatum)*
Wild rice (*Zizania palustris)*
Soft-stemmed bulrush (*Scirpus validus)*

Submergents

Wild celery (*Vallisneria americana)*
Waterweed (*Elodea canadensis*)
Floating-leafed pondweed (*P. natans*)*
Coontail (*Ceratopyllum demersum)*
Fern pondweed (*P. Robbinsii)*
Musky weed (*P. amplifolius)*
Musk grass (*Nitella sp*.)

Lone Tree Lake
Emergents and floating –leafed

White water lily (*Nymphea tuberosa)**

Submergents

Waterweed (*Myriophyllum tenellum)**
Ribbon-leaf pondweed (*Potomageton epihydrus)**

Razorback Lake

Emergents and floating-leafed

None sampled

Submergents

Musk grass (*Nitella)*
Slender waterweed (*Elodea Nuttallii)**
Fern pondweed (*P. Robbinsii)**
Clasping-leaf pondweed (*P. Richardsonii)**
Wild celery (*Vallesneria americana)**

- Most of Razorback Lake is devoid of vegetation

Blueberry Lake

Emergents and floating-leafed

Yellow water lily (*N. variegatum)*
Pitcher plant (*Sarracenia purpurea)*

Submergents

Common bladderwort (Utricularia vulgaris)

- Blueberry Lake is an acid stained bog lake

Laura Lake

Emergents and floating-leafed

Water shield (*Brasenia Schreberi)**

Submergents

Variable pondweed (*P. gramineus)**
Filamentous Cyanobacteria coated with diatoms
Green filamentous alga *(Spirogyra sp.)*
Muskgrass (*Nitella flexilis?)*
Waterweed *(Elodea canadensis)**
Musky weed (*P. amplifolius)**
Fern pondweed (*P. Robbinsii)**
Coontail (*Ceratophyllum demersum)**

Plum Lake

Emergents and Floating leafed

White water lily (*Nyphea odorata)*
Yellow water lily (*Nuphar vareigatum)*
Pickeral Weed (*Pontederia cordata)**

*On 30 July, a citizen reported that purple loosestrife was growing at the west end of the lake near where Highway N crosses. An investigation revealed that the plants were, actually, pickerel weed.

Submergents

Coontail (*Ceratophylum demersum)**

Wild celery (*Vallisneria americana)**
Clasping-leafed pondweed (*Potomageton Richardsonii)*
Flat-stemmed pondweed (*P. zosteriformis)**
Musk grass (*Nitella sp.)*
Green alga (*Spirogyra sp)*
Cyanobacterium (*Gloeotrichia pisum)*
Musky weed (*P. amplifolius)**

***Star Lake**

Emergents and floating-leafed

Yellow water lily (*Nuphar variegatum)*
Water shield (*Brasenia Schreberi)*
White water lily (*Nymphea odorata)*
Hard-stem bulrush (*Scirpus acutus)*
Purple loosestrife (*Lythrum salicaria)*

Submergents

Fern pondweed (*P. Robbinsii)**
Musky weed (*P. amplifolius)*
Coontail (*Ceratophyllum demersum)**
Wild celery (*V. americana)**
Flat-stemmed pondweed (*P. zosteriformis)*
Northern milfoil (*Myriophyllum sibericum)**
Waterweed (E*lodea canadensis)**
Spirogyra sp.
Ribbon-leaf pondweed (*P. epihydrus)**
Clasping-leaf pondweed (*P. Richardsonii)*

***Nearly 2.5 miles of littoral zone around Star Lake that supported aquatic plant communities in the 1960s and 1970s, are now devoid of any vegetation! It is assumed that the rusty crayfish (*Orconectes rusticus),* which is and invasive species, devoured the plants (Sloey and Haberle, 2006).**

A number of the plant specimens were sent to Dr. Neil Harriman, Professor Emeritus, at the UW-Oshkosh Herbarium for vouchering (confirmation) and deposit. These are identified by an asterisk behind the scientific name in the individual lake list, above. We did not sample the Ballard/White birch/ Irving complex for plants this year for lack of time and because we have a recent comprehensive study done by consultants in connection with the freeze-out event. However, the boat launches were routinely monitored for exotics. We also did not sample Crystal Lake because the lake level was

so low as to make launching a boat very difficult and because the DNR routinely monitors this valuable lake.

Analysis

The Town of Plum Lake has a wide diversity of lakes ranging from oligotrophic (sterile) to eutrophic (fertile), with an unusual number of small, clear-water, seepage lakes with low mineral content (soft water). Normally, seepage lakes are boggy with brown-stained water (from tannic acid) like Blueberry Lake.

Crayfish

The low mineral content renders a number of these smaller lakes unsuitable for crayfish, which need large quantities of calcium for their external skeletons. That is certainly why we found none in Blueberry Lake and likely why we found none in Dorothy Dunn and Lone Tree lakes. I believe that the over-abundant vegetation which currently covers even known gravel bars and the otherwise soft, silt bottom restricts the crayfish in Partridge Lake.

Fishery composition may have a profound impact on crayfish numbers. Escanaba, which has primarily a walleye/muskelunge fishery (9-15/acre of age-3 and over walleye during the past several years) and limited smallmouth population (1-1.5 smallmouth/acre over 6"), has a huge crayfish population (19.5/trap). Meanwhile Pallette, which is just 200 yds away, and Nebish, which is across the road, have few or no crayfish. All three lakes have an abundance of gravel and rubble, which make for excellent crayfish habitat and, obviously, share the same ground water. Thanks to special management regulations, however, Pallette Lake has a large population of very large smallmouth bass (anglers harvested 2/acre of 16" and larger smallmouths in 2005) and Nebish has an abundance of small smallmouth bass (Newman, et. al., 2006). Apparently, however, the few large male crayfish in Nebish Lake are more than the small bass are willing to attack, because we did catch two large (male?) crayfish from there. Nils Holmgram (Personal communication) reports that, while diving in Star Lake, he watched bass approach big rusty crayfish, then back away and eat smaller crayfish nearby.

While we did not trap Laura Lake for crayfish this year, it, too, is primarily a walleye lake and also has a large native crayfish population (*Orconectes virilis ?)* we are awaiting a report from the UW on work conducted during summer, 2006).

We suspect that the recent response of Plum Lake to special smallmouth regulations (which allow the harvest of only one fish over 18"/day), speaks loudly for enhancing the smallmouth bass population in Star Lake via regulation changes and habitat manipulation. In Plum Lake, the smallmouth population and average size has increased and the rusty crayfish population appears to have decreased and weedbeds are expanding (Wise, et. al., 2006). **These and other studies strongly suggest that a healthy population of large smallmouth bass is imperative to restricting crayfish populations**. To this end, the Lakes Committee requested that the DNR initiate

proceedings to change the bass regulations to mimic those extant on Plum Lake. Unfortunately, the earliest that any such regulation change could go into effect is 2008.

Note: It should also be interesting to watch Laura Lake over the next few years. Bob Munsen, of Deerfoot Lodge on Laura, believes that, based upon the number of small bass caught by his clients this past summer, there is a rapidly increasing population of smallmouths in that lake.

Plants

The diversity of lake-types in the Town of Plum Lake results in a rich diversity of aquatic plants, including many rare species. I have worked with several times as many species of aquatic plants this past summer on this project than I did in 25 years of research on the Winnebago Pool. Separate reports on the changes and current status of vegetation in Star and Plum lakes will be forthcoming (see, Sloey and Haberle, 2006, Wise, et. al., 2006).

Sampling Team

The Sampling Team consisted of Chris Wise, Frank Splitt, Jim & Vicki Haberle, Bob & Carol Oie, Bob Munsen, and Gerry Kurth. I want to thank each of you for a tremendous effort and a job well done! I hope that each of you will volunteer to help sample again next year. I have a few possible new members who have offered to help and I will try to bring them on board. We need to develop a core of seasoned samplers, each of whom could lead this effort into the future**. Under the pressure on ever intensifying use and abuse, our precious lakes depend upon us to keep them safe from exotic invaders**. **THANK YOU!**

References cited:

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