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# AQUATIC INVERTEBRATES

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## A PRELIMINARY CHECK LIST OF AQUATIC MACROINVERTEBRATES ASSOCIATED WITH MEADOW BANK LAKE IN VAN BRIENEN LAND NATURE SANCTUARY, SK

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### Introduction

Nature Saskatchewan administers a number of nature sanctuaries throughout the province.<sup>20</sup> One of its programs involves surveys to document

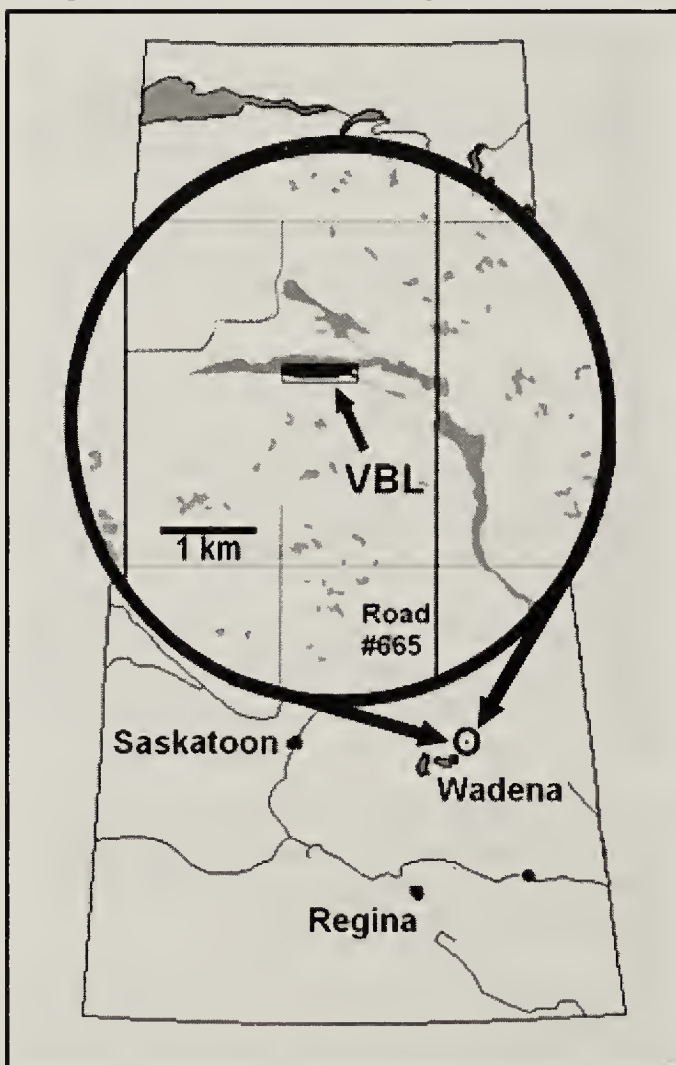


Figure 1: Map of Saskatchewan indicating location of Van Brien Land Nature Sanctuary. Inset is a large-scale map of Van Brien Land Nature Sanctuary (VBL) and area of Meadow Bank Lake.

the plants and animals inhabiting these sanctuaries. This paper reports on the biodiversity of aquatic macroinvertebrates - insects and other invertebrates that live in water and are retained in a 0.2 mm to 0.5 mm meshed net - found associated with Meadow Bank Lake in the Van Brien Land Nature Sanctuary.

### Study Site

Van Brien Land Nature Sanctuary (103°40' 21" W, 52°06' 08" N) is located 19.7 km northeast of Wadena, Saskatchewan in the aspen parkland ecoregion (Figure 1). The sanctuary includes a 6.5 ha section of Meadow Bank Lake. This small lake has an area of 96 ha. It was dry in the 1940s but has since contained water continuously.<sup>20</sup> It receives surface water runoff from surrounding pasture land and cropland. Pasture land borders the north shore of the lake across from the sanctuary. A narrow 8.1 ha strip of mixed bush dominated by Balsam Poplar with an understory of wild roses, honeysuckle, cranberry and other plants separates the south shore from cropland.<sup>20</sup> The shoreline is almost entirely ringed by emergent vegetation dominated by bulrushes (*Scirpus validus*) (Figure 2). The substrate is firm clay, silt and sand with many embedded rocks and boulders, all covered with a 20 cm layer

of soft organic ooze. Near the east edge of the sanctuary, tree branches and logs from an active beaver lodge litter the bottom. Aquatic vegetation includes Ivy-leaved Duckweed (*Lemna trisulcus*) in abundance, water milfoil (*Myriophyllum sp.*), and the alga, stonewort (*Chara sp.*). The lake is subject to algal blooms.

## Methods

Meadow Bank Lake was visited on four occasions over a three-year period, June 20, 2001, June 5 and August 13, 2002 and July 16, 2003. The delayed spring in 2002 made the June 5 date correspond to mid-May of a more typical year.

Qualitative collections were made by sweeping a 20 cm diameter sieve or 30 cm D-framed aquatic dip net, both with 0.5 mm mesh openings, through the water, and submerged vegetation, and along bottom substrates. A rectangular 20 cm by 10 cm aquarium net with 0.13 mm mesh openings was used to sweep the water surface to collect pupae, pupal exuviae (skins), emerging adults and surface dwelling insects. Submerged rocks and logs were inspected for adhering macroinvertebrates. Net contents were placed in a white pan and visually sorted on site. Sorted macroinvertebrates were preserved in labeled jars containing 100% alcohol. Aerial sweep nets were used to collect adult insects from the shoreline vegetation. These samples were preserved in 75% alcohol. Representatives of adult damselflies and dragonflies were killed using a killing jar.

In the lab, five to ten specimens of each macroinvertebrate type were picked from the material and preserved in 75% alcohol. Specimens of non-biting midges (Chironomidae) were dissected, cleared and mounted on

microscope slides. Other adult flies, beetles, damselflies and dragonflies were pinned. Identifications were made using a dissecting stereomicroscope and a phase-contrast compound microscope while consulting appropriate identification literature.

## Results

Most of the 116 different taxa (distinctive taxonomic groupings) of macroinvertebrates collected in the study were insects (Table 1). Two-winged flies (Diptera) were the most diverse group collected: 39 taxa were collected including 24 taxa of non-biting midges (Chironomidae). The beetles (Coleoptera) were the second most diverse insect group with 28 taxa collected. These included 11 taxa of diving beetles (Dytiscidae), eight water-scavenging beetles and six taxa of crawling beetles (Halipilidae). Other insect groups collected were three mayflies (Ephemeroptera), and ten species of damselflies and dragonflies (Odonata). True bugs (Hemiptera) were represented by nine species of water boatman (Corixidae) and two species of backswimmers (Notonectidae). Seven species of caddisflies (Trichoptera) were also collected from the pond. Non-insects included six species of leeches and nine of snails. Significantly, no fish were collected in any of the samples.

The cumulative taxa count graph indicates a steady, approximately linear, increase in new taxa being collected on each sampling date with only a slight presence of a plateau between the last two sampling dates (Figure 3). This suggests there are more macroinvertebrate taxa inhabiting the pond that have yet to be collected and identified.

## Discussion

All of the macroinvertebrate taxa



Figure 2: South shoreline of Meadow Bank Lake at Van Brienens Land Nature Sanctuary.  
Dale Parker

collected from Meadow Bank Lake have been previously recorded from Saskatchewan and most are widely distributed in the ponds, lakes and rivers of the province.<sup>2,3,5,7,13,18,25,31,32</sup> Unfortunately, this information is mostly from taxonomic surveys rather than from comprehensive, species level, habitat oriented research.

Strangely absent from the samples were the water striders (Gerridae: Hemiptera). Only a small number were observed on the June 20, 2001 visit but these could not be collected. Water striders are normally common in ponds and sheltered areas of lakes and flowing water.<sup>3</sup> Why they were present only in extremely low numbers during the sampling period is not clear. It could be that the shoreline vegetation was not appropriate for them, although certain species do inhabit bulrush vegetated shorelines.<sup>24</sup> At present there is no explanation for their apparent extremely low numbers.

The presence of the migratory dragonfly, *Anax junius*, (Common Green Darner) is interesting (see inside front cover). *A. junius* is distributed throughout North America. It has been recorded from every state, including Alaska and Hawaii.<sup>30</sup> Records from the latter two states are incidental occurrences. The reproductive range reaches its northern limits in southern and central Canada.<sup>27,30</sup> Typically the adults arrive in Canada from the United States in early spring and lay eggs. Larvae develop rapidly and the next generation emerges in August.<sup>19,30</sup> The new adults migrate south, often in large "flocks", to produce another generation in the southern states.<sup>30</sup> However, in southern Ontario at least, two subpopulations of *A. junius* have been identified.<sup>27,28</sup> One is migratory, as described above, but the other is a year round resident. The adults emerge in late summer and lay eggs in the same general area. Over-wintering occurs as partially grown larvae; however, this

apparently is sporadic.<sup>14</sup> At Meadow Bank Lake adults were observed flying in tandem and laying eggs in shoreline bulrushes on June 5, 2002. Subsequently, mature larvae were collected on August 13, 2002. It is likely the larvae collected were from the egg laying observed in spring and the resulting adults would migrate south.

No fish such as minnows or sticklebacks were collected or observed during the study. This suggests Meadow Bank Lake either freezes to the bottom during the winter, which is not likely as there are beaver present in the lake, or, that the water present under the ice does not contain enough oxygen for fish to survive. Lack of fish predation enhances macroinvertebrate communities, allowing many species to reach greater densities than would occur if fish were present.<sup>1,12,29,34</sup>

Small lakes, pothole lakes, ponds, sloughs and wetlands are an important part of Saskatchewan's prairie and parkland ecosystems.<sup>10</sup> They not only

provide habitats for wildlife and birds, including waterfowl, but also store and filter water for human and livestock consumption.<sup>10</sup> However, 40% to 70% of the smaller ponds and wetlands in Saskatchewan have been lost or are threatened by agricultural practices and urban sprawl.<sup>8,10,11</sup> It is expected that global warming will further reduce this number.<sup>4</sup>

These changes to the landscape have resulted in the remaining small lakes and larger ponds becoming increasingly isolated from each other in an "ocean" of cropland. Evidence suggests that isolated water bodies provide less suitable wildlife habitats than do groupings of ponds and wetlands.<sup>17,33</sup> Meadow Bank Lake and the ponds and wetlands in close proximity to it (Figure 1) should continue to be protected not only for their value as wildlife habitat but also for research purposes.

Aquatic macroinvertebrates are important to the natural functioning of

aquatic ecosystems.<sup>23</sup> They are essential basic links in aquatic food webs, feeding on plants and decaying material, and in turn being food for predators.<sup>15,21,26</sup> They are important food for waterfowl, fish, amphibians, reptiles, bats and song birds.<sup>1,6,9</sup> Because they play such an integral role in aquatic habitats, macroinvertebrates are commonly used to monitor the impact of human activity, such as mining, logging and

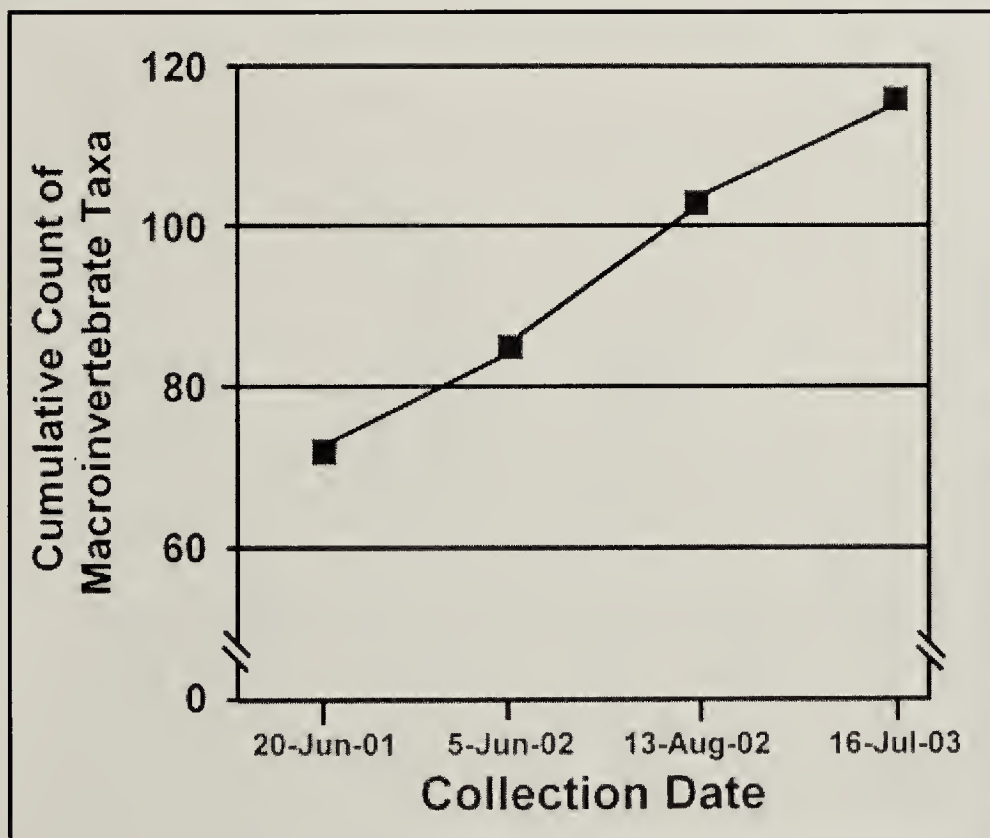


Figure 3: Cumulative count of aquatic macroinvertebrate taxa collected in association with Meadow Bank Lake at Van Brienens Land Nature Sanctuary.

**Table 1: Aquatic macroinvertebrates collected in association with Meadow Bank Lake.**

(? After a name indicates a tentative identification.)

**Hirudinea (Leeches)**

- Erpobdellidae
- Erpobdella punctata* (Leidy)
- Nephelopsis obscura* Verrill
- Glossiphoniidae
- Glossiphonia cf complanata* (Linnaeus)
- Helobdella stagnalis* (Linnaeus)
- Placobdella ornata* (Verrill)
- Theromyzon rude* (Baird)

**Mollusca**

**Gastropoda (Snails)**

- Lymnaeidae (Pond snails)
- Lymnaea stagnalis jugularis* (Say)
- Pseudosuccinea columella* (Say)?
- Stagnicola elodes* (Say)
- Stagnicola reflexa* (Say)
- Planorbidae (Ramshorn Snails)
- Helisoma pilsbryi infracarinatum* Baker
- Helisoma trivolvis subcrenatum* Carpenter
- Gyraulus circumstriatus* (Tryon)
- Promentus exacuus* (Say)
- Physidae (Tadpole Snails)
- Physa jennessi skinneri* Taylor

**Pelecypoda (Clams)**

- Sphaeriidae (Fingernail and Pea Clams)
- Pisidium* sp

**Amphipoda (Scuds)**

- Gammaridae
- Gammarus lacustris* Sars
- Hyalellidae
- Hyalella azteca* (Saussure)

**Insecta**

**Ephemeroptera (Mayflies)**

- Baetidae
- Callibaetis ferrugineus* (Walsh)
- Callibaetis pallidus* Banks
- Caenidae
- Caenis amica* Hagen

**Odonata (Damselflies and Dragonflies)**

- Zygoptera (Damselflies)
- Coenagrionidae (Narrow-winged Damselflies)
- Coenarion angulatum* Walker
- Coenagrion resolutum* (Hagen)
- Enallagma boreale* (Selys)
- Enallagma cyathigerum* (Charpentier)
- Enallagma ebrium* (Hagen)
- Nehalennia irene* (Hagen)
- Lestidae (Spread-winged Damselflies)
- Lestes disjunctus* Selys
- Anisoptera (Dragonflies)
- Aeshnidae (Darner Dragonflies)
- Aeshna interrupta* Walker

*Anax junius* (Drury)  
 Libellulidae (Skimmer Dragonflies)  
*Sympetrum internum* Montgomery  
**Hemiptera (True bugs)**  
 Corixidae (Water boatman)  
*Callicorixa audeni* Hungerford  
*Cenocorixa bifida* (Hungerford)  
*Cenocorixa dakotensis* (Hungerford)  
*Dasycorixa hybrida* (Hungerford)  
*Dasycorixa rawsoni* Hungerford  
*Sigara bicoloripennis* (Walley)  
*Sigara conocephala* (Hungerford)  
*Sigara decoratella* (Hungerford)  
*Trichocorixa verticalis interiores* Sailer  
 Notonectidae (Backswimmers)  
*Notonecta kirbyi* Hungerford  
*Notonecta undulata* Say

**Trichoptera (Caddisflies)**

Leptoceridae  
*Mystacides interjecta* Banks  
*Oecetis avara* (Banks)  
 Limnephilidae  
*Anabolia bimaculata* (Walker)  
*Limnephilus cf extractus* (Walker)  
 Molannidae  
*Molanna flavicornis* Banks  
 Phryganeidae  
*Agrypnia pagetana* Curtis  
*Agrypnia straminea* Hagen

**Coleoptera (Beetles)**

Dytiscidae (Predaceous Diving Beetles)  
*Acilius* sp  
*Agabus* sp  
*Dytiscus alaskanus* Balfour-Browne  
*Graphoderus perplexus* Sharp  
*Hydroporus* sp  
*Hygrotus* sp 1  
*Hygrotus punctilineatus* (Fall)  
*Hygrotus unguicularus* (Crotch)  
*Ilybius descendens* Sharp  
*Laccophilus biguttatus* Kirby  
*Rhantus sericans* Sharp  
 Gyrinidae (Whirligig Beetles)  
*Gyrinus confinis* LeConte  
*Gyrinus maculiventris* LeConte  
*Gyrinus pectoralis* LeConte  
 Haliplidae (Crawling Water Beetles)  
*Haliplus apicalis* Thomson  
*Haliplus canadensis* Wallis  
*Haliplus immaculicollis* Harris  
*Haliplus longulus* LeConte?  
*Haliplus stagninus* Leech  
*Peltodytes tortulosus* Roberts  
 Hydrophilidae (Water Scavenger Beetles)  
*Berosus striatus* (Say)?  
*Berosus fraternus* LeConte?  
*Enochrus diffusus* (LeConte)  
*Enochrus hamiltoni* (Horn)  
*Helophorus* sp

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*Helophorus orientalis* Motschulsky  
*Hydrobius fuscipes* (Linnaeus)  
*Hydrochara obtusata* (Say)  
**Diptera (Two-winged flies)**  
 Ceratopogonidae (Biting midges)  
   *Ceratopogonidae* sp  
 Chironomidae (Non-biting midges)  
 Tanypodinae  
   *Ablabesmyia illinoensis* (Malloch)  
   *Derotanypus alaskensis* (Malloch)  
   *Procladius bellus* Loew  
   *Procladius freemani* Sublette?  
   *Tanytus punctipennis* Meigen  
 Orthoclaidiinae  
   *Corynoneura scutellata* Winnertz  
   *Cricotopus sylvestris* gr.  
   *Cricotopus intersectus* (Staeger)  
 Chironominae: Chironomini  
   *Chironomus decorus* Johannsen  
   *Chironomus tentans* Fabricus  
   *Cryptochironomus digitatus* (Malloch)  
   *Dicrotendipes* sp01  
   *Dicrotendipes* sp02  
   *Glyptotendipes barbipes* Staeger?  
   *Glyptotendipes lobiferus* (Say)  
   *Glyptotendipes paripes* (Edwards)  
   *Polypedilum halterale* (Coquillett)  
 Chironominae: Tanytarsini

*Cladotanytarsus mancus* group  
*Micropsectra* sp  
*Paratanytarsus natvigi* (Goetghebeur)?  
*Paratanytarsus penicillatus* group  
*Tanytarsus* sp01  
*Tanytarsus* sp02  
*Tanytarsus cf mendax* Kieffer  
 Culicidae (Mosquitoes)  
   *Aedes* sp  
 Dolichopodidae (Long-legged Flies)  
   *Dolichopus* sp 01  
   *Dolichopus* sp 02  
 Ephydriidae (Shore Flies)  
   *Ephydriidae* sp  
 Psychodidae (Moth Flies)  
   *Psychodidae* sp  
 Stratiomyidae (Soldier Flies)  
   *Odontomyia* sp  
 Syrphidae (Hover Flies)  
   *Helophilus* sp?  
 Tabanidae (Deerflies and Horseflies)  
   *Chrysops aestuans* Wulp  
   *Hybomitra frontalis* (Walker)?  
   *Hybomitra illota* (Osten Sacken)  
   *Hybomitra cf pediontis* (McAlpine)  
 Tipulidae (Crane Flies)  
   *Pinocera*-sp?  
   *Tipula* sp  
   *Limonia* sp

agricultural practices, on the aquatic environment.<sup>23</sup> A great deal of research has been initiated to investigate the effects of agricultural chemicals on “duck food”, i.e. macroinvertebrates, in smaller lakes and ponds.<sup>1,8,16,22</sup> However, results of such “duck food” directed research have provided little detailed information on the biodiversity and biology of macroinvertebrates in these habitats. This often makes it difficult to interpret research results, suggesting more research should be directed to understanding the natural variation and community functioning of these water bodies.<sup>16</sup> It is therefore important to document the macroinvertebrate biodiversity of these habitats to provide baseline information for future investigations and to develop sound management practices.

Future collecting at Meadow Bank Lake will probably yield additional taxa to the list of macroinvertebrates already collected. More collecting is also likely to improve the identifications of many of the specimens that are presently known only as immatures or adult females and cannot, as such, be fully identified to species with certainty. Other collecting methods, such as light traps, emergence traps, activity traps, and the use of quantitative samplers (dredges) and per cent taxonomic composition samples would undoubtedly add new taxa for the lake and would provide information regarding macroinvertebrate community structure in the lake. However, these sampling methods were beyond the funding and scope of the present project.

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“Chimney swifts have clawed feet for perching inside hollow trees and masonry chimneys, but they cannot walk. Neither can most hummingbirds, which must take off and land to move even an inch or two”

Scott Weidensaul, *The Birder's Miscellany*, p.12