The Aquatic Invertebrate Database for Minnesota

A Report to the Legislature of Minnesota

by Dr. Judy Helgen

Minnesota Pollution Control Agency
St. Paul, MN 55155
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This project is dedicated to the memory of Dr. Charles W. Hamrum of St. Peter. An expert in Minnesota's dragonflies, he was as much a lover of species as he was a teacher of peace.

Report Summary

Funding for this project was approved by the Minnesota Legislature (ML 1989 Ch. 335, Art. I, Sect. 29, Subd. 10) as recommend by the Legislative Commission on Minnesota Resources from the Minnesota Future Resources Fund or the Minnesota Environment and Natural Resources Trust Fund. The project was managed by Dr. Judy Helgen at the Minnesota Pollution Control Agency through the cooperation of the Science Museum of Minnesota, the fiscal agent for the project before Dr. Helgen went to MPCA. The purpose was to develop a database to centralize information on aquatic invertebrates of the state, and to provide education on using aquatic invertebrates to assess the environment.

The database has been developed and used for entry of over 6000 records from the aquatic invertebrate collection of Dr. Ralph Gundersen at St. Cloud State University, and over 1400 records of chironomids (midges) from the collections at the Entomology Museum at the University of Minnesota.

The data is recorded in two related files: the species file and the sites or location file. These files are related, so species can be listed by location, by date, or by habitat type. A database for the environmental sensitivities of chironomids has been established based on the list of Minnesota species derived from the Entomology collection. This is a foundation for centralizing information on this important group of environmental indicators.

Education was provided through a two day workshop for high school biology teachers on assessing wetlands with aquatic invertebrates, co-taught by Dr. Gundersen and Dr. Helgen. This workshop uncovered a real interest among students and teachers in doing biological assessment. Tying the results to a government database makes the students feel their work is important. A curriculum that grew out of the workshop will be used by some of the teachers this next year. This is included in this report, to demonstrate the educational approach.

Acknowledgements

Without all the cooperation, assistance and resources of the many people listed below, this project would not have succeeded. Thanks to LCMR for funding this project, and to the Science Museum and Pat Hamilton for handling the funds. Special thanks to Phil Taylor of the Science Museum and Chuck Hamrum of Gustavus Adolphus College for encouragement early on. Thanks especially to Dr. Ralph Gundersen for his enthusiasm and expertise and willingness to be the 'guinea pig', to Kyle Thompson and Dean Hansen for all their good work on the database and the collections, to Bob Franklin Gordon for patiently and humorously programming FOXBASE for our particular needs. Thanks to the Entomology Department at the University of Minnesota for space and for use of the collections, to Macalester College for use of the Ordway Natural History Area facility and Shelley Shreffler, the resident manager. Thanks to Molly Redmond at ECSU, the MN DNR and Sean Hunt for all the NWI maps needed on short notice, to the DNR Nongame Program for the frog show, to the staff at the Cornell Library of Natural Sounds and Bill Schmid for lending his frog call tapes. Thanks to Bennett Davis and Celine Lyman at MPCA for their patient help on coding and VAX transfers, and to Jeanne Soban at MPCA for assistance with the word processing.

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Technical Report to the Legislative Commission on Minnesota Resources November 15, 1991

Project Title: Aquatic Invertebrate Education and Database
Project Manager: Judy Helgen, MPCA 296-7240
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ML 1989 Ch. 335 Art. I Sect 29 Subd. 10

I. Introduction

There were two objectives for this project, one to develop an aquatic invertebrate database, the second to provide education to teachers on the use of invertebrates in assessing water quality. The project was needed because we have had no central place to accumulate information on which species of aquatic invertebrates occur in Minnesota in which habitat types. This allows centralization of existing information on sensitivities of species known to occur in the state.

This report will cover technical information about 1) the database's structure and use, 2) the specific data from St. Cloud State University and the University of Minnesota that was entered during the development of the database, and 3) a report on the educational workshop given to teachers, including curriculum and assessment materials for use by high school biology teachers.

II. The database

II.A. Software and hardware

The Macintosh 2ci computer with 8 meg of RAM and an 80 meg hard drive was selected for the database. Macintosh was chosen because of its ease of use by non-programmers, its availability to teachers in schools, and its availability to the biologists at the Bell Museum at the University of Minnesota and Dr. Gundersen in biology at St. Cloud State University.

The software program FOXBASE+/MAC was chosen for database development because it is a top-rated database program, plus it accepts IBM PC dBase database files and programming commands. The FOXBASE version for the IBM is in wide use, and the forthcoming FOXPRO will allow easy interchange between Macintosh and IBM type computers. The Science Museum St. Croix Field Station is about to purchase FOXPRO for their IBM computer.

II. B. Database file structure and function

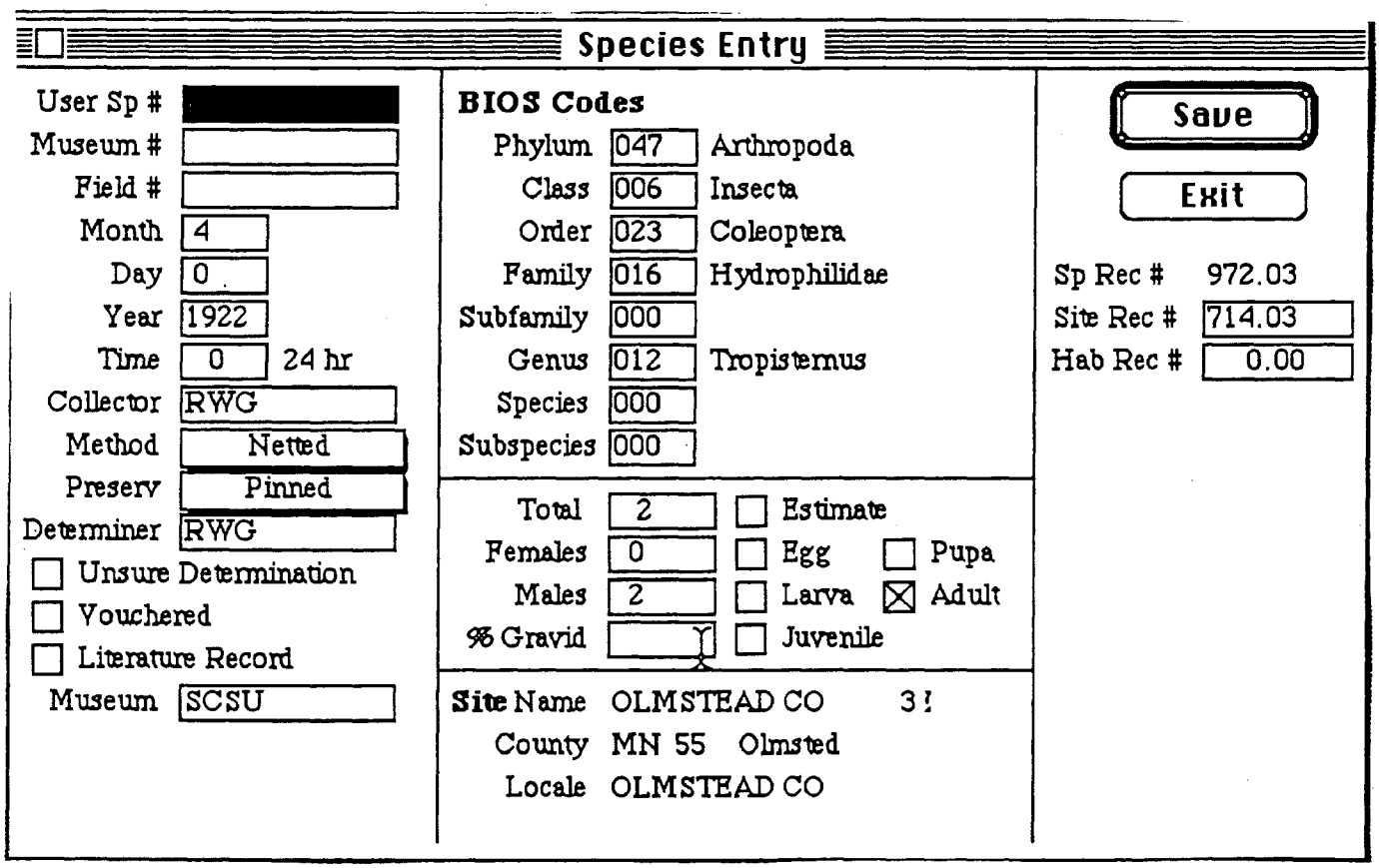
The function of the database is to record records of species by location, habitat and date. The database works on two major files: the sites file and the species file. The sites file has all the locational information concerning where the species were collected, such as county and latitude-longitude. The species file has the date of collection, the particular habitat type where it occurred, and the taxonomic coding of the species.

In database jargon, the species file is the 'many' file, and the sites file the 'one' file. These separate files share a common field, the site record number, and through this key field the two files can be related. This allows us to enter lots of species records for one site, without having to enter site information. See Appendix I.1 for the species database structure and definition of the fields, and Appendix I.2 for the sites database structure.

III.C. The species file

The species file contains the record of the species collected at a particular site. The data enterer enters the STORET BIOS codes for the organism to the level that it was identified (eg family, genus or species), and the names come up on the data entry screen. Figure 1 shows an example of the species data entry screen. In order to enter species information, the site record number (site rec # on the screen) must be entered. This brings up information onto the species screen about the site: its name and county. The species database also includes collection date, methods, whether the specimens were vouchered to a museum, and which museum. The date of collection is important because it allows tracking of species over time.

Figure 1. Species data entry screen from the Aquatic Invertebrate Database.



The BIOS codes are from the federal EPA STORET data system's taxonomic coding for species. BIOS codes have the following structure: phylum 2, class 2, order 2, family 3, genus 3, species 3, variety 3 characters. The code runs together, for example 470623005001001 is the code for a particular species of beetle in the Phylum Arthropoda (47), Class Insecta (06), Order Coleoptera (23), Family Carabidae (005). In the Minnesota database, 3 character codes are used for each taxonomic level, with the BIOS numbers that are currently available. A code for subfamily has been added, since BIOS lacks this level.

The database is designed to require BIOS codes for species record entries. Unfortunately, quite a few of the Minnesota species have not yet been coded, so we have gone ahead and coded them as reasonably as possible. Requests for assignments of new codes from NODC were not fulfilled. The current method of accessing the BIOS codes to the FOXBASE/MAC program involves an MPCA staff person calling up the code files from the federal STORET system, and transferring them to a mainframe directory. From there they are moved to the Macintosh, then formatted by a FOXBASE program procedure into the codes database called TACODES. There has been some difficulty in the obtaining consistent formatting of the VAX-originated files into the FOXBASE program, plus the current TACODES database does not allow easy browsing of the BIOS codes and names. The original intent was to place the codes into the database in a space-conserving way, but now I realize we need to have a full view of the code file. The BIOS code files are large, containing codes for much of the North American fauna. We can save a lot of room by inputting just the codes needed for this region. Therefore, the code files are now being re-developed by hand-entering the species expected for the state or region. This will allow full viewing of the codes and names, and makes it easier to keep track of which species codes have been created by MPCA or Dr. Gundersen.

Within the next year, there will be a new system for coding species at the national level. The format will be an 8 or 9 character unique 'social security' type number for each species or level. This new system will be incorporated into this database when it becomes available, by using a code

translation program that should be provided by EPA. The unique codes will not reveal any information about the taxonomic levels in the way that BIOS codes do, but will have advantages such as allowing for other taxonomic categories, and for name changes as they occur.

II.D. The sites file

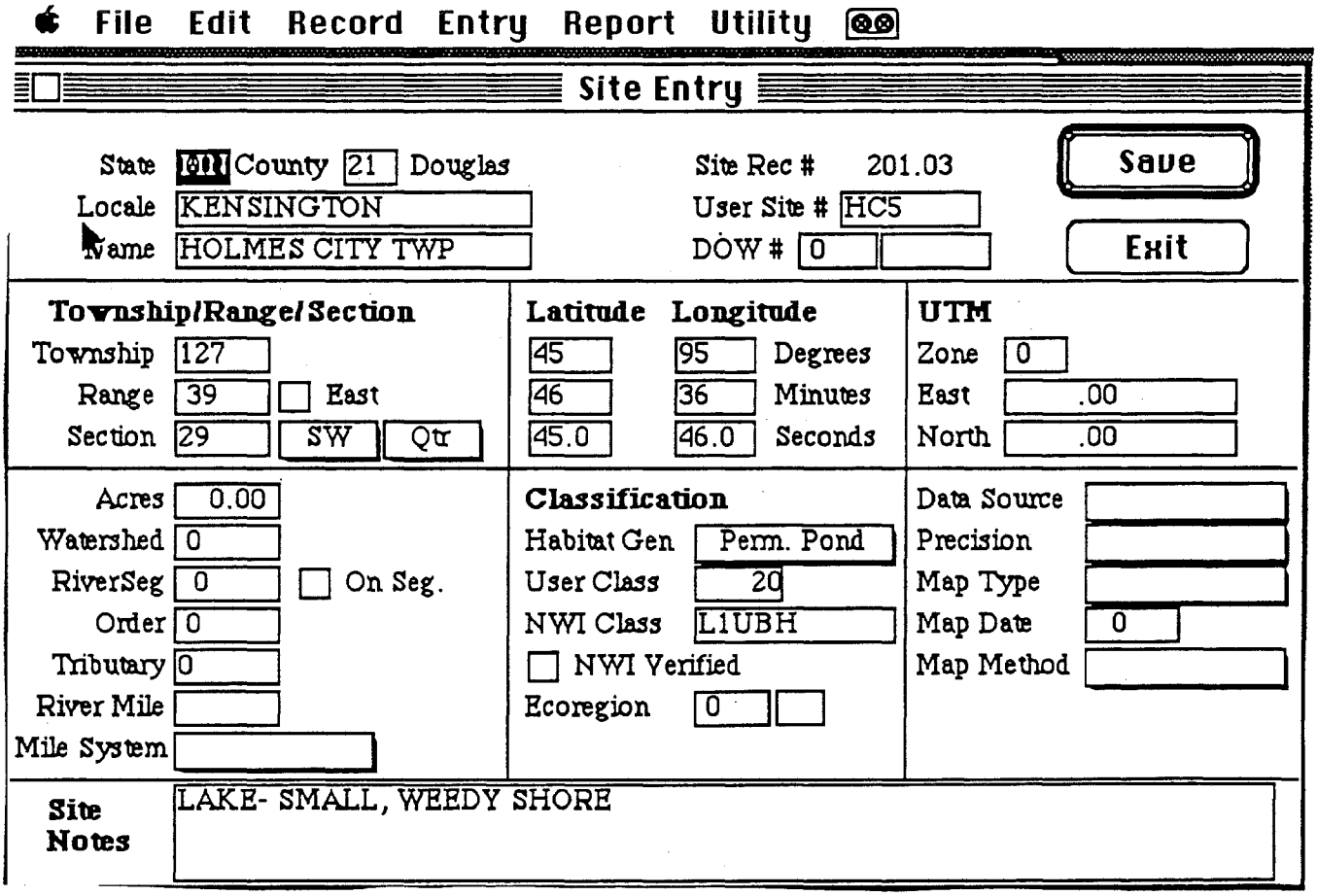
The sites file is the database for all locational information for the species records. The fields for this database are detailed in Appendix I.3., and the record entry screen is shown in Figure 2. The critical numbers in the site record for relating to the species record is the site record number (or the user site number). The site record number is computer-assigned, the user site number is the researcher's site number. At present, the file relation is made with the site record number. This works all right if there is no delete/pack of site records from the site file, causing a shift in record numbers. In the future, to avoid this possibility, we will be using the user-created and user-entered site numbers to link the two files.

The locational information from museum collections can be just the county, or a mark on a map, or Township, Range and Section (TRS) numbers. For many of Dr. Gundersen's collecting sites, the locations were digitized at MPCA from his maps to latitude-longitude readings. Older collections may have almost no locational information.

In the sites file, the classification information for habitat type is important. At present, we are using two systems, the one used by Dr. Gundersen for his general habitats (lake, permanent pond, temporary pond, bog and flowing water), and his specific habitat types entered under 'user class'. We have coded his habitats so the 3 character number entered into user class had the general habitat code as the first character, and the specific habitat code as the next two characters. See Appendix II.1 for Dr. Gundersen's habitat types and the codes for them.

The second classification system is that used in the U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI) classification. We have obtained NWI maps from the DNR. These 7.5' scale maps contain outlines

Figure 2. Site data entry screen from the Aquatic Invertebrate Database



and classifications of all aquatic habitats, with the exception of farmed wetlands. The system is heriarchical, making a distinction between lake (lacustrine) and wetland (palustrine) based on depth and vegetation, and then distinguishing habitats by broad vegetational and substrate categories (see Appendix II.2). Because the classifications are based on stereoscopic interpretation of aerial photographs, the U.S. Fish and Wildlife service is interested in the "ground-truthing" of the assigned classifications. This has not been done yet for Dr. Gundersen's sites, but will be done in the next project on reference wetlands. The check-box "NWI verified" is where positive ground-truthing can be indicated.

II.E. How to use the MAID database

MAID is the programmer's name for the Minnesota Aquatic Invertebrate Database. The description below is a capsule of a full documentation that will be completed after changes alluded to in this writeup are made.

a. For data entry
    1. Open MAID 9.8, click 2X on Main Program
    2. Type the password in the dialog box. Program opens.
    3. From menu bar select ENTRY, see choice of SITES and SPECIES
    4. Select SITES brings up the SITES entry screen, SPECIES brings up the SPECIES entry screen (see Figs. 1 and 1).
    5. Enter site data first, click to save (exit if don't want to save)
    6. Select SPECIES screen, enter BIOS codes, confirm names, enter species data.
b. Relating SITE and SPECIES databases
    1. Move both databases into the View window (Window to View)
    2. Index SITE file on the site record number (or user site #)
    3. Draw arrow from species to sites, click on the arrow and enter site record number (or user site #) as the key field
    4. The entire relation can be saved as part of the report format.
c. Reports
    1. Create database relation (see above)
    2. Select File new Report
    3. Select Report Quick Report

4. Select fields desired for report (change database to access fields from each one)
5. Save the report form, including the 'environment'. This saves the databases used, the relations, indices and key expressions.
5. To print the report, select Database Report/Label. At this point, a FOR expression can be made to limit data to print.

III. Results from the database.

III.A. The Gundersen collection

Over 6000 records of the extensive collection of aquatic invertebrates of Dr. Ralph Gundersen at St. Cloud State University have been added to the database. He has collected from over 600 different sites in Minnesota. Many of Dr. Gundersen's sites are wetlands, which means his information will be very useful in the next project on biological criteria for wetlands.

The reports in Appendix IV from Dr. Gundersen's collection are given as examples of how the database works. Because Dr. Gundersen is just completing entries, these tables are not intended for public use, and must be considered draft in nature. The following kinds of reports have been generated:

Appendix	II.1	Dr. Gundersen's habitat classes and codes.
Appendix.	III.1	A list of the species with codes (non-redundant).
Appendix	III.2	Dr. Gundersen's collecting sites.
Appendix	III.3	Records of species from a habitat type.

When Dr. Gundersen's entries are completed, reports will be made on the frequency of each species in each habitat type, to provide lists of species that would be expected to occur in different habitats.

III.B. The Chironomid Collection at the University of Minnesota.

The chironomids (midges) are extremely important in aquatic habitats. They are prime food for young and nesting waterfowl, as well as food for

other invertebrates such as dragonflies. They have been reviewed and studied as environmental indicator species (Beck, 1977; Dawson and Hellenthal 1986). Chironomids have wide ranges of tolerances, from the species that thrive in sewage ponds to species requiring very clean water.

The Entomology Museum in the Entomology Department at the University of Minnesota has an extensive, curated collection of over one million insects, including the chironomids. With permission from the Department Chair, we moved my personal IBM-compatible computer to the museum, where the records for the chironomids were added using the software dBase III. Because there was so little locational information, a single database structure was used. The information on the 5" IBM disc was transferred at MPCA to a smaller high density disc and read into the Macintosh directly into FOXBASE. This database was indexed to create a unique genus and species list for chironomids, and with this a database was set up to add tolerance information known for the Minnesota species.

The following appendices are reports from the chironomid database:

Appendix IV.1 displays the list of 190 species of chironomids in Minnesota, with the BIOS codes.
Appendix IV.2 shows the list of the 63 genera of midges in the state.
Appendix IV.3 The subfamilies of chironomids and their genera.
Appendix IV.5 The species collected in MN before 1941.

Appendix IV. 4 contains tolerance information for many of the chironomids of the state. This database will grow as more information is added. The table needs explanation. The data in the columns labelled 'Nutrients,' 'Organics' and 'Oxygen' are from Beck, 1977. The parameters as defined by Beck are as follows:

Nutrients	Beck's scale	Our codes	Beck's Definition
	Eutrophic	1 Eutr	High nutrient concentration
	Mesotrophic	2 Meso	Moderate nutrient concentration
	Oligotrophic	3 Oligo	Low nutrient concentration
	Dystrophic	4 Dystro	Rich in humic materials

Organics	Saprophilic	1	Pollut	Occurring usualy in polluted waters accompanied by brief periods of dissolved oxygen concentrations below 5.0 mg/L, pH changes of up to 2 units, and/or temperatures exceeding 25°C; but also present in limited numbers in clean water habitats.
	Facultative	2	Toler	Wide range of tolerance to organic pollution; common in both polluted and clean waters.
	Saproxenous	3	Clean	Characteristic of clean water habitats but also tolerant of organic enrichment if the dissolved oxygen concentration remains above 5.0 mg/L, and pH and water temperature are not adversely altered.
	Saprophobic	4	VClean	Restricted to waters that have not been exposed to pollutants.
Oxygen	Euoxyphilous	1	Satur	Characteristic of water having high 0_2 concentrations (saturated).
	Mesooxyphilous	2	Moder	Characteristic of water having moderate 0_2 concentration.
	Oligooxyphilous	3	Low	Characteristic of water having low 0_2 concentration.
	Anoxyphilous	4	Anaer	Facultative anaerobic.

In Appendix IV.4, the numbers given in the column indicate which ones of the four levels were checked for the particular species. For instance, a 1204 under nutrients means the species was found in eutrophic, mesotrophic, and dystrophic conditions, but not in oligotrophic waters. Under oxygen, 0200 means the species occurred only in level 2, or in moderate oxygen conditions.

In Appendix IV.4, the categories 'Eutr' and 'Low 0_2' are taken from lists of chironomids in Dawson and Hellenthal (1986, as listed in Adamus and Brandt, 1990). 'Eutr', for eutrophic, was defined as species that may indicate eutrophic conditions in wetlands. 'Low 0_2' was defined as species that tolerate low oxygen conditions in wetlands.

IV. Education on Biological Assessment with Aquatic Invertebrates

IV.A The Biological Assessment Workshop

To provide education on biological assessment of wetlands using aquatic invertebrates, a two day workshop was held at the Ordway Natural History Area of Macalester College. Located south of St. Paul near Invers Grove Heights, the Ordway Area has temporary and semi-permanent wetlands, a spring, and access to the Mississippi River. The facility on site houses a large laboratory, where we set up the workshop for two full Saturdays in April and May, 1991.

The Educational Cooperative Services Unit (ECSU) for the St. Paul Schools administered the workshop, providing advertising to teachers and registration. A proposal was sent to Hamline University and the workshop was accepted and offered for one graduate credit to the high school biology teachers. Dr. Ralph Gunderson co-taught the workshop with myself. Shelley Shreffler, the resident manager at Ordway, assisted in set up, talked about the Natural History Area, and went with us to the wetland sites.

This project provided the teachers with National Wetlands Inventory (NWI) and USGS 7.5' quad maps, a draft Wetlands Guide that contained background information on NWI and DNR wetlands classifications, on wetlands losses and hydrology, on the need for biological criteria development, on stream assessment approaches using aquatic invertebrates, on methods for sampling invertebrates, on the database, and various articles on wetlands and conservation. The teachers were given draft wetlands assessment sheets for recording data about their wetlands sites.

Overall, the teachers were introduced to identification of aquatic invertebrates, and ways to quantify them in their classes. They did field sampling on both days with three methods, coring, dip-netting and bottle traps. The concepts behind biological assessment were explained. Teachers were expected to sample a wetland near their school before our second workshop session, to fill out the wetlands assessment sheets, and to write a journal of their ideas and experiences related to this project. Some

teachers involved their students and were amazed at the level of interest among the students, resulting partly from the idea their information might contribute to a state-wide database at MPCA.

There was a very positive response from the teachers, and many would like to continue to work on biological assessment of wetlands. Eight of 12 would like to test curriculum in their schools, 9/12 would like another workshop that would focus on the database, 5/12 would like to meet to discuss curriculum. They liked the hands on approach, learning techniques, and taking home their reference collections of invertebrates.

IV.B Curriculum development for biological assessment of wetlands

A draft of a curriculum for high school biology classes is included as part of this report in Appendix V, essentially as an outgrowth of the workshop. One of the teachers, John McCanna of Simley High School, wrote a curriculum this summer, and I have incorporated additional material and revised it based on responses from teachers at the workshop. This will be sent to the teachers involved, for their review and testing next spring.

Biological monitoring of wetlands will not depend entirely on the aquatic invertebrates. Species whose life cycles are tied to the wetland are also important indicators of wetland health. Frogs and toads depend on shallow fishless wetlands for their reproduction and growth, and their presence is a positive sign. Monitoring frogs at wetland study sites is a nice addition to a biomonitoring program, especially for the schools. One good way to assess the frog populations is by identifying the calls of the frogs and toads, especially in the evening. At the workshop, the teachers were shown the DNR's slide show on frogs and toads, and already they were learning the calls of the spring species. This program is available at the DNR Nongame Program for citizen's to check out.

IV.C.The tape of frogs and toads

A non-commercial tape of the frogs and toads of Minnesota was made by the Cornell University Ornithology Laboratory of Natural Sounds where they have a collection of most of the calls of the frogs and toads found

here. For one species, we used a tape made by Dr. Bill Schmid at the University of Minnesota. This tape was not available by the time of the workshop, but is now being sent out to the teachers, all of whom indicated they would like to use it. A limited number of copies of the tape is available for people who teach about the biology of wetlands.

A copy of this tape is enclosed with this report. Because this is a non-commercial tape, it cannot be copied or sold, by agreement with Cornell University.

Biological Assessment of Wetlands Curriculum

The curriculum below is for high school biology teachers to review and use. It represents a merging of John McCanna's curriculum with MPCA's approach to biological monitoring of wetlands. Please send comments and feedback to Judy Helgen at MPCA.

Why monitor wetlands? The Clean Water Act requires protection of the "physical, chemical and biological integrity of the Nation's surface waters". We need background information on wetlands for development of biological criteria for future use in wetlands evaluation. Data will assist MPCA in developing biological measures for wetlands.

I. What the MPCA wants to do.

A. Develop biological criteria for assessing the environment by studying wetlands so they can be used as environmental change indicators.
   1. Very little data is currently available about our wetlands.
   2. Gathering this data is a very big task which could be assisted by schools and citizens.

B. Steps to collecting data for the assessment.
   1. Choosing a wetland sight to study.
   2. Identify and classify the type of wetland.
   3. Learn and plan how to sample the location.
   4. Identify the organisms including how many there are.
   5. Record the information on the state-wide database.
   6. Keep track of year to year changes at the location.

II. The biology classes role as a data gathering group.

A. What kind of data.
   1. Physical characteristics.
   2. Chemical characteristics.
   3. Survey identifying which organisms are present and in what quantity.

B. Physical data
   1. Size, shape, location, depth - Make a map. Water depth.
   2. Categorize the wetland from the U.S. Fish and Wildlife Services system of identification.
   3. Map the vegetation around and in the pond.

4. Map the surrounding landuse and vegetation types.
5. Find any historical information (about water levels, was it farmed, etc).
6. Identification of the water sources to (and from) the wetland.

C. Chemical data
1. Perform water tests (oxygen, pH, mineral or N and P content).
2. Measure temperature, water clarity.
3. If possible measure N and P in sediments (top 3" of core)

D. Survey of organisms
1. Survey the broad groups of plants around and in the pond.
2. Observe/record any vertebrates in or around the pond.
3. Collect/identify/quantify invertebrates in the pond.

E. How the class will accomplish all this.
1. Learn the basics about what a wetland is
2. Learn to identify wetland organisms.
3. Learn how to sample (collect) specimens.
4. Learn how to survey the physical, chemical and biological aspects.
5. Divide the work up by teams. Some schools may want to assign tasks to different classes.
6. Combine the team data into a final summary to be submitted to the MPCA. data base for that year. (Assistance may be sought from cooperating MPCA and University staff to deal with taxonomic or other complications.)

III. Sequence of activities for wetland evaluation

A. Schedule for placement of samplers ahead of field trip day

Sampler type sampled	Number to set	Set out time	Organisms
1. White PVC pipe (artificial substrate)	3 - 4	-3 weeks	Midges
2. Bottle traps	6 (3 pairs)	-3 days	Beetles,bugs
3. Baited bottle traps	2	-1 day	Leeches
4. Baited minnow traps	2	-1 day	Fish

B. DAY BY DAY PLAN

This plan includes one class field trip day, with samplers set out in advance of the day as shown above.

Day by day overview

Day 1.	Wetlands background.
Day 2.	Changes in wetlands, what to evaluate.
Day 3.	Background on the biological monitoring project. Class as data gathering group.
Day 4.	Information about wetlands invertebrates. How to use keys and identify organisms.
Day 5.	Field trip preparation: team responsibilities.
Day 6.	Field trip to wetland.Actual sampling.
Day 7, 8.	Sample processing, identification.
Day 9.	Write up results, data entry, cleanup.
Day 10.	Class presentations/displays/discussion.

Day 1. Background on wetlands

1. Background on why we have concern for the environment (see McCanna handout).
2. Background on wetlands, what they are, range of types.
3. Vegetation and landscape
   a. role of vegetation in and around wetland
   b. transitions from terrestrial upland into the wetland
   c. landscape types to look for
   d. landuse types
4. Wildlife of wetlands
   a. what types might be at or in a wetland and why are they there? examples:

1) waterfowl:	feeding, nesting, food for young
2) amphibians:	reproduction for many in shallow fishless wetlands some remain at wetland to feed as adults
3) fish	life cycle, or part of it (impact of exotics,carp)
4) invertebrates	reproduction, much of life cycle in aquatic phase, often short adult phase
5) what others?	

5. For next day's discussion: have students begin thinking about what kinds of changes could happen to wetlands.

Day 2. Changes in wetlands

1. Discuss together or in small groups (see Section IV on Changes in Wetlands, at the end of the curriculum)
   a. What would be a change to a wetland,?
   b. What causes are there of change?
   c. What are the ecological values of wetlands?

2. Introduce evaluating and measuring change in wetlands. (See Section III on Evaluating Changes in Wetlands).
   a. What do they think is important, and should be 'watched'?
   b. Introduce the idea of monitoring local wetlands.
   c. Value of biological monitoring to see how environment changes.

Day 3 and 4. Background for biological monitoring

1. Go over how the biology class can be a monitoring or data gathering group.
   a Physical characteristics: what to record about the site
      1) Size, depth
      2) Landscape around it
      3) Bottom (what type, how deep is the mud layer?)
      4) See Wetlands Guide Assessment sheets
   b. Chemical characteristics: what to monitor
      1) Dissolved oxygen
      2) pH
      3) Temperature
      4) Other
   c. Biological survey: what to monitor
      1) Observations of wildlife, nests, amphibians, turtles, adult dragonflies (visual)
      2) Direct sampling of invertebrates, quantify
      3) Observations of frogs by calls and sitings in water
      4) Fish presence/absence

2. Background on wetlands invertebrates.
   a. Discuss what an invertebrate is, role they have in food webs, and how we will use a diverse community of invertebrates as one indicator of a healthy wetland and ongoing records of other wildlife as 'monitors'.
   b. Acquaint students with the major groups of **invertebrates**.
      1) Show a slide of one organism, and walk students through the use of a simple key to the major groups (JCH will provide this).

2) Have small groups each have a critter to try to key out . Try to have examples of each of the major types of invertebrates expected in wetlands for them to key out. Let me know of any fun approaches to this.

c. Review the work sheets you will use for the field samples, and the idea of contributing to the state-wide database on wetlands invertebrates at MPCA.

Day 5 Field trip preparation -- Team Responsibilities

1. **Ahead of field day** you should set out
   1) 3 white PVC pipe midge samplers -- put out 3 weeks ahead
   2) 6 unbaited bottle trap samplers -- put out 3 days ahead, in pairs
   3) 2 liver-baited bottle trap samplers-- 1 day ahead (optional)
   4) 1-2 minnow traps, baited with bread crumbs -- 1 day ahead (optional)

2. **Note on samples**: keep the samples for the biomonitoring separate from material gathered for the class to learn how to identify invertebrates. The biomonitoring samples are needed to get the relative % community composition. It is very important to keep the entire sample for analysis.

   Biomonitoring samples should be collected as described below, and labelled in pencil on index card material inside the jar with date, school, site location, and method used for the sample.

3. **Note on preservation:** midge samples should be brought back live, and kept cool until analysis, bottle trap samples should be preserved with 80 % alcohol especially if there are prey species in the sample, bottle trap samples of leeches can be brought back alive, and slowly preserved with alcohol, dip net samples pan water portion should be preserved with 80% alcohol, vegetation portion can be kept alive in the frig overnight and analyzed live.

4. **The teams for field work and analysis.**
   Divide class into teams, have each team be responsible for assembling or preparing what they need for the field day. See separate sheets with team responsibilities and preparation, and methods section for more detail on the methods we are using.

Team responsibilities (con)

Team 1. Mapping team
Goal: This team will create a map of the wetland and will record at the site the locations of vegetation groups in and around the wetland. They will record or map the landuses around the site.

Method: The students can locate the site on the USGS 7.5' quad map or NWI map, and make an enlarged outline, preferably on gridded paper for sketching in the wetland vegetation and in flows at the site. Compass orientations should be included. This map can be used to record the vegetation groups in and around the wetland, and any water flow and shoreline features. They should also make a sheet with the wetland sketched small, and compass orientations, for recording the surrounding land use on a larger scale, and surrounding vegetation near the site. Students can look up and decode the NWI classification for the site, and see if they agree with this when they visit the site. Students should be prepared to identify and record the broad classes of vegetation at the site, and know the kinds of land uses to record.

Team 2. Dip net team(s)
Goal: These teams will collect invertebrates for **community** analysis as part of the biological monitoring effort. They need to bring back the entire sample to analyze. Be sure to keep the 'pan' and 'vegetation' portions of each sample united by labelling.

Sampling Method: Rapidly pull the net down toward you from the surface almost to the bottom. Keep doing this for about 10 seconds, around 7 dips. After each ten-seconds of sweeping, empty the net onto a 1/2" screen over a large pan containing an inch or so of pond water. Allow about 10 minutes for active species to crawl out and fall into the pan water. **Collect the sample in two (labelled) portions, the pan water portion and the vegetation portion.**

a) For the **pan water portion,** strain the pan water through a tea strainer, or a finer mesh strainer available through MPCA. Put organisms in a jar, and preserve with 80% alcohol.

b) For the **vegetation portion,** collect the vegetation on the screen into a labelled freezer bag and keep cool (do not freeze!) for analysis next day. You may want to bring some pond water back to help with the vegetation analysis.

Team responsibilities (con)

Note: if the numbers in the total sample appear to be low (less than 100 overall), then do a second 10 seconds of sweeping and repeat the process above, in the same area where you just sampled. Combine both pan samples and vegetation samples. Remind students of the need to bring the entire community back to get relative proportions of groups.

All of the above essentially produces one sample.
To do a second sample, repeat this process in a different area of the site.

Number of samples and where: Collect at least two samples, for the biomonitoring analysis, as detailed above. Students can collect other dip net samples any way they want, for general class use in learning identification and for observation. Keep these separate from the biomonitoring samples.

Team 3. Midge team.
Goal: collect artificial substrates for analysis of **midges** in the wetland. Midges are important consumers, and important prey or food for other invertebrates and vertebrates, including waterfowl. We are interested in the number found per sampler and the relative per cent of red chironomids per sampler.

Sampling method: samplers are 5 inch lengths of 3" white PVC sewer pipe, placed horizontally about 8" below the water surface on wood dowel mounts as used by MPCA. Three (or more, to be sure 3 are recovered) samplers should be placed in wetland 3 weeks before the class field trip. These become colonized with periphyton, and then by midge larvae, mostly the tube-building types. We are also collecting aquatic worms on these samplers. This method is easier than coring and sieving cores for midge larvae, and produces a cleaner sample.

Sampler retrieval: Samplers need to be recovered into standard substrate retrievers so the midges don't slide off as they are lifted from the water. These cylinders are covered on one end with a 250 micron mesh net, and have plastic covers. The cylindrical retrieval jar is back-filled with water through the net-covered end, then slid over the PVC substrate and covered. Samplers can be rinsed directly into retrievers to collect the midges and tubes.
Rinse off as much as possible into sieve part of the retriever, then use an old toothbrush to get the rest of sample cleaned off the pipe. Be careful to

recover midges stuck in the toothbrush! Pool sample into a jar, and refrigerate overnight.

Other samples: For class observation, use the extra PVC sampler for observation of midges. Place midges in aquarium that has a piece of clean white PVC pipe so students might observe progressive colonization of the pipe. Aquarium should have pond water, some natural vegetation, and a fluorescent light right over it to promote algae growth.

Team 4. Bottle trap team.
Goal: predator analysis. Set out 3 pairs of unbaited bottle traps 3 days before the class field trip. Set out extra traps for bringing live specimens back for observation. These traps will primarily capture the larger predators (beetles and bugs) of the community which are very active swimmers. They swim into the funnel of the bottle trap. Place the bottles horizontally and about one foot below the water surface. Low cost adjustable dowel mounts will be available. The bottle trap team could also collect the leech and minnow traps.

To collect **leeches**, set out 2 additional bottle traps each containing a small piece of liver, around 50g wrapped in nylon stocking. These traps should be out just one night, because leeches may try to escape traps in daylight. We would like information on leeches in wetlands. Mike Riggs at the DNR is conducting a survey on leeches, and he would be happy to identify any collections we can get. He will need to know the location of the site.

To collect **small fishes**, set out 2 minnow traps baited with bread crumbs overnight. The main concern is whether fish are present or not. Fish could be counted (per trap) and released. Note what else was caught in the minnow traps, like crayfish, beetles, bugs, mudpuppies.

Retrieval Method: Collect 6 unbaited bottle traps that were set out in pairs 3 days before the class field day. Pour each bottle through a small seive or tea strainer and pool 2 bottle traps into one sample jar. One sample = 2 bottle traps. This is because the numbers are usually quite low

per bottle. Be aware beetles and bugs might sting, use reasonable caution, like not keeping one in the bare hand for very long. To prevent larger predators from eating the sample, preservation is recommended. Use your judgment. Collect an extra sample so students can observe behaviors live

in the lab. Put these into your aquarium. For biomonitoring reporting, 3 samples (pairs of bottles) will be the minimum number needed for analysis.

Collect 2 (optional) liver-baited traps and remove leeches. Look for small leeches attached to the plastic. Be sure to bring a plastic zip-locking bag for the liver-bait, and dispose of it in regular trash, not the site. Put leeches in clean pond water. If you keep them overnight, put a screen over the jar, tightly. Record number of leeches per trap. Put into a preserving jar, and slowly add alcohol so they are preserved in a relaxed condition. This will help Mike identify them. Place a pencilled label inside the jar with the school name, county, site and date, so we can give them to Mike.

Team 5. Wildlife observation team.
This team will make observations of wildlife at the site. They should be the first to approach the site, to see any waterfowl. They should familiarize themselves with field guides to birds, turtles, amphibians and mammals. They could put out turtle 'basking boards' ahead of the field trip. They could learn the frog calls, and visit the site in the evening and tape record what they hear. They can check the site for any evidence of frog adults, reproduction, eggs, tadpoles. They can check in the vegetation around the wetland for active bird nests. They can observe whether dragonflies are active over the wetland, or swallows and speculate what they are eating. They can put together a poster or display about the wildlife observed at the site. They could also make a phenological chart for future records of sitings at the site, one that could be added to year after year.

Team 6. Chemistry team.
This team will be responsible for obtaining the temperature, pH, dissolved oxygen readings at the site on the day of the field trip. They will need to become familiar with the methods available to the school before the field trip. They should be learning about what causes the oxygen levels to change. What would they expect at dawn compared to what readings they got during the day? (I've seen a wetland's O2 go to zero overnight by dawn, then climb back up during the day as photosynthesis takes place). What would cause a change in pH? Would they expect it to be the same at dawn vs. late in the afternoon of a sunny day? (pH will be lower overnight because only respiration is going on overnight, it will increase during the day as photosynthesis occurs). Note that the organisms (vegetation, algae) are responsible for these 'chemical' parameters. Do they know what pH is, and that plants use oxygen themselves as well as produce it?

It would be interesting to get a water sample for pH and DO early in the morning (perhaps there's one early riser?) and late in the afternoon to compare to the samples taken during the day of the field trip. A student might get interested in taking the 'pulse' of the metabolism of the wetland. Be sure they take the water sample properly, overfilling the BOD bottle so no bubbles remain.

Day 6. Field trip to wetland. See Day 5, and team sheets.

Day 7 and 8. Sample processing and analysis.

You may need to rearrange the teams somewhat. When they are done, both the mapping and wildlife teams could join the other teams, and assist in sample processing.

1. Mapping analysis
Product: finish map of site for class, make copies if needed by others, then join other teams and help process samples. Make poster display of site, could be color-coded for vegetation types (grass, shrub, trees, cornfield, submergent, emergent).

2. Dipnet sample analysis
Data to get: Relative abundance of the major invertebrate,groups, i.e. the community composition as determined from the sorting of both the 'pan water' and 'vegetation' portions of the sample. Be sure to count which is the dominant type in relation to the community total number. See Wetlands Assessment sheets.

Sorting the types: Part of the team can process the 'pan water' portion of the sample, the others can do the vegetation portion. Sorting from the vegetation could be worked on by 2 pairs of students (each pair with a pan), as long as they keep their data for the one sample in one place. Separate out the major groups into muffin tins, and identify what the major groups are. For the vegetation sample, place small amounts of the vegetation into a pan with water, tease apart the vegetation and pick out smaller invertebrates such as mayflies, smaller damselfly nymphs and amphipods. Count how many in each major group, record, fill out assessment sheets. It would be helpful to show subtotals for vegetation and pan water portions of the sample.

Sample processing and analysis (con)

Teams can cooperate on identifications, but should count each sample separately. Sample to sample variability is normal. They can compare their results to see how great the variability was, how much the total numbers and total kinds of organisms obtained in two different samples differed. The sorted samples should be preserved in 80% alcohol with a pencilled label giving date, location, school and sampling method.

Subsampling: Remember the goal is to get the relative abundance of the groups within the sample, so they need to look at the entire sample. However, they may have too many organisms to count the complete sample. They may need to subsample the sample. A standard EPA method involves analyzing a minimum subsample of 100 organisms from a random subsample. To subsample, the sample must be preserved. The alcohol can be seived to a jar, and the sample flooded with water for the sorting. The tray should have a uniform grid of 2"squares. The choice of which squares to pick and count must be unbiased. Squares to pick from can be selected with a random number table. The idea is to count enough squares to get the minimum number of organisms.

3. Midge analysis

These biologists have the hardest job, getting the midges out of their tubes and then counting them. I assume they cleaned the PVC substrates off into jars that were chilled overnight. They should randomly select one sample to analyze. Random selection is important, otherwise they might tend to take the sample they knew had the most (or the least!) midges. If they have time and patience, or if there is a second team, they could count a second PVC sampler sample, randomly selected of course!

Data to get: Count the total number of midges on one (or two) sampler and the number that were red, green, gray/black or white. chironomids. Other species like small worms and mayflies can be counted.

Sample processing: there are two methods for removing the midges from the tubes. Both use the midges live. Try either one. A lighted magnifying light helps here.

1) Warm water method. Pour chilled sample into a large tray, and add very warm tap water. This drives most of the midges out of their tubes. Collect midges with fine forceps to a dish. Count and observe colors (do count by color) before preserving in a vial with 80% alcohol.

Sample processing and analysis (con)

2) Sucrose float method. You must seive out most of the water from the chilled sample first by placing a seive over the jar and draining the water. It is mportant to use a fine mesh seive here (250 micron is ok). Then get it into a large 9 x 13" pan. It helps to have a squirt bottle of 30% sucrose to transfer the sample. Add 30% sucrose to a depth of around 2" (probably around 2 quarts). Stir the sample. Midges will wiggle out of tubes and float to top. Collect with forceps to dish, count (by color) and observe color before transfer to vial and preservation with 80% alcohol. This method will bring stickiness to you lab, but it works! To make 30% sucrose: add 30g sucrose to a final volume of 100 ml. Add the sucrose to a smaller volume of hot water with stirring or shaking in a jug. Keep warm and agitated until dissolved. Specific gravity should be near 1.12, if you have a hydrometer.

For subsampling: have grid of 2" squares on the tray or pan, so the sample can be subsampled if necessary. Preserve sample in rubbing alcohol (70-80%), label jar, or vial, and keep. Put index card/pencil label in jar, even if you label on outside.

4. Bottletrap analysis

This group will give a picture of the predator community present. Predators will also be caught with the dip nets, and the team should see what the dip nets brought in for predators, and how they differed (did the bottle traps bring in larger ones than the dip nets?).

They should identify whether they are beetles or bugs, and count how many there are of each type in their three (2 bottle traps pooled) samples. They might like to try to identify them to another taxonomic level, and report which one is the dominant one in their samples. They could measure the lengths of the types they record. They may want to make observations in an aquarium. Remember, beetles and bugs fly, and many leave the wetlands in fall to migrate to deeper water habitats.

Data to report: Number of beetles and bugs per sample (2 bottle traps pooled), types found, and which one is dominant type in their samples. Also report what else was in the samples.

5. Wildlife analysis
This team can prepare a display or chart of wildlife observed at the site. They can join the dip net or midge teams and assist in sample processing. They could prepare to talk to the class about the life cycle and ecology of some of the wildlife, especially frogs and others closely tied to the wetland quality.

6. Chemisty analysis.

Day 9. **Finish samples, write up data, data entry, prepare displays or presentations.**

Day 10. **Presentations, displays, discussion. (Another class could be invited, or community people?)** Collect a set of assessment sheets and writeup from each student.

IV. Identifying and Evaluating Environmental Change in Wetlands

This material is intended as background for possible discussions with the class.

IV.A. What changes might be observed over time in the wetland?

Students could first list what changes they think are important in wetlands. Which ones might they be concerned about?

1. Animals rarely come to feed or reproduce at the site. Over the years, people have observed fewer birds, frogs/tadpoles, turtles or other wildlife at the wetland.
2. The water is toxic to underwater life.
3. The sediments are toxic to underwater life.
4. The sediments have high concentrations of N and P.
5. There were many kinds of plants at the site, but now it is mostly cattails.
6. There was a fish kill in the winter.
7. There used to be lots of kinds of invertebrates, now there are fewer kinds, but they may be very abundant.
8. There used to be shrubs and trees, but now there are lawns down to the water's edge.
9. There used to be emergent vegetation at the shore, but now there is not.
10. Dissolved oxygen is very low even during the daytime.

11. The water turns green with algae in late summer.
12. The water is murky, it used to be clear.
13. The water is gone, or very low.
14. The water level used to go up and down periodically, now it is uniform, or now it is higher than it used to be.

IV. B. What are some of the causes of changes in wetlands?
Let students run with this before giving them ideas, then add in other possible causes. These can be the basis of discussion of benefits of various activities to humans, how our view of the land is changing, how different people have different value systems for the environment, and why. Be careful not to make them guilty for living! Ask them where could changes be made in our activities to preserve natural systems, point out some changes are already happening, and that awareness of wetlands as important natural systems is greater now.

1. Water is lowered or drained out by ditching to create dry land dewatering of a nearby site drought
2. Wetland is filled or partly filled for a parking lot or other use
3. Natural outlet of wetland is plugged, water level rises and remains constant
4. A road is built through the wetland.
5. There is construction nearby, and silt and clay flow into the wetland especially during storms.
6. Culverts are built for road or other stormwater runoff and they feed to the wetland.
7. Herbicides, fertilizers, and insecticides are used on the land adjacent to the wetland.
8. There is rich organic matter and N and P nutrients coming into the wetland from various human land uses (farming, feed lot, residences, possibly industrial/municipal uses)
9. In dry years, the wetland was plowed, treated with normal fertilizers and pesticides for farming, and crops were harvested. Row crops may have more impact on wetland than hay.
10. Nearby river floods, backwater allows carp to get into wetland.
11. Herbicides were used to reduce vegetation at shore or in wetland.
12. Restoration?
13. Septic tanks are leaking to the wetland

Wetland Invertebrate Type Evaluation — Worksheet-1

School Site #_____ Date sampled_____

Sampling method_____

Number of types

1. Total number of species types found. Use "type of organisms" list plus others you can tell are are a different type _____

2. Total number of insect types found (add adults and larvae if different types _____

3. Total number of crustacean types _____

4. Total number of mollusc types _____

5. Total number of other types _____

Circle types you observed in your sample:

Molluscs
Fingernail clams
Snails
Mussels

Crustaceans
Daphnia & relatives
Clam shrimp
Fairy shrimp
Amphipods
Crayfish

Insects
Beetle larvae
Beetle adult
Bug adults (aquatic)
Dragonfly nymphs

Burrowing mayfly
Mayfly, non-borrower
Caddisfly
Red midge larvae
Other midge larvae
Mosquito larvae

Other
Tubifex worms
Nematode worms
Leeches

Bryozoans

Wetland Quantitative Invertebrate Worksheet-2

School site #_____ Date sampled_____

Sampling method _____

_____

1. Dominant type in numbers

Type of invertebrate _____
(Describe or name)

a. Number of the dominant type in the sample _____

b. Total number of organisms (all types) in sample _____

c. Percent dominance (number/total in sample) _____

2. Red midge larvae/total insects

a. Number of red midge larvae (Chironomus) in sample_____
(put 0 if none are present)

b. Total number of insects (mayflies, caddisflies, beetles, bugs, dragonflies, midges, including red midges, and others)
Total in sample _____

c. Percent red midge larvae/total insects (a/b) _____

Wetland quantitative invertebrate	Worksheet-3

School site #_____

Date sample collected _____

3. **Tubificid worms/total insects in sample**

a. Total tubificid worms in sample (put 0 if none)_____

b. Total insects in sample _____

c. Ratio of tubificids/insects (a/b) _____

4. **Number of burrowing mayflies/total mayflies**

a. Were mayflies found in sample? (yes or 0) _____

b. Number of burrowing mayflies (have tusks) _____

c. Total number of mayflies in sample (includes burrowers) _____

d. Ratio of burrowers/total mayflies (b/c) _____

5. **Percent predators as beetles and bugs**

a. See predators list to help you count all the predators (dragonflies, beetles, bugs, crayfish)

b. Number of beetles plus number of bugs _____

c. Total number of predators (including beetles and bugs) _____

d. Percent predators as beetles and bugs (b/c) _____

School site # _____

Date sample collected _____

6. **Crustaceans % of total organisms in sample**

a. Count total crustaceans in sample _____

b. Number of all invertebrates (including the crustaceans) in sample _____

c. Per cent as crustaceans (a/b) _____

7. **ET taxa, or number of species of mayflies plus caddisflies**

a. Pick out all the **mayflies** you can find in the sample. You will need to use the microscope to see if you have different species of mayflies. You may have different sizes (instars) of one species. Look at the gill plates, the antennae and head for obvious differences. Your teacher may have pictures of different species of mayflies as nymphs. Some of them look very different from others.

b. Number of different **types** of mayflies in the sample _____ (put 0 if none present)

c. Pick out all the **caddisfly** larvae in your sample. Their cases are species-specific, and are made from leaves or sticks or pebbles or sand. Picking them out as they swim around is much easier than in a "pickled" sample where you have to look for an unusual leave or stick! Your teacher will have pictures of different caddisfly larval cases.

d. Number of different **types** of caddisflies in sample _____

e. Total number of **ET types** (b + d) in sample _____
= total taxa of mayflies and caddisflies

Wetland Site Description (for database) Worksheet-5

Data needed for Maid Database Site File

School_____ School's site #_____

Teacher_____ Class_____

Locale_____ Name_____

Latitude
degrees_____
minutes_____
seconds_____

Longitude
degrees_____
minutes_____
seconds_____

Ecoregion_____
Modifier _____

Township_____ Range _____ Section _____Qtr S_____

Acres of site _____ estimated from: _____

_____

Classification

General class _____

User class _____

NWI class _____

Suggested change in NWI class_____

_____

Site notes (relating to locating the site)

_____

_____

_____

Map type _____ Map date_____

Wetland Site Description: Landscape and water Worksheet-6

Date_____ _____

School_____School Site #_____

Attach a general description in your own words of the landscape surrounding the wetland. Use separate sheet.

Give rough proportion of area next to wetland affected, like 1/4, 1/2:

Elements within	**100 ft**	**1000 ft**
Other water body	_____	_____
Woods	_____	_____
Shrub-scrub	_____	_____
Grassy	_____	_____
Agricultural	_____	_____
Commercial	_____	_____
Dirt road	_____	_____
Railroad	_____	_____
Construction	_____	_____
Other	_____	_____

Per cent open water in wetland _____

Strong wave action could often occur_____

Water source of wetland if known

Storm water drains or culverts _____ Seepage wetland_____

Wetland is in a depression_____

Wetland is on an elevation of land _____

Water flows into wetland from_____

_____

There is a definite stream through the wetland, or inlet and outlet:

_____

Written Description of Wetland Site. Worksheet 7

_____School Site #_____

*Look all around the wetland. Describe what you see, both natural and human activities and landscapes surrounding the wetland.
*Look at the wetland, and describe what it looks like to you.
*Close your eyes and listen for two minutes (5 minutes is hard!). What do you hear?

Field measurement at Wetland Site. **Worksheet 8**

School site # _____ Date _____

Temperature Air_____ Water_____
(state F or C)

Water pH_____ Time_____

DO_____ Method_____

Other _____

_____

_____

_____

_____

_____

Water depth _____ Guage # _____

_____Guage# _____

_____

Precipitation

Rainfall inches _____ for _____ days

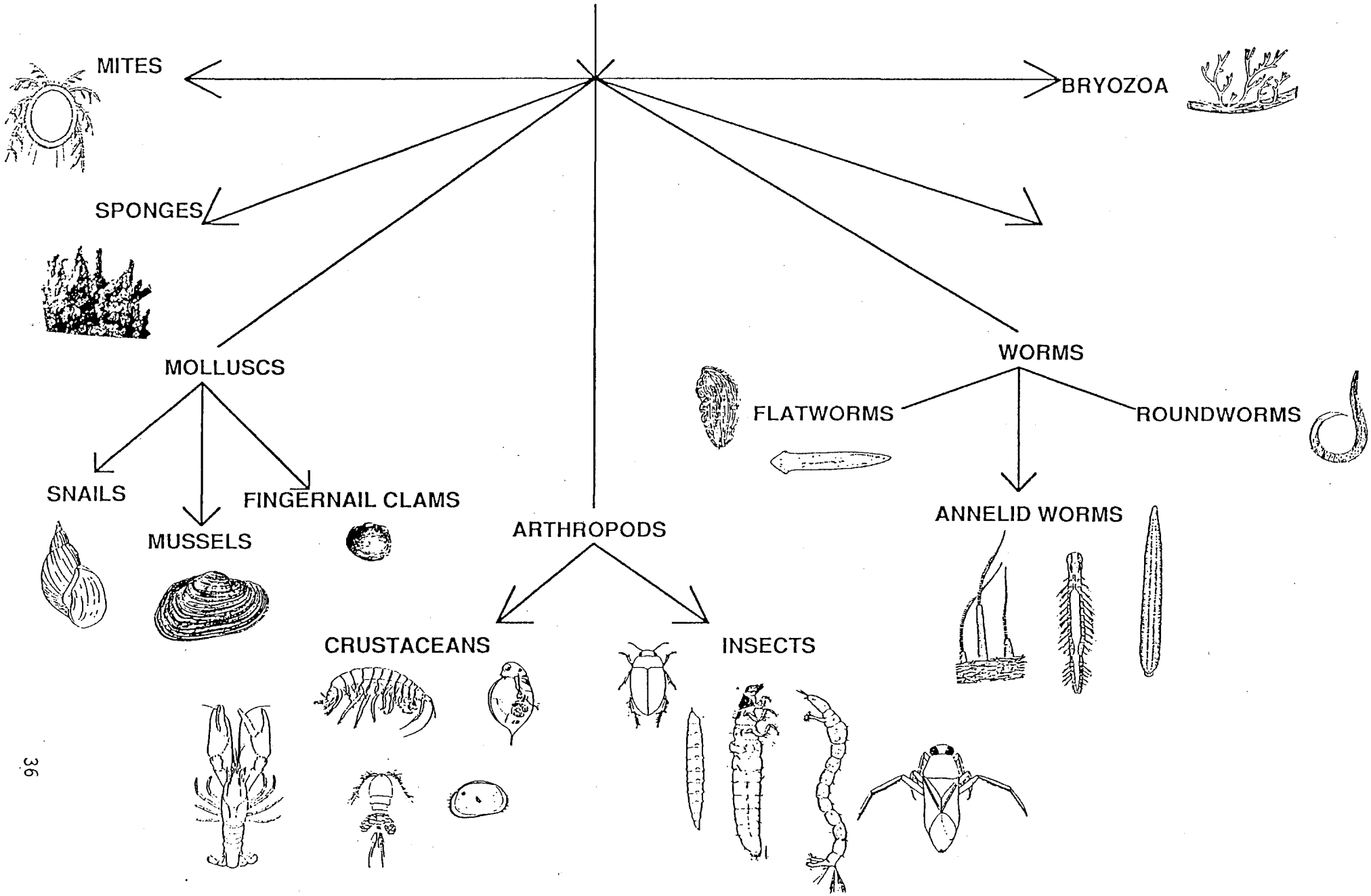
Snowfall inches _____ for _____days

Site is (circle one)

DRY ALMOST DRY FAIRLY FULL FULL OVERFLOWING

Distance of water's edge to apparent shoreline _____ft

GENERAL INVERTEBRATE GROUPS

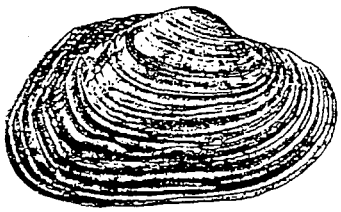


General Guide to Aquatic Invertebrate Groups

If it has	then look at these groups
1. A hard case, shell, or firm body covering	Molluscs and arthropods (A and B below)
2. Primarily a fleshy body, no hard case or shell	Insect larvae, worms, mites (B, C, D below)
3. A mass of branching, sponge-like or gelatinous material, no clear head/tail ends	Sponges, Bryozoa or egg masses or amphibians (E, F below)

A. MOLLUSCS

HAVE: hard carbonate shell, either coiled (snails), or paired valves (the bivalves, or clams and mussels)

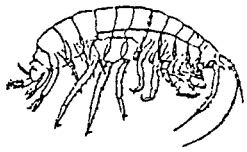


DON'T HAVE: segmented appendages (watch out! clam shrimp and ostracods may look like small clams, but have segmented appendages)

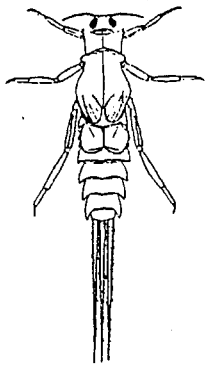
B. ARTHROPODS (the crustaceans and insects)

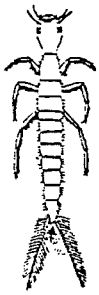
ALL HAVE: paired segmented appendages and chitinous exoskeleton.

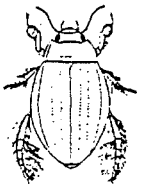
CRUSTACEANS HAVE: <u>biramous</u> (or branched) appendages in the most anterior area; <u>two pairs</u> of antennae; they breath by gills or through the body surface.



INSECTS HAVE: Either three pairs of semented legs on the thorax, or the body is a fleshy larva with head capsule or/and fleshy legs or prolegs. If wing pads are present, is insect.

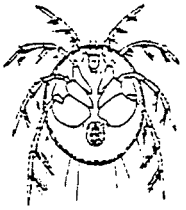






C. MITES (called Hydracarina, in Order Arcarina in class Arachnida with spiders).

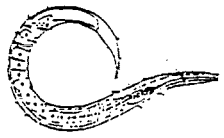
The body of aquatic mites is fused, has no segments, has 4 pairs of legs, plus one pair of chelicera and a pair of pedipalps near the mouth. Length around 0.4 to 3 mm



D. WORMS are flat or round in cross-section, can creep, swim or thrash around, have no head capsule, lack fleshy legs, lack segmented legs.

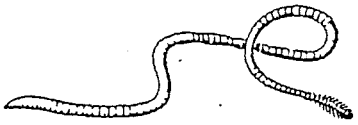
FLATWORMS (Platyhelminthes) HAVE: a dorsoventrally flattened elongate body, not obviously segmented, no anus, many less than 1 cm long.

ROUNDWORMS (Nematoda) HAVE: small, elongate, rounded bodies that taper at each end. Most are less than 1 mm long. Body not obviously segmented. Uses a thrashing, rather than a swimming or creeping motion.

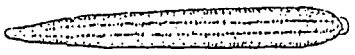


ANNELID WORMS (Annelida) HAVE: definite body segments, creep or swim. Includes oligochaetes and leeches.

Oligochaetes: includes earthworm, Tubifex worms, have short stout hairs (setae) projecting from body wall.



Leeches: body is flattened, has disc-like sucker on posterior end, definite mouth, no setae on body surface, size 1-5 cm.

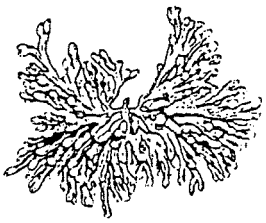


E. SPONGES (Porifera)

Found as an encrusting mass or vertical fingerlike projections, a few mm to several cm thick. Can be brown or gray or green. Water passes in small pores, and out larger openings (or oscula). Sensitive to pollution.

F. BRYOZOA (Ectoprocta)

Found as encrusting or branched colonies or large gelatinous masses. Mouth is in a tentacle-rimmed crown (the lophophore) which can retract into the secreted hard case (or zooecium). Produce unique resting eggs, or statoblasts. Sensitive to pollution.



BIRAMOUS APPENDAGES

Both crustaceans and insects have paired segmented appendages, but just crustaceans have biramous, or branched appendages. Sometimes this is hard to see, as the second branch is reduced.

Copepod 5th leg, from one side (smaller "branch" is towards center of underside of animal)

PROLEGS IN INSECT LARVAE

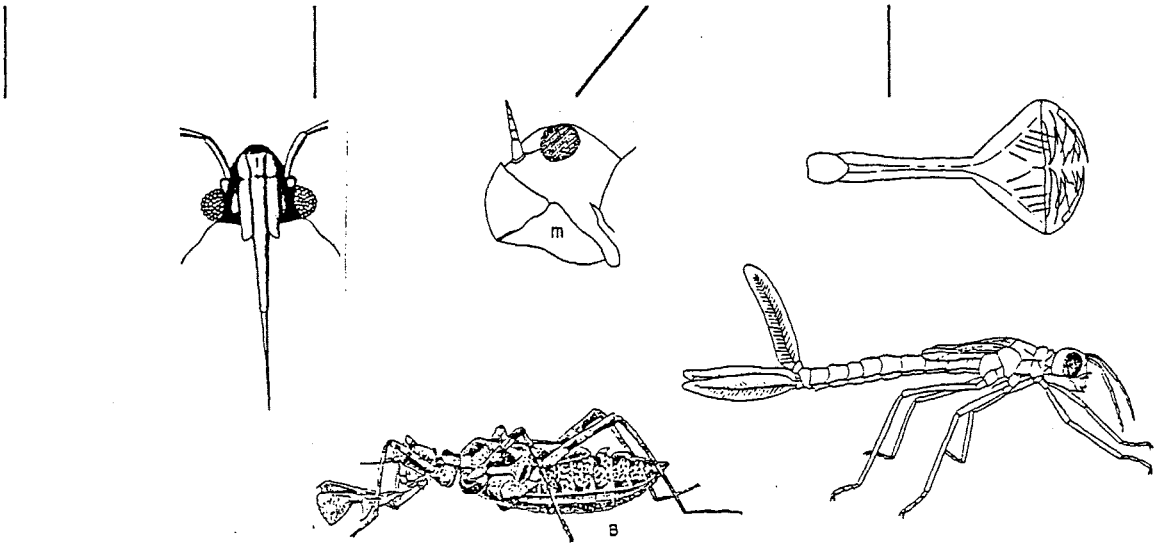
These are fleshy short legs, different from the chitinous jointed legs of, say, mayfly nymphs.

Many fly larvae, like midge larvae, have prolegs near the head

Caddis fly larvae have small prolegs at the posterior end

(Beetle larvae lack posterior prolegs)

MOUTHPARTS OF BEETLES (CHEWING), BUGS (SUCKING), DRAGON AND DAMSELFLIES



Appendix I.1 Definitions of fields in invertebrate database SPECIES file

Field name	Data type	Field description
1. status	N 1	
2. entrysite	N 2	Workstation number, same as in site file. BG tied it to the computer-generated site record # as a decimal (St. Cloud is 03.)
3. entryone	C 3	Initials of data entry person
4. entrydate	D 8	Date of data entry. BG had it called up from the computer clock, ok if your clock always works right.
5. sprecno	N 9.2	Computer-assigned record number for the species entry (Sp rec # on species entry screen). Unique record for each entry.
6. phylum	C 3	BIOS code for phylum, would look up name and bring to screen. The BIOS code is 2 digits for phylum.
7. class	C 3	BIOS code is 2 digits.
8. order	C 3	BIOS code is 2 digits.
9. family	C 3	BIOS code as is.
10. subfam	C 3	BIOS has no code for subfamily.
11. genus	C 3	BIOS code as is.
12. species	C 3	BIOS code as is.
13. variety	C 3	BIOS code is 2.
14. cspecies	C 3	
15. cvariety	C 2	
16. userspno	C 10	User's own code number for species of concern. We should add a prefix, eg user's 3 initials, or museum name in front of this number, to make sure the user codes can be spotted.
17. unsure	L 1	Check box for certainty of identification
18. cd_month	N 2	Month of collection
19. cd_day	N 2	Day of collection
20. cd_year	N 4	Year of collection
21. colltime	N 4	Time of collection, military
22. estimate	L 1	Check box to indicate that the total number (or count of collection) given is an estimate
23. total	N 4	Total number of individuals in collection. Should widen this field.
23. egg	N 1	Life stage present, click to indicate egg.
24 larval	N 1	Life stage present
25. juv	N 1	Life stage present
26. pupa	N 1	Life stage present
27. adult	N 1	Life stage present
28. sex-male	N 3	Number of males present.
29. sex-female	N 3	Number of females present.
30. sex-unknown	N 1	Not on screen, but available
31. gravid	N 3.2	Per cent females bearing eggs.

32. collector	C 16	Name of collector (first initial, last name)
33. collnumber	C 16	Collection number of user, not computer-assigned, not the museum number, and not necessarily the field number
34. coll method	N 2	Collection method popup: other, by hand, netted, pumped, reared, SCUBA, substrate, trapped, shocked, snorkel (let substrate indicate artificial substrate).
35. preserve	N 1	Preservative popup: other, alcohol, dry or shell, formalin, pinned, slide, shell/tissue, tissue only
36. determiner	C 16	Name of identifier of specimens, initials and last name.
37. museum	C 16	Museum name where the specimens are
38. museumno	C 16	Museum's number for the collecti
39. vouchered	L 1	Click to indicate specimen is vouchered to a museum, in a collection
40. literature	L 1	Click to indicate the record is only from the literature. BG had this open up a memo field for the complete literature citation. Don't think it could take more than one reference. Would this be used, should it allow for more than one citation?
41. siterecno	N 9.2	Computer assigned record number for the site when it was entered into the site file. Warning! If this is used to unite the SITE and SPECIES files, be sure not to delete/pack in sites, nor sort.
42. habrecno	N 9.2	Habitat file computer assigned record number.

Appendix I.2. Definitions of fields in invertebrate database SITE file, for locational information.

1	status	N 1	
2	entrysite	N 2	Workstation number, BG tied it to the computer-generated site record # as a decimal (eg 3002.03, 03 = St. Cloud)
3	entryone	C 3	Initials of data entry person
4	entrydate	D 8	Date of data entry. BG had it called up from the computer clock. This is ok, as long as the clock is correct.
5	siterecno	N 9.2	Computer-generated # for each entry made. BG had the workstation # added to this as a decimal. Could be used to find site entry records.
6	state	C 2	State abbreviation letter code. BG set an option to have default to MN
7	county	C 2	County where the collection was made. Use the 2 digit county code. After code is entered, name of county comes up on the screen.
8	locale	C 20	Useful if site lacks name, as in many wetlands. Could be park name, or nearest river, lake, town. Idea is to give nearest location to site.
9	name	C 20	Site name. Be consistent if you want to search by site name.
10	userno	C 6	User site number, the investigator's site number. This will be used to relate the site file to the species file.
11	habitat	N 1	This is the "general habitat" as a popup of: Other, Lake, Perm Pond, Temp Pond, Bog, Flow water, Wetland, Terrestrial
12	habitatdet	N 6	This is the user's classification of the type of site, eg Dr. Gundersen has 41 specific habitat types. See App.II.1.
13	nwiclass	C 10	The code for the US Fish and Wildlife Service's National Wetlands Inventory.
14	nwiverify	L 1	Click if the National Wetlands Inventory classification has been verified by actual site inspection.
15	watershed	N 2	The state watershed number, DNR/ LMIC major watershed codes, in DNR SIDRS Report 7002, "The Common Stream and Watershed Numbering System," June, 1981, Office of Planning. (I will probably add a field for the Hydrologic Unit Codes used by MPCA STORET database, 8 digits).

(minorwatershed)			Needs to be added to database. Will need to be 5 digits, first 2 for major watershed, next 3 for minor.
16	lakecty	N 2	County code to go with the DOW #, must be the one used in the DNR DOW code book which uses the county code for the largest area of the lake. Your collection could have been in the smaller area, see field #7 above.
17	dow	C 10	The DNR's lake or wetland # from MN DNR Bulletin #25, an Inventory of Minnesota Lakes (Dept. of Waters).
18	acres	N 8.2	Area of site.
19	riverseg	N 3	This is the segment of the river between two tributaries, based on MPCA's STORET stream stations system, which includes 2000 EPA-numbered river segments plus 600 numbered by MPCA. MPCA splits the EPA-numbered segments whenever there is a dam, or a change in classification. Segments are usually 10 miles long, but range from <1 to 54 m.
20	onseg N 1		Clicking this box indicates the sampling station is on the segment of the river. When the box is not clicked, it means the station is "Off" the segment, that is it is on a tributary that comes into the segment.
21	order N 2		This is the stream order, or the number of branches from the mainstem, e.g. a third order stream has 3 main branches from the mainstem.
22	tributary	N 1	These are numbered on the segment, 1 is the most downstream tributary. MPCA uses T in front of the tributary number.
23	rivermile	C 6	River miles are numbered from the mouth of the river up to the headwaters. Be sure to indicate which system you are using, see Mile System field below.
24	milesys	N 1	This is a popup menu of mile systems. At present it lists the following choices: Other, Army Corps, DNR, EPA, USFW.
25	ecoregion	N 2	One of 7 broadly defined regions of MN, defined by EPA. Left box, for code number.
26	ecotype	C 1	An ecoregion modifier, code letter M = most general, T = most typical
27	latitude	N 10.1	In degrees, minutes and seconds.0. BG had separate boxes to enter degrees minutes and seconds, with 5 digits for deg and min, 2.0 for secs. It was stored as seconds in the database.

28	longitude	N 10.1	See latitude above.
29	utmzone	N 2	MN has UTM zones 14, 15, 16. GIS uses only Zone 15 so far.
30	utmeast	N 10.2	Easting coordinate for UTM (Universal Transverse Mercator projection numbers) locations. The number format is 1,111,111.11. In MN, zone 15, Easting coordinates range from 257,454.13 - 723,782.46.
31	utmnorth	N 10.2	UTM Northing coordinate, ranging from 4,820,498.75 - 5,473,482.90 in MN Zone 15.
32	township	N 3	Township (T) number from MN DOT County Highway maps.
33	range	N 3	Range (R) number from MN DOT County Highway maps.
34	east	L 1	Click here indicates Eastern Range numbers.
35	section	N 2	Section number with the township, on county map. (36 per township, each one square mile).
36	qtrsection	N 1	Popup to select which of 4 quarter-sections within section
37	qtrqtr	N 1	Popup to select which quarter section within the quarter section
38	datasource	N 1	Popup for source of location numbers: Locality, TRS, Lat Long, UTM. Select which was used to get any numbers entered, eg if Lat Long data are entered, but they are from TRS centroid estimates, select TRS
39	precision	N 2	Popup to select precision level for your collection location. Qtr section is (1/2 mile)^2 or 1/4 m^2 (2640 ft per side). Qtr Qtr section is (1/4m)^2 or 1/16m^2 (1320 ft per side). Township means the 36 section township.
40	maptype	N 1	Popup of type of map used: Unknown, 7.5 Quad, 15 Quad, 30 Quad, County, 1:250,000, State Highway, State Base.
41	mapdate	N 4	Enter the year of publication of map.
42	method	N 1	Popup for the Map Method: unknown, centroid, digitized, estimated, GPS, measured, scanned, survey (we will have lat long centroids for TRS and municipalities available at MPCA)
43	note	N 5	Memo field that holds 80 characters, for description of the site location, eg, 4.2 m N of jct. Cty 46 and 11, wetland 500 ft. E of road. Important record for how to find the site

Appendix II.1. Dr. Gundersen's Habitat Codes and Habitat Descriptions

For general habitats, perm = permanent pond, temp = temporary pond. General code = Dr. Gundersen's code + 2. Combined code = Dr. Gundersen's general code 1st digit, with his specific habitat code the next two digits.

Habitat Codes			Habitat names	
Combined	General	Specific	General	Specific habitat description
101	3	1	lake	open lake surface, away from shore or over sand or gravel
102	3	2	lake	weedy lake shore, less than 3 feet deep
119	3	19	lake	littoral zone of lake with some emergent vegetation
203	4	3	perm pond	large permanent pond, over 1 acre
204	4	4	perm pond	small permanent pond, over 1 acre
207	4	7	perm pond	permanent pond - shaded by wooded edge
209	4	9	perm pond	permanent sedge bog, little open water
211	4	11	perm pond	drainage ditch, slowly flowing, grasses at edge
212	4	12	perm pond	river backwater, thickly weedy
217	4	17	perm pond	quarry, steep rocky edge, little to no vegetation
220	4	20	perm pond	small lake with extensive littoral zone
221	4	21	perm pond	small lake with heavily wooded edge
222	4	22	perm pond	large grassy or sedge marsh
225	4	25	perm pond	small permanent pond that comes close to drying up in dry years
226	4	26	perm pond	large drainage ditch of standing water
228	4	28	perm pond	large shallow pond with wooded edge, over 1 acre
230	4	30	perm pond	small sedge bog
232	4	32	perm pond	drainage ditch through sedge bog
233	4	33	perm pond	flowing ditch through sphagnum bog
242	4	42	perm pond	sewage pond
305	5	5	temp pond	temporary pond - sunny

Report from: habitat.preview.frx with habnames.dbf, indexed on habitatdet.

Habitat Codes			Habitat names	
Combined	General	Specific	General	Specific habitat description
306	5	6	temp pond	temporary pond - shaded by wooded edge
308	5	8	temp pond	shallow grassy marsh
318	5	18	temp pond	crevice or depression in rocks
327	5	27	temp pond	partially shaded permanent pond
410	6	10	bog	spagnum bog, pools in mat of moss with grasses and small bushes
423	6	23	bog	lake edge with floating sphagnum mat
429	6	29	bog	small shaded sphagnum depression
431	6	31	bog	boggy area with mix of sedge and sphagnum
434	6	34	bog	roadside ditch through sphagnum bog
513	7	13	flowing	weedy edge of river, slowly moving
514	7	14	flowing	stream with wooded edge, slow to moderate flow
515	7	15	flowing	open surface of river, slow to moderate flow
516	7	16	flowing	rapids or riffles area of stream or river
524	7	24	flowing	wooded shady edge of a large slow moving river
535	7	35	flowing	thinly weeded shady stream edge
536	7	36	flowing	weeded edge of a riffle area
537	7	37	flowing	open surface of wooded stream
538	7	38	flowing	open surface of a riffle area
939	1	39	other	not used in classification
940	0	40	no data	no data
941	9	41	terrestrial	terrestrial light trap

Appendix II.2. U.S. Fish and Wildlife Service Wetland Classification Materials for teachers' workshop.

Wetlands Classification: Cowardin system used by U.S. Fish and Wildlife
The U.S. Fish and Wildlife Service is advocating the use of the Cowardin classification system (Cowardin et al, 1979) as a better and more comprehensive descriptor of the diversity of wetlands than the older, "Circular 39" system of the Fish and Wildlife Service. Because the Minnesota DNR continues to use this system, it will be briefly listed at the end of the description of the Cowardin system.

The Cowardin system is heirarchical, that is, there are levels of classification which cover almost all surface waters, including oceanic. To understand the particular codes that apply to wetlands, it helps first to separate lakes from wetlands. Lakes are grouped in the Lacustrine (L) system. As defined in the Cowardin classification:

A lake is a "deepwater" habitat, having water more than 2 meters deep, and devoid of persistent emergent vegetation. Lacustrine is defined as follows:

1. In a topographic depression, or dammed river channel
2. Lack persistent **emergent plants**, or if present, they comprise less than **30%** of area coverage.
3. Total surface **area exceeds 20 acres** (8 ha), or if smaller, the depth **is over 2 meters** (6.6 ft).

The system that encompasses all wetlands is Palustrine (code P). The definition of Palustrine is as follows:

1. The surface area is **dominated by vegetation,**
2. Or, if lacking vegetation, **is <20 acres (8 ha),** lacking wave formed shoreline, water less that 2 meters at deepest part at low water low water.

Classes of palustrine habitats (wetlands)

The next level of classification (under system) is the **class**. The class describes the general appearance of the habitat, on the basis of vegetation if vegetation is present, otherwise on the basis of the bottom type. The codes as used on National Wetlands Inventory (NWI) maps are given first.

Class Code	Class description
RB	**Rock bottom**
UB	**Unconsolidated bottom:** ≥ 25% particles smaller than stones, vegetation < 30% of area
US	**Unconsolidated shore:** <75% stones 30% vegetation
AB	**Aquatic bed:** Aquatic bed is dominated by plants that grow **below the water surface** for most of the season in most of the years. Plants include algae beds, **rooted** vascular plants such as pond weeds, wild celery, Elodea, water lilies; and floating plants such as duckweeds, **floating** ferns, bladderworts and coontail. These plants are not emergent above the water line. Ponds.

EM **Emergent wetland:**
Erect (emergent) rooted, herbaceous aquatic plants (hydrophytes) present most seasons most years. Dominated by **perennial** plants such as cattail, bullrush, reed canary grass, and having non-persistent wild rice and arrowheads. Call these marsh, meadow, fen, prairie pothole or slough.

ML **Moss-lichen wetland**
Moss and/or lichens cover substrates other than rocks, emergents and shrubs are, 30% of the surface area. Bogs.

SS **Scrub-shrub wetland**
Woody vegetation <6 meters (20ft) dominates.

FO **Forested wetland**
Woody vegetation 6 meters (20 ft) or tall dominates.

Subclasses for palustrine classes
A subclass further defines the particular class assigned to the wetland. There is a different set of subclasses for each class. For the classes of non-vegetated wetlands, the subclasses define the substrate type on the bottom. For the classes of vegetated wetlands, the subclasses describe the general type of vegetation present, as determined by photointerpretation of aerial photographs. For many sites, direct observation will be needed to determine subclasses.

Class	Class Code	Subclass Code	Subclasses
Rock Bottom	RB	1	Bedrock
		2	Rubble
Unconsolidated Bottom	UB	1	Cobble-gravel
		2	Sand
		3	Mud
		4	Organic
Unconsolidated Shore	US	1	Cobble-gravel
		2	Sand
		3	Mud
		4	Vegetated
Aquatic Bed	AB	1	Algal
		2	Aquatic Moss
		3	Rooted Vascular
		4	Floating Vascular
Moss-lichen	ML	1	Moss
		2	Lichen
Emergent	EM	1	Persistent*
		2	Non-persistent*
Scrub-shrub	SS	1	Broad-leaved deciduous
		2	Needle-leaved deciduous
		3	Broad-leaved evergreen
		4	Needle-leaved evergreen
		5	Dead
		6	Deciduous
		7	Evergreen
Forested	FO	(same subclasses as scrub-shrub)	
Open Water	OW		unknown bottom

* Persistent does not necessarily mean perennial, it means that wetland vegetation persists into winter, as shrubs and cattails do. Non-persistent means the vegetation dies down in fall, and decomposes, as occurs with submersed vegetation, wild rice and arrowhead.

Modifiers of subclasses of Palustrine classes
The modifiers further define the water body. There are modifiers for water regime, water chemistry, soil and special modifiers. For wetlands, the water regime modifiers are especially important, as they relate to the degree of flooding and drainage of the wetland. The water chemistry modifiers relate primarily to salinity for coastal waters, and aren't shown here. The soils modifiers are only two, "o" for organic and "n" for mineral. The special modifiers describe types of physical disturbances, such as dikes, ditches or beavers.

Water regime modifiers (nontidal)
The water regimes are defined based on the water during the active growing season, the frost-free period for the wetland. The rest of the year is considered the "dormant" period for the wetland. Here are the modifiers, their codes and definitions (from Cowardin et al, 1979).

Code	Subclass Modifier	Definition of modifier
A	Temporarily flooded	Surface water is present for brief periods during the growing season, but the water table usually lies well below the soil surface for most of the season. Plants that grow both in uplands and wetlands are characteristic of the temporarily flooded regime.
B	Saturated	The substrate is saturated to the surface for extended periods during the growing season, but surface water is seldom present.
C	Seasonally flooded	Surface water is present for extended periods especially early in the growing season, but is absent by the end of the season in most years. When surface water is absent, the water table is often near the land surface.
D	Seasonally flooded/well drained	
E	Seasonally flooded/saturated	
F	Semipermanently flooded	Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land surface.
G	Intermittently exposed	Surface water is present throughout the year except in years of extreme drought.
H	Permanently flooded	Water covers the land surface throughout the year in all years. Vegetation is composed of obligate hydrophytes.
J	Intermittently flooded	The substrate is usually exposed, but surface water is present for variable periods without detectable seasonal periodicity. Weeks, months, or even years may intervene between periods of inundation. The dominant plant communities under this regime may change as soil moisture conditions change. Some areas exhibiting this regime do not fall within our definition of wetland because they do not have hydric soils or support hydrophytes.

K	Artificially flooded	The amount and duration of flooding is controlled by pumps and dams or dikes.
W	Intermittently flooded/Temporary	
Y	Saturated/Semipermanent/Seasonal	
Z	Intermittently exposed/Permanent	
U	Unknown	

Circular 39 Wetland Types (from U.S. Fish and Wildlife Circular 39 and Cowardin et al, 1979)

Type 1. Seasonally flooded basins or flats. Wet meadows. Soil is covered with water or is waterlogged during variable seasonal periods, but usually is well-drained during much of the growing season. Vegetation varies greatly according to season and duration of flooding: from bottom-land hardwoods as well as herbaceous growths. You can decode the NWI codes from the information above.
Typical NWI symbols: PEM1A, PEM1J, PFO1A, PFO1J

Type 2. Inland fresh meadows. Soil is usually without standing water during most of the growing season but is water logged within at least a few inches of surface. Vegetation includes grasses, sedges, rushes and various broadleaved plants. Meadows may fill shallow basins, sloughs, or farmland sags, or border shallow marshes.
Typical NWI symbols: PEM1B

Type 3. Inland freshwater marshes. Soil is usually waterlogged early during growing season; often covered with as much as 6 inches or more of water. Vegetation includes grasses, bulrushes, spikerush, and various other marsh plants such as cattails, arrowheads, pickeralweed and smartweeds. Marshes may nearly fill shallow lake basins or sloughs, or may border deep marshes. Often are seep areas on irrigated lands.
Typical NWI codes:PEMC, PEMF

Type 4. Inland deep fresh marshes. Soil is usually covered with 6" to 3' or more water. NWI codes include both Palustrine and Lacustrine; EM, AB, UB classes; F, G, H water regimes

Type 5. Inland open fresh water. These include shallow permanent ponds and reservoirs, and lakes.
NWI Palustrine or Lacustrine; AB, UB classes; G, H water regime

Type 6. Shrub swamps. Soil is waterlogged, may have 6" water over it. Vegetation includes alders, willows, buttonbus, dogwoods, swamp-privet. Found along sluggish streams and some on flood plains.

NWI Palustrine system; SS class; 1,2,3,4,5 subclasses; A,B,C,F,J,G water regimes
Type 7. Wooded swamps. Soil is waterlogged at least within a few inches of the surface, and often has to 1 ft of water. Trees include tamarack, arborvitae, black spruce, balsam, red maple and black ash. Northern evergreen swamps usually have a thick cover of mosses.
NWI Palustrine system FO class; A,B,C,F, and J water regimes

Type 8. Bogs. Soil is usually waterlogged and supports a spongy cover of mosses. Typical plants include heath shrubs, sphagnum moss and sedges. In the North, leather leaf, Labrador-tea, cranberries, carex and cottongrass are often present.
NWI Palustrine system; SS, FO, ML, EM classes; B water regime.

Appendix III.1. Species in Dr. Gundersen's collections

Unique list of species.

Codes				Names			
Ord	Fam	Gen	Spec	Order	Family	Genus	Species
005	001	001	005	Odonata	Aeshnidae	Anax	sp
005	001	002	000	Odonata	Aeshnidae	Aeschna	sp
005	004	008	000	Odonata	Libellulidae	Tramea	sp
005	006	001	005	Odonata	Corduliidae	Cordulegaster	obliqua
006	003	000	000	Zygoptera	Ceonagrionidae		
006	003	006	000	Zygoptera	Coenagrionidae	Enallagma	sp
021	001	002	000	Hemiptera	Corixidae	Sigara	sp
021	001	004	000	Hemiptera	Corixidae	Hesperocorixa	sp
021	001	008	000	Hemiptera	Corixidae	Corisella	sp
021	002	001	000	Hemiptera	Notonectidae	Notonecta	sp
021	002	002	000	Hemiptera	Notonectidae	Buenoa	sp
021	005	001	000	Hemiptera	Belostomatidae	Belostoma	sp
021	009	004	000	Hemiptera	Gerridae	Gerris	sp
023	006	001	000	Coleoptera	Haliplidae	Haliplus	sp5
023	006	001	009	Coleoptera	Haliplidae	Haliplus	subguttatus
023	006	001	020	Coleoptera	Haliplidae	Haliplus	borealis
023	006	001	030	Coleoptera	Haliplidae	Haliplus	apostolicus
023	006	001	031	Coleoptera	Haliplidae	Haliplus	blanchardi
023	006	001	032	Coleoptera	Haliplidae	Haliplus	nitens
023	006	001	033	Coleoptera	Haliplidae	Haliplus	canadensis
023	006	001	034	Coleoptera	Haliplidae	Haliplus	cribrarius
023	006	001	035	Coleoptera	Haliplidae	Haliplus	connexus
023	006	001	036	Coleoptera	Haliplidae	Haliplus	salarinus
023	006	001	037	Coleoptera	Haliplidae	Haliplus	strigatus
023	006	001	038	Coleoptera	Haliplidae	Haliplus	longulus
023	006	001	039	Coleoptera	Haliplidae	Haliplus	immaculicollis
023	006	003	020	Coleoptera	Haliplidae	Peltodytes	tortulosus
023	008	005	001	Coleoptera	Dytiscidae	Acilius	semisulcatus
023	008	005	005	Coleoptera	Dytiscidae	Acilius	sylvanus
023	008	005	006	Coleoptera	Dytiscidae	Acilius	athabascea
023	008	007	003	Coleoptera	Dytiscidae	Rhantus	binotatus
023	008	007	010	Coleoptera	Dytiscidae	Rhantus	sinuatus
023	008	007	011	Coleoptera	Dytiscidae	Rhantus	suturellus

Codes and names of species in Dr. Gundersen's collection
Report form Gundcodes.frx, spcodegund.dbf. gundcodes.ndx
on levels order thru spp

Appendix III.1. Species in Dr. Gundersen's collections

Unique list of species.

Codes				Names			
Ord	Fam	Gen	Spec	Order	Family	Genus	Species
023	008	007	012	Coleoptera	Dytiscidae	Rhantus	wallisi
023	008	007	013	Coleoptera	Dytiscidae	Rhantus	consimilis
023	008	007	014	Coleoptera	Dytiscidae	Rhantus	frontalis
023	008	008	003	Coleoptera	Dytiscidae	Thermonectus	ornaticollis
023	008	009	005	Coleoptera	Dytiscidae	Dytiscus	hybridus
023	008	009	015	Coleoptera	Dytiscidae	Dytiscus	circumcinctus
023	008	009	016	Coleoptera	Dytiscidae	Dytiscus	dauricus
023	008	009	017	Coleoptera	Dytiscidae	Dytiscus	alaskanus
023	008	009	018	Coleoptera	Dytiscidae	Dytiscus	cordieri
023	008	009	019	Coleoptera	Dytiscidae	Dytiscus	harrisii
023	008	009	020	Coleoptera	Dytiscidae	Dytiscus	fasciventris
023	008	009	021	Coleoptera	Dytiscidae	Dytiscus	verticalis
023	008	012	000	Coleoptera	Dytiscidae	Desmopachria	sp
023	008	012	003	Coleoptera	Dytiscidae	Desmopachria	convexa
023	008	016	001	Coleoptera	Dytiscidae	Graphoderus	occidentalis
023	008	016	002	Coleoptera	Dytiscidae	Graphoderus	liberus
023	008	016	005	Coleoptera	Dytiscidae	Graphoderus	fasciatocollis
023	008	016	006	Coleoptera	Dytiscidae	Graphoderus	perplexus
023	008	016	007	Coleoptera	Dytiscidae	Graphoderus	manitobensis
023	008	017	001	Coleoptera	Dytiscidae	Hydaticus	modestus
023	008	017	005	Coleoptera	Dytiscidae	Hydaticus	piceus
023	008	019	001	Coleoptera	Dytiscidae	Ilybius	fraterculus
023	008	019	004	Coleoptera	Dytiscidae	Ilybius	biguttulus
023	008	019	010	Coleoptera	Dytiscidae	Ilybius	ignarus
023	008	019	011	Coleoptera	Dytiscidae	Ilybius	denikei
023	008	019	012	Coleoptera	Dytiscidae	Ilybius	pleuriticus
023	008	019	013	Coleop[tera	Dytiscidae	Ilybius	discedeus
023	008	019	014	Coleoptera	Dytiscidae	Ilybius	subaeneus
023	008	019	015	Coleoptera	Dytiscidae	Ilybius	angustior
023	008	019	016	Coleoptera	Dytiscidae	Ilybius	incarinatus
023	008	019	017	Coleoptera	Dytiscidae	Ilybius	confusus
023	008	020	000	Coleoptera	Dytiscidae	Hygrotus	sp1
023	008	020	006	Coleoptera	Dytiscidae	Hygrotus	acaroides

Codes and names of species in Dr. Gundersen's collection
Report form Gundcodes.frx, spcodegund.dbf. gundcodes.ndx
on levels order thru spp

Appendix III.1. Species in Dr. Gundersen's collections

Unique list of species.

Codes				Names			
Ord	Fam	Gen	Spec	Order	Family	Genus	Species
023	008	020	007	Coleoptera	Dytiscidae	Hygrotus	sellatus
023	008	020	008	Coleoptera	Dytiscidae	Hygrotus	patruelis
023	008	020	009	Coleoptera	Dytiscidae	Hygrotus	nubilus
023	008	020	010	Coleoptera	Dytiscidae	Hygrotus	impressopunctatus
023	008	020	011	Coleoptera	Dytiscidae	Hygrotus	dissimilis
023	008	020	015	Coleoptera	Dytiscidae	Hygrotus	canadensis
023	008	020	016	Coleoptera	Dytiscidae	Hygrotus	compar
023	008	020	017	Coleoptera	Dytiscidae	Hygrotus	farctus
023	008	020	018	Coleoptera	Dytiscidae	Hygrotus	infuscatus
023	008	020	019	Coleoptera	Dytiscidae	Hygrotus	laccophilinus
023	008	020	020	Coleoptera	Dytiscidae	Hygrotus	picatus
023	008	020	021	Coleoptera	Dytiscidae	Hygrotus	sp2
023	008	020	022	Coleoptera	Dytiscidae	Hygrotus	hudsonieus
023	008	020	024	Coleoptera	Dytiscidae	Hygrotus	turbidus
023	008	020	025	Coleoptera	Dytiscidae	Hygrotus	tumidiventris
023	008	020	026	Coleoptera	Dytiscidae	Hygrotus	dispar
023	008	020	027	Coleoptera	Dytiscidae	Hygrotus	saturalis
023	008	020	028	Coleoptera	Dytiscidae	Hygrotus	sylvanus
023	008	021	002	Coleoptera	Dytiscidae	Hydrovatus	pustulatus
023	008	023	005	Coleoptera	Dytiscidae	Laccornis	conoideus
023	008	024	000	Coleoptera	Dytiscidae	Laccophilus	sp
023	008	024	001	Coleoptera	Dytiscidae	Laccophilus	maculosus
023	008	024	003	Coleoptera	Dytiscidae	Laccophilus	proximus
023	008	024	010	Coleoptera	Dytiscidae	Laccophilus	biguttatus
023	008	027	010	Coleoptera	Dytiscidae	Neoscutopterus	angustus
023	008	027	011	Coleoptera	Dytiscidae	Neoscutopterus	hornii
023	008	032	003	Coleoptera	Dytiscidae	Cybister	fimbriolatus
023	008	033	002	Coleoptera	Dytiscidae	Coptotomus	longulus
023	008	034	001	Coleoptera	Dytiscidae	Colymbetes	exaratas
023	008	034	006	Coleoptera	Dytiscidae	Colymbetes	sculptilis
023	008	037	010	Coleoptera	Dytiscidae	Uvarus	lacustris
023	008	037	011	Coleoptera	Dytiscidae	Uvarus	granarius
023	008	038	010	Coleoptera	Dytiscidae	Liodessus	affinis

Codes and names of species in Dr. Gundersen's collection
Report form Gundcodes.frx, spcodegund.dbf. gundcodes.ndx
on levels order thru spp

Appendix III.1. Species in Dr. Gundersen's collections

Unique list of species.

Codes				Names			
Ord	Fam	Gen	Spec	Order	Family	Genus	Species
023	008	038	011	Coleoptera	Dytiscidae	Liodessus	flavicollis
023	008	038	012	Coleoptera	Dytiscidae	Liodessus	contralli
023	008	038	013	Coleoptera	Dytiscidae	Liodessus	fuscatus
023	010	001	015	Coleoptera	Gyrinidae	Gyrinus	aquiris
023	010	001	016	Coleoptera	Gyrinidae	Gyrinus	bifarius
023	010	001	017	Coleoptera	Gyrinidae	Gyrinus	confinis
023	010	001	018	Coleoptera	Gyrinidae	Gyrinus	dichrous
023	010	001	019	Coleoptera	Gyrinidae	Gyrinus	frosti
023	010	001	020	Coleoptera	Gyrinidae	Gyrinus	hatchi
023	010	001	021	Coleoptera	Gyrinidae	Gyrinus	impressicollis
023	010	001	022	Coleoptera	Gyrinidae	Gyrinus	latilimbus
023	010	001	023	Coleoptera	Gyrinidae	Gyrinus	lecontei
023	010	001	024	Coleoptera	Gyrinidae	Gyrinus	lugens
023	010	001	025	Coleoptera	Gyrinidae	Gyrinus	marginellus
023	010	001	026	Coleoptera	Gyrinidae	Gyrinus	minutus
023	010	001	027	Coleoptera	Gyrinidae	Gyrinus	pectoralis
023	010	001	028	Coleoptera	Gyrinidae	Gyrinus	pugionis
023	010	001	029	Coleoptera	Gyrinidae	Gyrinus	ventralis
023	010	001	030	Coleoptera	Gyrinidae	Gyrinus	wallisis
023	010	003	000	Coleoptera	Gyrinidae	Gyrinus	sp
023	010	003	015	Coleoptera	Gyrinidae	Dineutus	hornii
023	010	003	016	Coleoptera	Gyrinidae	Dineutus	nigrior
023	016	012	000	Coleoptera	Hydrophilidae	Tropisternus	sp
023	016	012	015	Coleoptera	Hydrophilidae	Tropisternus	glaber
023	016	014	020	Coleoptera	Hydrophilidae	Enochrus	blatchleyi

Codes and names of species in Dr. Gundersen's collection
Report form Gundcodes.frx, spcodegund.dbf. gundcodes.ndx
on levels order thru spp

Appendix III.2. Dr. Gundersen's Collecting Sites.

Habitat code	User number	Site record #	Name	County Code	County Name	Latitude	Longitude
203	0099	1.03	3 MI NW CLEAR LAKE	71	Sherburne	45.48	94.06
305	0098	2.03	3 MI NW CLEAR LAKE	71	Sherburne	45.48	94.06
204	0103	3.03	103	71	Sherburne	45.49	94.07
204	0104	4.03	104	71	Sherburne	45.49	94.08
203	0091	5.03	lost 91	21	Douglas	0.00	0.00
211	0090	6.03	GAMES LAKE	34	Kandiyohi	45.33	95.08
102	0097	7.03	2 MI NW CLEAR LAKE	71	Sherburne	45.46	94.04
102	0096	8.03	1 MI W CLEAR LAKE	71	Sherburne	45.45	94.03
225	0102	9.03	1 MI SW HAPPY CHEF	73	Stearns	45.50	94.20
305	0101	10.03	1 MI W CO 122 & 136	73	Stearns	45.50	94.18
203	0100	11.03	CLITTY LAKE	71	Sherburne	45.41	93.89
102	0095	12.03	WARNER LAKE	73	Stearns	45.42	94.08
308	0094	13.03	HWY 10 & 52	05	Benton	45.56	94.13
305	0092	14.03	2 MI W SITE 91	05	Benton	45.57	94.12
538	0244	15.03	MAYHEW CREEK	05	Benton	45.59	94.05
538	0284	16.03	NOKASSIPPI RIVER	18	Crow Wing	46.18	94.36
212	0278	17.03	DARK SLOUGH	85	Winona	44.11	91.76
305	0277	18.03	GOODVIEW VILLAGE	85	Winona	44.07	91.72
305	0276	19.03	LAKE WINONA	85	Winona	44.05	91.68
102	0275	20.03	LAKE WINONA	85	Winona	44.04	91.64
203	0164	21.03	WHITE WATER RIVER	85	Winona	44.17	92.00
203	0163	22.03	WHITE WATER RIVER	85	Winona	44.12	92.00
516	0154	23.03	WHITE WATER RIVER	85	Winona	44.05	92.05
203	0155	24.03	WHITE WATER RIVER	85	Winona	44.05	92.05
101	0291	25.03	FROVOLD LAKE	76	Swift	45.38	95.57
740	0290	26.03	CHIPPEWA RIVER	76	Swift	45.35	95.59
213	0289	27.03	CHIPPEWA RIVER	76	Swift	45.39	95.66
204	0288	28.03	HWY 29 & HWY 104	76	Swift	45.33	95.60
211	0322	29.03	HWY 28 & E 1.6MI CO9	75	Stevens	45.57	96.08
225	0323	30.03	HWY 28 REFUGE	75	Stevens	45.57	96.01
514	0293	32.03	HIGH ISLAND CREEK	72	Sibley	44.64	94.22
212	0292	33.03	BUFFALO CREEK	72	Sibley	44.71	94.23
102	0114	34.03	IMHOLTE SLOUGH	71	Sherburne	45.45	94.03
308	0105	35.03	PICKEREL LAKE	71	Sherburne	45.48	94.06
102	0107	36.03	ROUND LAKE	71	Sherburne	45.47	94.06
308	0113	37.03	STICKNEY SLOUGH	71	Sherburne	45.46	94.04
514	0122	38.03	ELK RIVER	71	Sherburne	45.52	94.05
203	0283	39.03	HWY 6 & 32	14	Clay	46.72	96.24
203	0282	40.03	ANFINSON LAKE	14	Clay	46.80	96.26
203	0281	41.03	HWY 12 & 32	14	Clay	46.84	96.26
232	0279	42.03	HWY 75 & 83	14	Clay	46.89	96.75
515	0201	43.03	RED RIVER	14	Clay	47.09	96.82
305	0199	44.03		14	Clay	47.04	96.77
513	0272	45.03	CO RD 9 & 31	66	Rice	44.40	93.10
305	0308	46.03	FLOODED FIELD	12	Chippewa	44.93	95.72
225	0307	47.03	BY PARK	65	Renville	44.79	95.22
211	0203	48.03	POLK COUNTY LINE	60	Polk	47.50	96.81
204	0188	49.03	HOLLAND	59	Pipestone	44.12	96.14
211	0187	50.03		59	Pipestone	44.04	96.25
222	0176	51.03	SPLIT ROCK RESERVOIR	59	Pipestone	43.89	96.36
513	0177	52.03	SPLIT ROCK CREEK	59	Pipestone	43.90	96.36
204	0178	53.03	IHLEN	59	Pipestone	43.94	96.35
305	0179	54.03	IHLEN	59	Pipestone	43.94	96.35
515	0207	55.03	TWO RIVERS- S BRANCH	68	Roseau	48.65	96.39
513	0208	56.03	ROSEAU RIVER	68	Roseau	48.87	95.76
212	0209	57.03	LK OF WOODS- B WATER	68	Roseau	48.90	95.32
217	0093	58.03	DODD'S QUARRY #20	71	Sherburne	45.55	94.13
101	0135	59.03	CAMP LAKE	71	Sherburne	45.44	93.96
102	0136	60.03	CATER LAKE	71	Sherburne	45.47	94.02
513	0180	61.03	PIPESTONE NTL MNT	59	Pipestone	44.02	96.32
204	0181	62.03	10 MI HWY 75 NR PIPE	59	Pipestone	43.86	96.26

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Appendix III.2. Dr. Gundersen's Collecting Sites.

Habitat code	User number	Site record #	Name	County Code	County Name	Latitude	Longitude
308	0198	63.03	WILD RICE FIELD	56	Otter Tail	46.25	95.71
203	0197	64.03	EAGLE LAKE	56	Otter Tail	46.18	95.70
203	0196	65.03	MIDDLE LAKE- N CRNR	56	Otter Tail	46.17	95.71
204	0195	66.03	FLOODED POND	56	Otter Tail	46.14	95.70
211	0202	67.03	MARSH RIVER	54	Norman	47.45	96.82
211	0203	68.03	POLK CO LINE- DITCH	54	Norman	47.50	96.81
204	0153	69.03	CREEK E OF CHESTER	55	Olmsted	44.00	92.33
513	0165	70.03	NEAR KATHIO ST PRK	48	Mille Lacs	46.14	93.72
203	0166	71.03	NEAR KATHIO ST PARK	48	Mille Lacs	46.13	93.72
228	0167	72.03	KATHIO ST PARK	48	Mille Lacs	46.13	93.74
203	0168	73.03	KATHIO STATE PARK	48	Mille Lacs	46.13	93.78
212	0169	74.03	KATHIO STATE PARK	48	Mille Lacs	46.13	93.78
101	0170	75.03	MILLE LACS LAKE	48	Mille Lacs	46.14	93.48
102	0171	76.03	MILLE LACS- B WATER	48	Mille Lacs	46.12	93.55
203	0172	77.03	DITCH NR CAMP AREA	48	Mille Lacs	46.12	93.55
513	0204	78.03	TAMARAC RIVER	45	Marshall	48.44	96.87
212	0306	79.03	FLOODED FIELD	08	Brown	44.44	94.73
305	0305	80.03	FLOODED FIELD	08	Brown	44.37	94.74
211	0304	81.03	DITCH	08	Brown	44.37	94.69
305	0303	82.03	FLOODED FIELD	08	Brown	44.36	94.68
513	0302	83.03	FAST CLEAR STREAM	08	Brown	44.36	94.63
514	0301	84.03	SM CRK W NEW ULM	08	Brown	44.36	94.59
101	0300	85.03	LK COTTONWOOD	08	Brown	44.28	94.46
507	0299	86.03	LK COTTONWOOD-CAMP G	08	Brown	44.28	94.46
212	0298	87.03	MN RIVER BACK WATER	52	Nicollet	44.31	94.43
203	0297	88.03	POND NEAR COURTLAND	52	Nicollet	44.27	94.30
308	0296	89.03	3M	52	Nicollet	44.27	94.24
211	0295	90.03	DRAINAGE DITCH	52	Nicollet	44.21	94.11
538	0285	91.03	EAGLE CREEK	49	Morrison	45.95	94.39
434	0218	92.03	BELTRAM CO LN- BOG	04	Beltrami	48.34	94.54
232	0219	93.03	BELTR CO LN- WOODS	04	Beltrami	48.34	94.54
515	0221	94.03	CORMORANT RIVER	04	Beltrami	47.88	94.44
204	0220	95.03	KALLIHER	04	Beltrami	47.96	94.45
305	0274	96.03	HOW'S IT GOING MARK?	25	Goodhue	44.37	92.60
204	0273	97.03	HWY 9 MEETS CO 56	25	Goodhue	44.40	92.81
212	0152	98.03	ZUMBROTA RIVER- B W	25	Goodhue	44.28	92.68
212	0151	99.03	CANNON RIVER- B WATR	25	Goodhue	44.51	92.90
513	0150	100.03	PINE CREEK	25	Goodhue	44.54	92.89
203	0112	101.03	CO RD 60 PND-SITE 99	05	Benton	45.57	94.13
203	0111	102.03	TWIN PNDS- SITE 91	05	Benton	45.57	94.07
305	SC3	103.03	E. ST. GERMAIN POND	05	Benton	45.57	94.13
305	SC2	104.03	DAIRY QUEEN POND	05	Benton	45.56	94.13
211	SC13	105.03	CR BEFORE SITE 91	05	Benton	45.57	94.11
203	SC10	106.03	TWIN PNDS- SITE 91	05	Benton	45.57	94.07
204	SC12	107.03	POND NR DONOVAN LK	05	Benton	45.57	94.05
102	SC11	108.03	DONAVAN LAKE	05	Benton	45.57	94.06
535	0141	109.03	ST. FRANCIS RIVER	05	Benton	45.66	93.88
535	0134	110.03	ST. FRANCIS RIVER	05	Benton	45.64	93.86
535	0145	111.03	ST. FRANCIS RIVER	05	Benton	45.64	93.87
515	0324	112.03	ELLEN'S TRAILER PRK	05	Benton	45.59	93.83
515	SC7	113.03	WATAB CREEK	73	Stearns	45.62	94.21
102	0116	114.03	CLEARWATER RIVER DAM	73	Stearns	45.43	94.08
308	0115	115.03	115	73	Stearns	45.42	94.09
514	0109	116.03	ST AUGUSTA CREEK	73	Stearns	45.45	94.19
535	0144	117.03	LUXEMBURG CREEK	73	Stearns	45.46	94.22
204	0131	118.03	KNUTSON POND	73	Stearns	45.46	94.28
203	0174	119.03	SM LK FROM I94 CONST	73	Stearns	45.50	94.23
204	0175	120.03	RD SIDE DITCH- #173	73	Stearns	45.50	94.23
204	0173	121.03	SM PND OFF HWY 15	73	Stearns	45.50	94.23
513	0117	122.03	SPORTSMAN'S ISLAND	73	Stearns	45.52	94.15
514	0118	123.03	BEAVER ISLS BELW DAM	73	Stearns	45.54	94.14

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Appendix III.2. Dr. Gundersen's Collecting Sites.

Habitat code	User number	Site record #	Name	County Code	County Name	Latitude	Longitude
514	0119	124.03	BEAVER ISLS ABOV DAM	73	Stearns	45.56	94.16
101	0130	125.03	LAKE GEORGE	73	Stearns	45.55	94.16
514	0120	126.03	WILSON PARK	73	Stearns	45.58	94.13
514	0140	127.03	SAUK RI- HEIM'S MILL	73	Stearns	45.59	94.18
515	0110	128.03	WATAB R- ALSO #07	73	Stearns	45.62	94.21
514	0108	129.03	SAUK RIVER	73	Stearns	45.57	94.23
513	0142	130.03	TRIB OF WATAB CR	73	Stearns	45.62	94.29
305	0133	131.03	POND NR WATAB LAKE	73	Stearns	45.61	94.29
410	0121	132.03	WILSON PARK	73	Stearns	45.64	94.33
203	0123	133.03	COLLEGE VILLE PONDS	73	Stearns	45.59	94.39
305	0267	134.03	EQUISETAM MARSH	38	Lake	47.56	91.65
212	0266	135.03	SAND RIVER	38	Lake	47.61	91.65
410	0265	136.03	HWY 2 NEAR WAMPUS LK	38	Lake	47.64	91.63
204	0264	137.03	KIWADINIPI HOC SCHL	38	Lake	47.73	91.66
434	0263	138.03	NEAR BEAVER HUT LK	38	Lake	47.73	91.65
306	0262	139.03	NEAR DUNNIGAN LK	38	Lake	47.72	91.65
101	0261	140.03	EAST CHUB LAKE	38	Lake	47.68	91.62
515	0260	141.03	STONEY RIVER	38	Lake	47.66	91.60
308	0259	142.03	NEAR CAMPERS LAKE	38	Lake	47.65	91.58
308	0258	143.03	NEAR CAMPERS LAKE	38	Lake	47.66	91.58
203	0257	144.03	TEAMSTER LAKE	38	Lake	47.65	91.54
207	0256	145.03	NEAR GEGOKA LAKE	38	Lake	47.65	91.47
513	0255	146.03	WEISS RIVER	38	Lake	47.65	91.46
204	0254	147.03	HWY 1 NEAR WEISS R	38	Lake	47.64	91.44
306	0251	148.03	BOG NEAR SLATE LK	38	Lake	47.68	91.64
209	0250	149.03	DUMBBELL LAKE	38	Lake	47.62	91.31
230	0249	150.03	POND NEAR SITE 248	38	Lake	47.62	91.34
410	0248	151.03	PITCHER PLANT BOG	38	Lake	47.62	91.34
204	0247	152.03	N-19	38	Lake	47.62	91.39
211	0246	153.03	MURPHY CITY	38	Lake	47.50	91.32
102	0242	154.03	SLATE LAKE	38	Lake	47.69	91.63
203	0240	155.03	BIRCH LAKE -K5	38	Lake	47.82	91.79
318	0245	156.03	LAKE SUPERIOR	38	Lake	47.12	91.51
209	0269	157.03	TOIMI CREEK	38	Lake	47.29	91.66
538	0268	158.03	CLOQUET RIVER	38	Lake	47.35	91.66
211	0317	159.03	S FORK YELLOW BNK RI	37	Lac Qui Parle	45.04	96.44
305	0316	160.03	FLORIDA CREEK	37	Lac Qui Parle	44.93	96.32
203	0315	161.03	1.5 MI S HADENVILLE	37	Lac Qui Parle	44.99	96.31
225	0314	162.03	HWYS 17 X 40	37	Lac Qui Parle	45.01	96.25
305	0313	163.03	FLOODED MOTEL LAWN	37	Lac Qui Parle	45.01	96.19
204	0312	164.03	MADISON	37	Lac Qui Parle	45.01	96.13
211	0311	165.03	FLOWING DITCH	37	Lac Qui Parle	45.01	95.98
940	0310	166.03	SHADE END OF #309	37	Lac Qui Parle	45.03	95.88
203	0309	167.03	LAC QUI PARLE ST PRK	37	Lac Qui Parle	45.03	95.88
305	0205	168.03	EAST OF DONALDSON	35	Kittson	48.57	96.88
211	0206	169.03	LOWR TWIN LK- DITCH	35	Kittson	48.61	96.45
515	0207	170.03	S BRANCH TWO RIVERS	35	Kittson	48.64	96.39
203	0182	171.03	ROCK RIVER	67	Rock	43.66	96.20
203	0183	172.03	ROADSIDE POND	67	Rock	43.65	96.11
204	0193	173.03	DITCH NR DOUG CO LN	26	Grant	46.02	95.80
102	0194	174.03	PELICAN LK- E CORNER	26	Grant	46.05	95.83
536	0189	175.03	REDWOOD RIVER	42	Lyon	44.37	95.92
102	0185	176.03	STRING LAKE	17	Cottonwood	43.86	95.20
513	0186	177.03	HERON LAKE OUTLET	17	Cottonwood	43.86	95.28
212	0184	178.03	DES MOINES RIVER	32	Jackson	43.72	95.05
102	0243	179.03	BIG SANDY LAKE	01	Aitkin	46.73	93.30
211	0226	180.03	HWYS 169 X 54	01	Aitkin	46.59	93.61
203	0222	181.03	BY DOGFISH LAKE	18	Crow Wing	46.50	93.86
513	0217	182.03	RAPID RIVER	39	Lake of the Woods	48.53	94.56
232	0216	183.03	8 MI S BAUDETTE	39	Lake of the Woods	48.58	94.56
211	0215	184.03	6 MI S BAUDETTE	39	Lake of the Woods	48.61	94.57

Report form: HabcodeJCH.frx, sites.dbf indexed on siterecno, county.dbf on countycode, key = sites->county.

Appendix III.2. Dr. Gundersen's Collecting Sites.

Habitat code	User number	Site record #	Name	County Code	County Name	Latitude	Longitude
212	0214	185.03	BAUDETTE RIVER	39	Lake of the Woods	48.71	94.60
204	0213	186.03	GRACETON	39	Lake of the Woods	48.74	94.85
513	0212	187.03	TWIDDLE DEE	39	Lake of the Woods	48.75	94.91
305	0211	188.03	ROADSIDE DITCH	39	Lake of the Woods	48.77	95.00
513	0210	189.03	TOMATO CREEK	39	Lake of the Woods	48.78	95.02
516	0225	190.03	PRAIRIE RIVER	01	Aitkin	47.24	93.48
515	0162	191.03	MONEY CREEK	23	Filhmore	43.82	92.03
204	0161	192.03	TRIB FRM BADGER CR	28	Houston	43.72	91.57
538	0160	193.03	BADGER CREEK	28	Houston	43.69	91.55
204	0159	194.03	NO FORK CROOKED CR	28	Houston	43.63	91.45
513	0158	195.03	N FORK CROOKED CR	28	Houston	43.63	91.43
513	0157	196.03	N FORK CROOKED CR	28	Houston	43.63	91.43
515	0156	197.03	BEAVER CREEK	28	Houston	43.64	91.58
102	0318	198.03	A SMALL LAKE	06	Big Stone	45.39	96.39
204	0319	199.03	ELI LAKE	06	Big Stone	45.46	96.43
102	0321	200.03	ELI LAKE	06	Big Stone	45.46	96.42
204	HC5	201.03	HOLMES CITY TWP	21	Douglas	45.78	95.61
102	HC1	202.03	MUD LAKE	21	Douglas	45.78	95.57
410	HC2	203.03	S OF LAKE RACHEL	21	Douglas	45.79	95.55
204	HC3	204.03	EAST OLAF LAKE	21	Douglas	45.76	95.56
204	HC4	205.03	HOLMES CITY TWP	21	Douglas	45.76	95.61
204	HC6	206.03	HOLMES CITY TWP	21	Douglas	45.80	95.59
204	HC7	207.03	HOLMES CITY TWP	21	Douglas	45.81	95.59
305	HC8	208.03	HOLMES CITY TWP	21	Douglas	45.79	95.51
209	HC9	209.03	PETE NELSON LAKE	21	Douglas	45.85	95.57
209	HC10	210.03	HOLMES CITY TWP	21	Douglas	45.85	95.52
204	HC11	211.03	HOLMES CITY TWP	21	Douglas	45.84	95.52
204	HC12	212.03	SOUTH KRON LAKES	21	Douglas	45.83	95.58
102	L2	213.03	LUND TWP	21	Douglas	46.05	95.65
102	L1	214.03	LAKE CINA	21	Douglas	46.04	95.66
304	L3	215.03	LUND TWP	21	Douglas	46.06	95.66
102	L4	216.03	LUND TWP	21	Douglas	46.02	95.70
102	L5	217.03	LUND TWP	21	Douglas	46.02	95.72
102	L6	218.03	LUND TWP	21	Douglas	46.04	95.73
203	L7	219.03	LUND TWP	21	Douglas	46.05	95.73
204	L8	220.03	LUND TWP	21	Douglas	46.06	95.74
204	L9	221.03	LUND TWP	21	Douglas	46.06	95.67
204	L10	222.03	LUND TWP	21	Douglas	46.03	95.73
102	L11	223.03	LUND TWP	21	Douglas	46.05	95.76
102	L12	224.03	LAKE CHRISTINEA	21	Douglas	46.10	95.69
102	MV1	225.03	MILLERVILLE TWP	21	Douglas	46.09	95.52
102	MV2	226.03	MILLERVILLE TWP	21	Douglas	46.10	95.62
102	MV3	227.03	HOAKENSON LAKE	21	Douglas	46.10	95.63
204	MV4	228.03	MILLERVILLE TWP	21	Douglas	45.09	95.62
102	MV5	229.03	MILLERVILLE TWP	21	Douglas	46.03	95.63
204	MV6	230.03	MILLERVILLE TWP	21	Douglas	46.04	95.63
102	MV7	231.03	STOCKHAVEN LAKE	21	Douglas	46.05	95.64
102	MV8	232.03	STOCKHOUSEN LAKE	21	Douglas	46.06	95.64
306	MV9	233.03	MILLERVILLE TWP	21	Douglas	46.09	95.64
305	MV10	234.03	MILLERVILLE TWP	21	Douglas	46.09	95.55
305	LV1	235.03	LEAF VALLEY TWP	21	Douglas	46.04	95.49
305	LV2	236.03	LEAF VALLEY TWP	21	Douglas	46.05	95.49
204	LV3	237.03	LEAF VALLEY TWP	21	Douglas	46.07	95.50
102	LV4	238.03	LEAF VALLEY TWP	21	Douglas	46.03	95.42
306	LV5	239.03	LEAF VALLEY TWP	21	Douglas	46.04	95.46
305	LV7	240.03	LEAF VALLEY TWP	21	Douglas	46.04	95.46
306	LV8	241.03	LEAF VALLEY TWP	21	Douglas	46.03	95.47
212	LV9	242.03	CHIPPEWA RIVER	21	Douglas	46.03	95.48
204	LV10	243.03	LEAF VALLEY TWP	21	Douglas	46.07	95.52
306	LV11	244.03	LEAF VALLEY TWP	21	Douglas	46.08	95.42
204	LV12	245.03	LEAF VALLEY TWP	21	Douglas	46.03	95.40

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Appendix III.2. Dr. Gundersen's Collecting Sites.

Habitat code	User number	Site record #	Name	County Code	County Name	Latitude	Longitude
306	M1	246.03	MILTONA TWP	21	Douglas	46.05	95.51
306	M2	247.03	MILTONA TWP	21	Douglas	46.06	95.37
204	M3	248.03	LAKE IRENE- ADJ PND	21	Douglas	46.06	95.32
207	SH2	250.03	SPRUCE HILL TWP	21	Douglas	46.09	95.25
209	SH3	251.03	SPRUCE HILL TWP	21	Douglas	46.11	95.21
306	SH4	252.03	SPRUCE HILL TWP	21	Douglas	46.09	95.20
306	SH5	253.03	SPRUCE HILL TWP	21	Douglas	46.09	95.20
102	SH6	254.03	SPRUCE HILL TWP	21	Douglas	46.11	95.19
204	O1	255.03	NELSON	21	Douglas	45.89	95.26
207	O2	256.03	BIRD LAKE	21	Douglas	45.90	95.20
204	O3	257.03	BIRD LAKE	21	Douglas	45.90	95.20
102	O4	258.03	BIRD LAKE	21	Douglas	45.90	95.20
204	O5	259.03	OSAKIS TWP	21	Douglas	45.89	95.18
513	O6	260.03	FAIRFIELD CREEK	21	Douglas	45.89	95.22
212	OR1	261.03	ENGLISH GROVE LK	21	Douglas	45.77	95.19
204	OR2	262.03	ORANGE TWP	21	Douglas	45.77	95.17
305	OR3	263.03	ORANGE TWP	21	Douglas	45.79	95.20
204	OR4	264.03	ORANGE TWP	21	Douglas	45.82	95.25
204	OR5	265.03	ORANGE TWP	21	Douglas	45.82	95.20
102	OR6	266.03	HERBERGER LAKE	21	Douglas	45.81	95.14
204	OR7	267.03	ORANGE TWP	21	Douglas	45.84	95.15
102	OR8	268.03	ORANGE TWP	21	Douglas	45.84	95.15
209	S1	269.03	SOLEM TWP	21	Douglas	45.79	95.65
306	S2	270.03	SOLEM TWP	21	Douglas	45.78	95.65
306	S3	271.03	SOLEM TWP	21	Douglas	45.82	95.70
102	S4	272.03	SOLEM LAKE	21	Douglas	45.81	95.64
305	S5	273.03	SOLEM TWP	21	Douglas	45.80	95.69
204	S6	274.03	SOLEM TWP	21	Douglas	45.77	95.69
204	S7	275.03	SOLEM TWP	21	Douglas	45.77	95.70
305	S8	276.03	SOLEM TWP	21	Douglas	45.77	95.71
204	S9	277.03	SOLEM TWP	21	Douglas	45.78	95.74
102	S10	278.03	SOLEM TWP	21	Douglas	45.79	95.73
305	S11	279.03	SOLEM TWP	21	Douglas	45.81	95.74
203	S12	280.03	SOLEM TWP	21	Douglas	45.82	95.74
308	S13	281.03	SOLEM TWP	21	Douglas	45.82	95.66
203	U1	282.03	URNESS TWP	21	Douglas	45.87	95.64
102	U2	283.03	BY LAKE THORSTAD	21	Douglas	45.88	95.64
102	U3	284.03	HANEQUE LAKE	21	Douglas	45.90	95.67
204	U4	285.03	URNESS TWP	21	Douglas	45.90	95.72
204	U5	286.03	URNESS TWP	21	Douglas	45.88	95.71
207	U6	287.03	URNESS TWP	21	Douglas	45.88	95.72
204	U7	288.03	URNESS TWP	21	Douglas	45.88	95.73
102	U8	289.03	URNESS TWP	21	Douglas	45.85	95.64
102	U9	290.03	LAKE VENUS	21	Douglas	45.89	95.70
204	U10	291.03	LAKE VENUS	21	Douglas	45.89	95.70
102	MO1	292.03	ESALA LAKE	21	Douglas	45.88	95.62
204	MO2	293.03	MOE TWP	21	Douglas	45.88	95.64
102	MO3	294.03	MOE TWP	21	Douglas	45.86	95.63
305	MO4	295.03	MOE TWP	21	Douglas	45.86	95.61
102	MO5	296.03	MOE TWP	21	Douglas	45.86	95.61
102	MO6	297.03	ELK LAKE	21	Douglas	45.92	95.51
308	MO7	298.03	MOE TWP	21	Douglas	45.85	95.54
102	E1	299.03	SOLBERG LAKE	21	Douglas	45.95	95.77
102	E2	300.03	DAVIDSON LAKE	21	Douglas	45.96	95.76
102	E3	301.03	HUBRID LAKE	21	Douglas	45.96	95.76
102	E4	302.03	EVANSVILLE TWP	21	Douglas	46.01	95.70
101	E5	303.03	OLSON LAKE	21	Douglas	46.01	95.71
209	E6	304.03	EVANSVILLE TWP	21	Douglas	45.94	95.64
101	E7	305.03	LONG LAKE	21	Douglas	45.96	95.67
204	E8	306.03	MAHLA LAKE	21	Douglas	46.00	95.75
102	E9	307.03	MAHLA LAKE	21	Douglas	46.00	95.75

Appendix III.2. Dr. Gundersen's Collecting Sites.

Habitat code	User number	Site record #	Name	County Code	County Name	Latitude	Longitude
203	E10	308.03	BAH LAKE	21	Douglas	46.01	95.77
204	E11	309.03	EVANSVILLE TWP	21	Douglas	45.99	95.77
204	B1	310.03	BRANDON TWP	21	Douglas	45.96	95.60
204	B2	311.03	BRANDON TWP	21	Douglas	45.96	95.61
209	B3	312.03	BRANDON TWP	21	Douglas	45.94	95.54
305	B4	313.03	BRANDON TWP	21	Douglas	45.97	95.54
102	B5	314.03	ALDRICH LAKE	21	Douglas	45.96	95.55
204	B6	315.03	BRANDON TWP	21	Douglas	45.96	95.57
206	B7	316.03	BRANDON TWP	21	Douglas	46.02	95.60
204	B8	317.03	BRANDON TWP	21	Douglas	45.95	95.51
204	B9	318.03	MUD LAKE	21	Douglas	45.96	95.58
204	B11	319.03	MOON LAKE	21	Douglas	45.96	95.58
102	B12	320.03	BRANDON TWP	21	Douglas	45.97	95.63
209	B13	321.03	MUD LAKE	21	Douglas	45.96	95.58
203	B14	322.03	BRANDON TWP	21	Douglas	45.93	95.53
102	B15	323.03	BRANDON TWP	21	Douglas	45.95	95.60
410	A3	326.03	ALEXANDRIA TWP	21	Douglas	45.90	95.37
308	A4	327.03	ALEXANDRIA TWP	21	Douglas	45.91	95.31
204	A5	328.03	ALEXANDRIA TWP	21	Douglas	45.92	95.30
207	A6	329.03	ALEXANDRIA TWP	21	Douglas	45.91	95.35
204	A8	331.03	ALEXANDRIA TWP	21	Douglas	45.89	95.30
207	A9	332.03	ALEXANDRIA TWP	21	Douglas	45.90	95.29
204	A10	333.03	ALEXANDRIA TWP	21	Douglas	45.89	95.29
204	A11	334.03	ALEXANDRIA TWP	21	Douglas	45.90	95.30
207	A12	335.03	ALEXANDRIA TWP	21	Douglas	45.91	95.31
203	BR1	336.03	BELLE RIVER TWP	21	Douglas	45.99	95.26
410	BR2	337.03	BELLE RIVER TWP	21	Douglas	45.99	95.24
204	BR3	338.03	BELLE RIVER TWP	21	Douglas	46.02	95.23
204	BR4	339.03	BELLE RIVER TWP	21	Douglas	45.95	96.26
203	BR5	340.03	BELLE RIVER TWP	21	Douglas	46.02	95.24
305	BR6	341.03	BELLE RIVER TWP	21	Douglas	45.98	95.25
204	BR7	342.03	BELLE RIVER TWP	21	Douglas	45.98	95.24
513	BR8	343.03	CALAMUS CREEK	21	Douglas	45.97	95.20
410	BR9	344.03	CALAMUS CREEK BOG	21	Douglas	45.96	95.20
204	BR10	345.03	BELLE RIVER TWP	21	Douglas	45.94	95.16
513	BR11	346.03	LONG PRAIRIE RIVER	21	Douglas	45.98	95.17
514	C1	347.03	CARLOS TWP	21	Douglas	45.95	95.63
306	C2	348.03	CARLOS TWP	21	Douglas	46.00	95.38
306	C3	349.03	CARLOS TWP	21	Douglas	46.01	95.38
306	C4	350.03	CARLOS TWP	21	Douglas	46.01	95.37
207	C5	351.03	CARLOS TWP	21	Douglas	46.02	95.38
306	C6	352.03	CARLOS TWP	21	Douglas	46.02	95.37
102	C7	353.03	LAURA LAKE	21	Douglas	45.96	95.35
204	C8	354.03	CARLOS TWP	21	Douglas	45.96	95.35
203	C9	355.03	CARLOS TWP	21	Douglas	45.94	95.31
204	C10	356.03	CARLOS TWP	21	Douglas	46.00	95.31
204	C11	357.03	CARLOS TWP	21	Douglas	46.00	95.31
212	C12	358.03	LONG PRAIRIE RIVER	21	Douglas	46.01	95.27
204	C13	359.03	CARLOS TWP	21	Douglas	46.01	95.34
306	C14	360.03	CARLOS TWP	21	Douglas	46.01	95.36
305	C15	361.03	CARLOS TWP	21	Douglas	0.00	0.00
306	C16	362.03	CARLOS TWP	21	Douglas	46.02	95.39
102	H1	363.03	LOVERS LAKE	21	Douglas	45.77	95.31
410	H2	364.03	HUDSON TWP	21	Douglas	45.83	95.37
204	H3	365.03	HUDSON TWP	21	Douglas	45.83	95.37
204	H4	366.03	HUDSON TWP	21	Douglas	45.82	95.37
211	H5	367.03	HUDSON TWP	21	Douglas	45.80	95.38
204	H6	368.03	HUDSON TWP	21	Douglas	45.79	95.34
204	H7	369.03	HUDSON TWP	21	Douglas	45.79	95.34
305	H8	370.03	HUDSON TWP	21	Douglas	45.78	95.34
209	H9	371.03	HUDSON TWP	21	Douglas	45.77	95.34

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Appendix III.2. Dr. Gundersen's Collecting Sites.

Habitat code	User number	Site record #	Name	County Code	County Name	Latitude	Longitude
209	H10	372.03	HUDSON TWP	21	Douglas	45.77	95.34
204	H11	373.03	HUDSON TWP	21	Douglas	45.76	95.34
204	H12	374.03	HUDSON TWP	21	Douglas	45.85	95.32
204	H13	375.03	HUDSON TWP	21	Douglas	45.82	95.34
204	H14	376.03	HUDSON TWP	21	Douglas	45.80	95.35
204	H15	377.03	HUDSON TWP	21	Douglas	45.80	95.33
204	H16	378.03	HUDSON TWP	21	Douglas	45.80	95.31
102	H17	379.03	SKUNK LAKE	21	Douglas	45.78	95.30
306	I1	380.03	IDA TWP	21	Douglas	45.94	95.45
204	I2	381.03	IDA TWP	21	Douglas	45.95	95.44
207	I3	382.03	IDA TWP	21	Douglas	45.45	95.44
204	I4	383.03	KLOEHN'S LAKE	21	Douglas	45.94	95.46
204	I5	384.03	IDA TWP	21	Douglas	45.95	95.48
305	I6	385.03	IDA TWP	21	Douglas	45.96	95.46
305	I7	386.03	IDA TWP	21	Douglas	46.01	95.46
102	I8	387.03	IDA TWP	21	Douglas	46.00	95.51
204	LM1	388.03	LAKE MARY TWP	21	Douglas	45.86	95.39
513	LM2	389.03	LAKE MARY TWP	21	Douglas	45.84	95.43
305	LM3	390.03	LAKE MARY TWP	21	Douglas	45.84	95.44
513	LM4	391.03	LAKE MARY TWP	21	Douglas	45.84	95.39
305	LM5	392.03	LAKE MARY TWP	21	Douglas	45.77	95.39
204	LM6	393.03	LAKE MARY TWP	21	Douglas	45.83	95.39
204	LG1	394.03	LA GRANDE TWP	21	Douglas	45.90	95.47
102	LG2	395.03	BERGLINS LAKE	21	Douglas	45.90	95.48
207	LG3	396.03	LA GRANDE TWP	21	Douglas	45.90	95.50
306	LG4	397.03	LA GRANDE TWP	21	Douglas	45.90	95.50
204	LG5	398.03	N UNION LAKE	21	Douglas	45.92	95.43
203	LG6	399.03	LA GRANDE TWP	21	Douglas	45.89	95.49
207	LG7	400.03	LA GRANDE TWP	21	Douglas	45.92	95.45
204	LG8	401.03	LA GRANDE TWP	21	Douglas	45.90	95.49
308	LG9	402.03	LA GRANDE TWP	21	Douglas	45.93	95.47
306	LG10	403.03	LA GRANDE TWP	21	Douglas	45.93	95.48
102	LG11	404.03	LA GRANDE TWP	21	Douglas	45.91	95.49
209	0002	406.03	2	15	Clearwater	0.00	0.00
431	0004	408.03	4	29	Hubbard	0.00	0.00
209	0005	409.03	5	15	Clearwater	0.00	0.00
204	0006	410.03	6-PEACE PIPE LOOKOUT	15	Clearwater	0.00	0.00
306	0007	411.03	7	15	Clearwater	0.00	0.00
423	0008	412.03	8-E TWIN LAKE	29	Hubbard	0.00	0.00
204	0009	413.03	9	29	Hubbard	0.00	0.00
209	0010	414.03	10	29	Hubbard	0.00	0.00
204	0011	415.03	11	29	Hubbard	0.00	0.00
305	0012	416.03	12	29	Hubbard	0.00	0.00
209	0013	417.03	13	29	Hubbard	0.00	0.00
204	0014	418.03	14	29	Hubbard	0.00	0.00
308	0015	419.03	15	29	Hubbard	0.00	0.00
203	0016	420.03	16	29	Hubbard	0.00	0.00
204	0017	421.03	17	29	Hubbard	0.00	0.00
306	0018	422.03	18	29	Hubbard	0.00	0.00
423	0020	424.03	TWIN LAKES	29	Hubbard	0.00	0.00
204	0021	425.03	21	29	Hubbard	0.00	0.00
204	0022	426.03	22	29	Hubbard	0.00	0.00
102	0023	427.03	DEMING LAKE	29	Hubbard	0.00	0.00
204	0024	428.03	24	29	Hubbard	0.00	0.00
203	0025	429.03	LITTLE MANTRAP LK	29	Hubbard	0.00	0.00
410	0026	430.03	LAKE FRAZIER	03	Becker	0.00	0.00
305	0027	431.03	27- TOIMI CR ??	03	Becker	0.00	0.00
305	0027	431.03	27	03	Becker	0.00	0.00
204	0029	433.03	29	03	Becker	0.00	0.00
305	0030	434.03	30	03	Becker	0.00	0.00
306	0031	435.03	31	03	Becker	0.00	0.00

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Appendix III.2. Dr. Gundersen's Collecting Sites.

Habitat code	User number	Site record #	Name	County Code	County Name	Latitude	Longitude
306	0032	436.03	32	03	Becker	0.00	0.00
306	0033	437.03	33	15	Clearwater	0.00	0.00
305	0034	438.03	34	03	Becker	0.00	0.00
204	0035	439.03	35	03	Becker	0.00	0.00
203	0036	440.03	TWO ISLAND LAKE	03	Becker	0.00	0.00
209	0037	441.03	37	03	Becker	0.00	0.00
513	0038	442.03	MISSISSIPPI RIVER	15	Clearwater	0.00	0.00
513	0039	443.03	MISSISSIPPI RIVER	15	Clearwater	0.00	0.00
515	0040	444.03	SUCKER CREEK	15	Clearwater	0.00	0.00
513	0041	445.03	SUCKER CREEK	15	Clearwater	0.00	0.00
513	0042	446.03	SUCKER CREEK	15	Clearwater	0.00	0.00
101	0043	447.03	LONG LAKE	15	Clearwater	0.00	0.00
513	0044	448.03	NICOLLET CREEK	15	Clearwater	0.00	0.00
102	0045	449.03	ELK LAKE	15	Clearwater	0.00	0.00
513	0046	450.03	CHAMBERS CREEK	15	Clearwater	0.00	0.00
102	0047	451.03	LAKE ITASCA	15	Clearwater	0.00	0.00
102	0048	452.03	MARY LAKE	29	Hubbard	0.00	0.00
514	0049	453.03	49	29	Hubbard	0.00	0.00
306	0050	454.03	50	15	Clearwater	0.00	0.00
203	0051	455.03	51	15	Clearwater	0.00	0.00
306	0052	456.03	ICE HOUSE POND	15	Clearwater	0.00	0.00
102	0053	457.03	LAKE ITASCA	15	Clearwater	0.00	0.00
204	0054	458.03	54	15	Clearwater	0.00	0.00
327	0055	459.03	55	15	Clearwater	0.00	0.00
305	0056	460.03	56	15	Clearwater	0.00	0.00
306	0057	461.03	57	15	Clearwater	0.00	0.00
308	0058	462.03	58	15	Clearwater	0.00	0.00
204	0059	463.03	59	15	Clearwater	0.00	0.00
204	0060	464.03	60	15	Clearwater	0.00	0.00
209	0061	465.03	61	15	Clearwater	0.00	0.00
211	0062	466.03	62	15	Clearwater	0.00	0.00
524	0063	467.03	SQUAW LAKE	15	Clearwater	0.00	0.00
524	0064	468.03	SQUAW LAKE	15	Clearwater	0.00	0.00
203	0065	469.03	BEAVER POND	15	Clearwater	0.00	0.00
305	0066	470.03	66	15	Clearwater	0.00	0.00
203	0067	471.03	ALLEN LAKE	15	Clearwater	0.00	0.00
230	0068	472.03	ALLEN LAKE	15	Clearwater	0.00	0.00
306	0069	473.03	69	15	Clearwater	0.00	0.00
306	0070	474.03	70	15	Clearwater	0.00	0.00
306	0071	475.03	71	15	Clearwater	0.00	0.00
209	0072	476.03	72	15	Clearwater	0.00	0.00
305	0073	477.03	73	15	Clearwater	0.00	0.00
305	0074	478.03	74	15	Clearwater	0.00	0.00
101	0075	479.03	75	15	Clearwater	0.00	0.00
101	0076	480.03	JOSEPHINE LAKE	29	Hubbard	0.00	0.00
101	0077	481.03	ARCO LAKE	29	Hubbard	0.00	0.00
203	0078	482.03	78	15	Clearwater	0.00	0.00
209	0079	483.03	79	03	Becker	0.00	0.00
203	0080	484.03	80	03	Becker	0.00	0.00
102	0081	485.03	HERNANDO DESOTO LK	03	Becker	0.00	0.00
102	0082	486.03	HERNANDO DESOTO LK	03	Becker	0.00	0.00
102	0083	487.03	MIKENNA LAKE	15	Clearwater	0.00	0.00
204	0085	488.03	85	03	Becker	0.00	0.00
207	0086	489.03	SUCKER CREEK	15	Clearwater	0.00	0.00
204	0088	490.03	88	15	Clearwater	0.00	0.00
207	0089	491.03	89	15	Clearwater	0.00	0.00
940	2006	492.03	AURORA	69	St. Louis	47.53	92.24
940	2083	493.03	HIBBING	69	St. Louis	47.44	92.94
940	2038	494.03	CHISHOLM	69	St. Louis	47.48	92.88
940	2059	495.03	ELY	69	St. Louis	47.92	91.83
940	2185	496.03	TOWER	69	St. Louis	47.81	92.29

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Appendix III.2. Dr. Gundersen's Collecting Sites.

Habitat code	User number	Site record #	Name	County Code	County Name	Latitude	Longitude
940	2002	497.03	ALBON	69	St. Louis	46.97	92.58
940	2077	498.03	GRANITE FALLS	87	Yellow Medicine	44.88	95.53
940	2153	499.03	ROCKFORD	86	Wright	45.08	93.73
940	2204	500.03	WINONA	85	Winona	44.03	91.60
940	2093	501.03	JOHN HATCH ST PRK	85	Winona	44.17	91.83
940	2177	502.03	STILLWATER	82	Washington	45.02	92.83
940	2087	503.03	HUNTERSVILLE	80	Wadena	46.81	53.00
940	2023	504.03	BROWNS VALLEY	78	Traverse	45.57	96.83
940	2040	505.03	CLARISSA	77	Todd	46.12	94.95
940	2121	506.03	MORRIS	75	Stevens	45.58	95.92
940	2134	507.03	OWATONNA	74	Steele	44.08	93.23
940	2174	508.03	SPRING HILL	73	Stearns	45.52	94.83
940	2207	509.03	ZIMMERMAN	71	Sherburne	45.45	93.58
940	2094	510.03	JORDAN	70	Scott	44.67	93.63
940	2192	511.03	WARROAD	68	Roseau	48.92	95.33
940	2137	512.03	PELAN	68	Roseau	48.63	96.38
940	2112	513.03	MAGNOLIA	67	Rock	43.65	96.07
940	2108	514.03	LUVERNE	67	Rock	43.67	96.22
940	2130	515.03	NORTHFIELD	66	Rice	44.45	93.17
940	2082	516.03	HECTOR	65	Renville	44.75	94.70
940	2132	517.03	OLIVIA	65	Renville	44.78	95.00
940	2145	518.03	PLUMMER	63	Red Lake	47.92	96.05
940	2228	519.03	LAKE OWASSO	62	Ramsey	45.05	93.12
940	2178	520.03	SUCKER LAKE	62	Ramsey	45.07	93.10
940	2175	521.03	STARBUCK	61	Pope	45.62	95.55
940	2063	522.03	FARWELL	61	Pope	45.75	95.62
940	2126	523.03	NIELSVILLE	60	Polk	47.53	96.80
940	2048	524.03	CROOKSTON	60	Polk	47.75	96.62
940	2186	525.03	TROSKY	59	Pipestone	43.88	96.25
940	2173	526.03	SPLIT ROCK CR ST RES	59	Pipestone	43.88	96.37
940	2088	527.03	IHLEN	59	Pipestone	43.90	96.38
940	2144	528.03	PIPESTONE	59	Pipestone	44.00	96.33
940	2085	529.03	HOLLAND	59	Pipestone	44.08	96.20
940	2142	530.03	PINE CITY	58	Pine	45.83	92.95
940	2184	531.03	THIEF RIVER FALLS	57	Pennington	48.12	96.17
940	2125	532.03	NEW YORK MILLS	56	Otter Tail	46.53	95.37
940	2138	533.03	PELICAN RAPIDS	56	Otter Tail	46.58	96.08
940	2065	534.03	FERGUS FALLS	56	Otter Tail	46.28	96.08
940	2054	535.03	DOUGLAS	55	Olmsted	44.12	92.57
940	2037	536.03	CHESTER	55	Olmsted	44.02	92.35
940	2170	537.03	SHELLY	54	Norman	47.45	96.82
940	2206	538.03	WORTHINGTON	53	Nobles	43.62	95.62
940	2164	539.03	ST PETER	52	Nicollet	44.33	93.97
940	2084	540.03	HILLMAN	49	Morrison	46.00	93.88
940	2050	541.03	CUSHING	49	Morrison	46.13	94.58
940	2150	542.03	RANDALL	49	Morrison	46.08	94.50
940	2107	543.03	LITTLE FALLS	49	Morrison	45.97	94.35
940	2020	544.03	BOCK	48	Mille Lacs	45.78	93.55
940	2115	545.03	MILACA	48	Mille Lacs	45.75	93.65
940	2149	546.03	PRINCETON	48	Mille Lacs	45.58	93.58
940	2190	547.03	WAHKON	48	Mille Lacs	46.13	93.52
940	2197	548.03	WATKINS	47	Meeker	45.30	94.40
940	2106	549.03	LITCHFIELD	47	Meeker	45.12	94.53
940	2062	550.03	FAIRMONT	46	Martin	43.67	94.42
940	2176	551.03	STEPHEN	45	Marshall	48.45	96.87
940	2029	552.03	CAMDEN STATE PARK	42	Lyon	44.33	95.92
940	2196	553.03	WATERVILLE	40	Le Sueur	44.22	93.58
940	2074	554.03	GRACETON	39	Lake of the Woods	48.73	94.83
940	2011	555.03	BAUDETTE	39	Lake of the Woods	48.72	94.58
940	2200	556.03	WILLIAMS	39	Lake of the Woods	48.77	94.95
940	2073	557.03	GOOSEBERRY FLS ST PK	38	Lake	47.13	91.45

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Appendix III.2. Dr. Gundersen's Collecting Sites.

Habitat code	User number	Site record #	Name	County Code	County Name	Latitude	Longitude
940	2033	558.03	CASTLE DANGER	38	Lake	47.12	91.50
940	2188	559.03	TWO HARBORS	38	Lake	47.03	91.67
940	2095	560.03	KARLSTAD	35	Kittson	48.58	96.52
940	2053	561.03	DONALDSON	35	Kittson	48.57	96.90
940	2124	562.03	NEW LONDON	34	Kandiyohi	45.28	94.93
940	2201	563.03	WILMAR	34	Kandiyohi	45.12	95.08
940	2120	564.03	MORA	33	Kanabec	45.87	93.28
940	2100	565.03	KILEN WOODS ST PRK	32	Jackson	43.72	95.07
940	2076	566.03	GRAND RAPIDS	31	Itaska	47.25	93.50
940	2098	567.03	KEEWATIN	31	Itaska	47.42	93.08
940	2180	568.03	TACONITE	31	Itaska	47.33	93.38
940	2103	569.03	LA PORTE	29	Hubbard	47.22	94.75
940	2086	570.03	HUBBARD	29	Hubbard	46.83	95.00
940	2058	571.03	EITZEN	28	Houston	43.52	91.45
940	2012	572.03	BEAVER CR VLY ST PRK	28	Houston	43.63	91.58
940	2028	573.03	CALEDONIA	28	Houston	43.62	91.50
940	2116	574.03	MINNEAPOLIS	27	Hennepin	45.05	93.25
940	2068	575.03	FORT SNELLING ST PRK	27	Hennepin	44.88	93.20
940	2118	576.03	MINNETONKA	27	Hennepin	44.95	93.45
940	2005	577.03	ASHBY	26	Grant	46.10	95.82
940	2208	578.03	ZUMBROTA	25	Goodhue	44.30	92.67
940	2031	579.03	CANNON FALLS	25	Goodhue	44.52	92.92
940	2147	580.03	PRAIRIE ISL IND RES	25	Goodhue	44.65	92.65
940	2151	581.03	RED WING	25	Goodhue	44.62	92.58
940	2187	582.03	TWIN LAKES	24	Freeborn	43.58	93.42
940	2141	583.03	PILOT MOUND	23	Fillmore	43.82	92.03
940	2148	584.03	PRESTON	23	Fillmore	43.67	92.08
940	2069	585.03	GARFIELD	21	Douglas	45.93	95.48
940	2067	586.03	FORT RIPLEY	18	Crow Wing	46.17	94.35
940	2128	587.03	NOKASIPPI RIVER	18	Crow Wing	46.20	94.35
940	2049	588.03	CROSS LAKE RES	18	Crow Wing	46.67	94.05
940	2127	589.03	NISSWA	18	Crow Wing	46.50	94.32
940	2041	590.03	CLARK LAKE	18	Crow Wing	46.52	94.27
940	2203	591.03	WINDOM	17	Cottonwood	43.88	95.12
940	2075	592.03	GRAND MARAIS	16	Cook	47.77	90.35
940	2072	593.03	GONVICK	15	Clearwater	47.73	95.52
940	2070	594.03	GEORGETOWN	14	Clay	47.08	96.78
940	2119	595.03	MOORHEAD	14	Clay	46.87	96.75
940	2025	596.03	BUFFALO RIVER ST PRK	14	Clay	46.87	96.47
940	2081	597.03	HAWLEY	14	Clay	46.88	96.30
940	2158	598.03	RUSH LAKE	13	Chisago	45.70	93.05
940	2039	599.03	CHISAGO CITY	13	Chisago	45.37	92.93
940	2035	600.03	CENTER CITY	13	Chisago	45.40	92.80
940	2181	601.03	TAYLORS FALLS	13	Chisago	45.42	92.67
940	2183	603.03	TEN MILE LAKE	11	Cass	46.95	94.58
940	2044	604.03	CLOQUET	09	Carlton	46.75	92.50
306	N15	605.03	N-15	99		0.00	0.00
204	N16	606.03	N-16	99		0.00	0.00
102	N4	607.03	N-4	99		0.00	0.00
204	N17	608.03	N-17	99		0.00	0.00
212	N21	609.03	PARISH RIVER	99		0.00	0.00
516	N2	610.03	JAY COOKE ST PRK	09	Carlton	46.66	92.37
318	N1	611.03	JAY COOKE ST PRK	09	Carlton	46.66	92.37
207	N3	612.03	JAY COOKE ST PRK	09	Carlton	46.66	92.37
513	N6	613.03	NO NAME OF RIVER	69	St. Louis	0.00	0.00
102	N23	614.03	COLBY LAKE	69	St. Louis	47.53	92.14
515	N20	615.03	EMBARASS RIVER	69	St. Louis	47.66	92.20
515	N5	616.03	LESTER RIVER	69	St. Louis	46.84	92.01
516	N7	617.03	KNIFE RIVER	38	Lake	46.95	91.78
515	N8A	618.03	GOOSEBERRY RIVER	38	Lake	47.14	91.46
212	N8B	619.03	GOOSEBERRY RIVER	38	Lake	47.14	91.46

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Appendix III.2. Dr. Gundersen's Collecting Sites.

Habitat code	User number	Site record #	Name	County Code	County Name	Latitude	Longitude
533	N9	620.03	SPLIT ROCK CREEK	38	Lake	47.18	91.41
516	N10	621.03	BAPTISM RIVER	38	Lake	47.34	91.20
119	N11	622.03	TANNER LAKE	38	Lake	47.62	91.26
207	N12	623.03	DUMBELL LAKE	38	Lake	47.62	91.26
102	N13	624.03	N-13	38	Lake	47.62	91.24
203	N14	625.03	N-14	38	Lake	0.00	0.00
204	N19	626.03	N-19	38	Lake	47.62	91.39
513	N18	627.03	STR S ISABELLA STORE	38	Lake	47.62	91.36
410	N22	628.03	ISABELLA RIVER	38	Lake	47.62	91.34
211	SC1	629.03	REFORMATORY CR	71	Sherburne	45.53	94.10
217	SC4	630.03	DODD'S QUARRY #20	71	Sherburne	45.55	94.13
217	SC6	631.03	DODD'S QUARRY #20	71	Sherburne	45.55	94.13
204	SC5	632.03	TALAHI POND	71	Sherburne	45.54	94.14
204	0287	633.03	POND	69	St. Louis	47.48	92.78
204	MV4?	634.03	MV4	21	Douglas	46.10	95.62
0	M4	636.03	M4	21	Douglas	0.00	0.00
305	0132	637.03	DITCH AT SITE 91	05	Benton	45.57	94.07
513	0143	638.03	CREEK BY TWIN PNDS	05	Benton	45.57	94.09
203	0325	639.03	SHERB WILDLIFE RFG	71	Sherburne	45.45	93.72
204	0326	639.03	SHERB WILDLIFE RFG	71	Sherburne	45.45	93.72
203	0327	640.03	SHERB WILDLIFE RFG	71	Sherburne	45.46	93.74
203	0328	641.03	SHERB WILDLIFE RFG	71	Sherburne	45.47	93.71
102	0329	642.03	SHERB WILDLIFE RFG	71	Sherburne	45.50	93.66
513	0280	644.03	SITE 280	14	Clay	46.88	96.63
513	0200	645.03	BUFFALO RIVER	14	Clay	47.08	96.79
203	0190	646.03	GARFIELD	21	Douglas	45.94	95.50
203	0191	647.03	MOON LAKE	21	Douglas	45.96	95.58
203	0192	648.03	SITE 192	21	Douglas	46.01	95.71
0	0336	650.03	SEWAGE POND 2	13	Chisago	0.00	0.00
0	0335	650.03	SEWAGE POND 1	13	Chisago	0.00	0.00
0	0337	651.03	SEWAGE POND 3	13	Chisago	0.00	0.00
940	2000	652.03	AFTON	82	Washington	44.93	92.80
940	2001	653.03	AITKIN	01	Aitkin	46.63	93.67
940	2003	656.03	ALEXANDRIA	21	Douglas	45.88	95.37
940	2003	656.03	ALEXANDRIA	21	Douglas	45.88	95.37
940	2004	657.03	ANOKA	02	Anoka	45.18	93.33
940	2007	658.03	BABBIT	69	St. Louis	47.67	91.85
940	2008	659.03	BARNSVILLE	14	Clay	46.67	96.42
940	2009	660.03	BASSWOOD LAKE	38	Lake	0.00	0.00
940	2010	661.03	BATTLE LAKE	56	Otter Tail	46.27	95.73
940	2013	662.03	BECKER	71	Sherburne	0.00	0.00
940	2014	663.03	BELTRAMI	60	Polk	0.00	0.00
940	2015	664.03	BEMIDJI	04	Beltrami	47.48	94.87
940	2016	665.03	BENGAL	69	St. Louis	0.00	0.00
940	2017	666.03	BENSON	76	Swift	45.32	95.63
940	2018	667.03	BIG LAKE	71	Sherburne	45.30	93.77
940	2019	668.03	BLAINE	02	Anoka	45.13	93.17
940	2021	669.03	BRAINERD	18	Crow Wing	46.33	94.17
940	2022	670.03	BRANDON	21	Douglas	45.95	95.58
940	2024	671.03	BROWNSVILLE	28	Houston	43.70	91.30
940	2026	672.03	BUNKER LAKE	27	Hennepin	0.00	0.00
940	2027	673.03	CABLE	71	Sherburne	0.00	0.00
940	2030	674.03	CANBY	87	Yellow Medicine	44.68	96.30
940	2032	675.03	CARLOS AVERY GAME RF	21	Douglas	0.00	0.00
940	2034	676.03	CEDAR CREEK BOG	02	Anoka	0.00	0.00
940	2036	677.03	CHAMPLIN	62	Ramsey	0.00	0.00
940	2042	678.03	CLEAR LAKE	71	Sherburne	45.47	94.00
940	2043	679.03	CLEARWATER	15	Clearwater	45.28	94.13
940	2046	681.03	COON RAPIDS	02	Anoka	45.13	93.32
940	2047	682.03	CRAMER	99		0.00	0.00
940	2051	683.03	DEERWOOD	18	Crow Wing	46.50	93.88

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Habitat code	User number	Site record #	Name	County Code	County Name	Latitude	Longitude
940	2055	684.03	DULUTH	69	St. Louis	46.75	92.17
940	2056	685.03	EAGLE NEST	99		47.50	92.10
940	2057	686.03	EDEN PRAIRIE	27	Hennepin	0.00	0.00
940	2060	687.03	EVANSVILLE	20	Dodge	46.00	95.68
940	2061	688.03	EVELETH	06	Big Stone	47.48	92.77
940	2064	689.03	FATHER HENNEPIN ST P	48	Mille Lacs	0.00	0.00
940	2066	690.03	FOLEY	05	Benton	45.82	93.87
940	2071	691.03	GLACIAL LAKES ST PRK	62	Ramsey	0.00	0.00
940	2078	692.03	GRAY CLOUD ISLAND	82	Washington	0.00	0.00
940	2080	693.03	HAMEL	27	Hennepin	0.00	0.00
940	2089	694.03	ISABELLA	38	Lake	47.60	91.35
940	2090	695.03	ISABELLA, CLOQUET R	38	Lake	0.00	0.00
940	2091	696.03	ITASCA STATE PARK	31	Itaska	0.00	0.00
940	2092	697.03	JAY COOK STATE PARK	69	St. Louis	0.00	0.00
940	2096	698.03	KATHIO STATE PARK	48	Mille Lacs	0.00	0.00
940	2097	699.03	KAWISHIWI RIVER	39	Lake of the Woods	0.00	0.00
940	2099	700.03	KELLIHER	04	Beltrami	47.97	94.47
940	2101	701.03	KRAGNES	14	Clay	0.00	0.00
940	2102	702.03	LAKE CITY	79	Wabasha	44.45	92.30
940	2104	703.03	LAKE ITASCA	15	Clearwater	0.00	0.00
940	2105	704.03	LE SUEUR	40	Le Sueur	44.47	93.87
940	2109	705.03	LUXEMBURG	73	Stearns	0.00	0.00
940	2110	706.03	LUXEMBURG CREEK	73	Stearns	0.00	0.00
940	2111	707.03	McGREGOR	01	Aitkin	46.60	93.32
940	2113	708.03	MAKINEH	69	St. Louis	0.00	0.00
940	2114	709.03	MANKATO	07	Blue Earth	44.17	94.00
940	2117	710.03	MINNEHAHA CREEK	27	Hennepin	0.00	0.00
940	2122	711.03	MOUND	27	Hennepin	44.92	93.70
940	2123	712.03	SNAKE RIVER- MOUTH	58	Pine	0.00	0.00
940	2131	713.03	OAK ISLAND	39	Lake of the Woods	0.00	0.00
940	2133	714.03	OLMSTEAD CO	55	Olmsted	0.00	0.00
940	2135	715.03	PALISADE	01	Aitkin	0.00	0.00
940	2136	716.03	PARTRIDGE RIVER	69	St. Louis	0.00	0.00
940	2139	717.03	PIERZ	49	Morrison	45.95	94.12
940	2140	718.03	PILLAGER	49	Morrison	46.30	94.48
940	2143	719.03	PINE RIVER	11	Cass	46.67	94.37
940	2152	721.03	RICHMOND	73	Stearns	45.47	94.62
940	2146	722.03	PONSFORD	03	Becker	0.00	0.00
940	2154	723.03	ROCK ISLAND	99		0.00	0.00
940	2155	724.03	ROCKVILLE	73	Stearns	45.45	94.35
940	2156	725.03	ROGERS	86	Wright	0.00	0.00
940	2157	726.03	ROSEAU	68	Roseau	48.85	95.77
940	2159	727.03	ST ANTHONY PARK	62	Ramsey	0.00	0.00
940	2160	728.03	ST AUGUSTA	73	Stearns	0.00	0.00
940	2161	729.03	ST FRANCIS RIVER	73	Stearns	0.00	0.00
940	2162	730.03	ST JOSEPH	73	Stearns	0.00	0.00
940	2163	731.03	ST PAUL	62	Ramsey	45.00	93.17
940	2165	732.03	ST STEPHENS	73	Stearns	0.00	0.00
940	2166	733.03	SAND DUNES ST FOREST	71	Sherburne	0.00	0.00
940	2167	734.03	SAND RIVER	99		0.00	0.00
940	2168	735.03	SARTELL	73	Stearns	45.60	94.22
940	2169	736.03	SAUK RAPIDS	05	Benton	45.58	94.17
940	2171	737.03	SHOOKS	04	Beltrami	0.00	0.00
940	2172	738.03	SILVER LAKE	43	McLeod	44.87	94.17
940	2179	739.03	SWAN LAKE	99		44.28	94.25
940	2182	740.03	TEEPEE LAKE	11	Cass	0.00	0.00
940	2191	741.03	WAITE PARK	73	Stearns	42.53	94.25
940	2193	742.03	WASKISH	04	Beltrami	48.18	94.50
940	2194	743.03	WASECA	81	Waseca	44.08	93.48
940	2195	744.03	WASHINGTON CO	82	Washington	0.00	0.00
940	2198	745.03	WHITEWATER ST PRK	79	Wabasha	0.00	0.00

Report form: HabcodeJCH.frx, sites.dbf indexed on siterecno, county.dbf on countycode, key = sites->county.

Appendix III.2. Dr. Gundersen's Collecting Sites.

Habitat code	User number	Site record #	Name	County Code	County Name	Latitude	Longitude
940	2199	746.03	WHITEWATER WL AREA	85	Winona	0.00	0.00
940	2202	747.03	WILTON	04	Beltrami	0.00	0.00
940	2205	748.03	WINSTON	69	St. Louis	0.00	0.00
940	2214	749.03	BIG STONE COUNTY	06	Big Stone	0.00	0.00
940	2215	750.03	ROSCOE	73	Stearns	0.00	0.00
940	2217	751.03	POLK COUNTY	60	Polk	0.00	0.00
940	2218	752.03	NOBLES COUNTY	53	Nobles	0.00	0.00
940	2219	753.03	PIPESTONE COUNTY	59	Pipestone	0.00	0.00
940	2220	754.03	DE SOTO LAKE	03	Becker	0.00	0.00
940	2221	755.03	WATOWAN COUNTY	83	Watonwan	0.00	0.00
940	2222	756.03	ST LOUIS COUNTY	69	St. Louis	0.00	0.00
940	2223	757.03	LAKE CALHOUN	27	Hennepin	0.00	0.00
940	2224	758.03	DAVIS LAKE	40	Le Sueur	0.00	0.00
940	2225	759.03	BETHYL TOWNSHIP	02	Anoka	0.00	0.00
940	2226	760.03	BUSSY'S POND	99		0.00	0.00
940	2227	761.03	ST PETER FISH HATCH	40	Le Sueur	0.00	0.00
940	2229	762.03	PINE COUNTY	58	Pine	0.00	0.00
940	2230	763.03	BELVIEW	64	Redwood	0.00	0.00
940	2231	764.03	CHISAGO COUNTY	13	Chisago	0.00	0.00
940	2232	765.03	LAC QUI PARLE ST PRK	37	Lac Qui Parle	0.00	0.00
940	2233	766.03	MILLE LACS COUNTY	48	Mille Lacs	0.00	0.00
940	2234	767.03	TODD COUNTY CREEK	77	Todd	0.00	0.00
940	2235	768.03	VALLEY CREEK	99		0.00	0.00
940	2236	769.03	NICOLLET COUNTY	52	Nicollet	0.00	0.00
940	2237	770.03	SANDSTONE	58	Pine	46.13	92.83
940	2238	771.03	HOUSTON COUNTY	28	Houston	0.00	0.00
940	2239	772.03	NERSTRAND WOODS	66	Rice	0.00	0.00
940	2240	773.03	CARLSON	99		0.00	0.00
940	2241	774.03	LAKE COUNTY	38	Lake	0.00	0.00
940	2242	775.03	OTTOWA	40	Le Sueur	0.00	0.00
940	2243	776.03	LAKELAND	82	Washington	0.00	0.00
940	2244	777.03	GOLF COURSE PND 1-3	99		0.00	0.00
940	2245	778.03	OTTER TAIL COUNTY	56	Otter Tail	0.00	0.00
940	2246	779.03	NORTH BRANCH	13	Chisago	45.48	92.98
940	2247	780.03	BECKER COUNTY	03	Becker	0.00	0.00
940	2248	781.03	BEAVER DAM	16	Cook	0.00	0.00
940	2249	782.03	DAKOTA COUNTY	19	Dakota	0.00	0.00
940	2250	783.03	TRAVERS COUNTY	78	Traverse	0.00	0.00
940	2251	784.03	BIRD ISLAND	65	Renville	44.75	94.87
940	2252	785.03	DETROIT (lakes ?)	03	Becker	46.82	95.82
940	2253	786.03	FRONTENAE	29	Hubbard	44.52	92.35
940	2254	787.03	OTTERTAIL RIVER	56	Otter Tail	0.00	0.00
940	2255	788.03	SHAKOPEE	70	Scott	44.82	93.50
940	2256	789.03	PHALAN PARK	82	Washington	0.00	0.00
940	2257	790.03	CROW WING COUNTY	18	Crow Wing	0.00	0.00
940	2258	791.03	WINONA COUNTY	85	Winona	0.00	0.00
940	2259	792.03	INSULA LAKE	38	Lake	0.00	0.00
940	2315	793.03	ALBERTA LEA	24	Freeborn	0.00	0.00
940	2316	794.03	ANOKA COUNTY	02	Anoka	0.00	0.00
940	2317	795.03	ARLINGTON	72	Sibley	0.00	0.00
940	2318	796.03	BAYPORT	82	Washington	0.00	0.00
940	2306	797.03	BENTON COUNTY	05	Benton	0.00	0.00
940	2319	798.03	BLACKDUCK	04	Beltrami	0.00	0.00
940	2267	799.03	BLOOMINGTON	27	Hennepin	0.00	0.00
940	2268	800.03	BOWLUS	49	Morrison	0.00	0.00
940	2266	801.03	BUFFALO	86	Wright	0.00	0.00
940	2299	802.03	CARLTON	09	Carlton	0.00	0.00
940	2283	803.03	CEDAR CRK NATURE RSV	01	Aitkin	0.00	0.00
940	2301	804.03	CLAY COUNTY	14	Clay	0.00	0.00
940	2274	805.03	CLEARWATER CO	15	Clearwater	0.00	0.00
940	2285	806.03	COLD SPRING	73	Stearns	0.00	0.00

Report form: HabcodeJCH.frx, sites.dbf indexed on siterecno, county.dbf on countycode, key = sites->county.

Appendix III.2. Dr. Gundersen's Collecting Sites.

Habitat code	User number	Site record #	Name	County Code	County Name	Latitude	Longitude
940	2284	807.03	COYOTE CREEK	01	Aitkin	0.00	0.00
940	2280	808.03	DEER LAKE	86	Wright	0.00	0.00
940	2279	809.03	DEER RIVER	31	Itaska	0.00	0.00
940	2277	810.03	DOUGLAS COUNTY	21	Douglas	0.00	0.00
940	2289	811.03	LAKE EMMONS	24	Freeborn	0.00	0.00
940	2304	812.03	FISH LAKE	02	Anoka	0.00	0.00
940	2322	813.03	GOODLAND	31	Itaska	0.00	0.00
940	2261	814.03	HALLOCK	35	Kittson	0.00	0.00
940	2320	815.03	HOWARD LAKE	36	Koochiching	0.00	0.00
940	2321	816.03	HUGO	82	Washington	0.00	0.00
940	2323	817.03	INTERNATIONAL FALLS	36	Koochiching	0.00	0.00
940	2264	818.03	KIMBALL	86	Wright	0.00	0.00
940	2293	819.03	LAKE MINNETONKA	27	Hennepin	0.00	0.00
940	2276	820.03	MUDHEN CREEK	69	St. Louis	0.00	0.00
940	2324	821.03	MAHNOMEN	44	Mahnomen	0.00	0.00
940	2273	822.03	MAHNOMEN COUNTY	44	Mahnomen	0.00	0.00
940	2300	823.03	MENDOTA/HAMEL CREEK	62	Ramsey	0.00	0.00
940	2262	824.03	SAUK CENTER	73	Stearns	0.00	0.00
940	2282	825.03	MOOSE LAKE	09	Carlton	0.00	0.00
940	2312	826.03	MOSSE LAKE	09	Carlton	0.00	0.00
940	2294	828.03	OTTERTAIL COUNTY	56	Otter Tail	0.00	0.00
940	2325	829.03	PIGEON RIVER	16	Cook	0.00	0.00
940	2269	830.03	PIKERAL LAKE	71	Sherburne	0.00	0.00
940	2291	831.03	RICE COUNTY	66	Rice	0.00	0.00
940	2327	832.03	ROCHESTER	55	Olmsted	0.00	0.00
940	2290	833.03	SHERRBURNE COUNTY	71	Sherburne	0.00	0.00
940	2298	835.03	SIBLEY STATE PARK	34	Kandiyohi	0.00	0.00
940	2329	836.03	SPECTACULE LAKE	30	Isanti	0.00	0.00
940	2272	837.03	STEVENS COUNTY	75	Stevens	0.00	0.00
940	2297	838.03	SUGAR LAKE	54	Norman	0.00	0.00
940	2287	839.03	SWANVILLE	49	Morrison	0.00	0.00
940	2281	841.03	WALKER	11	Cass	0.00	0.00
940	2295	842.03	WAUBON PRAIRIE	44	Mahnomen	0.00	0.00
940	2263	843.03	WHITE BEAR LAKE	82	Washington	0.00	0.00
940	2265	845.03	WRIGHT COUNTY	86	Wright	0.00	0.00
940	2307	846.03	YELLOW MEDICINE CO	87	Yellow Medicine	0.00	0.00
940	2300	858.03	MENDOTA/HAMEL CREEK	27	Hennepin	0.00	0.00
940	2310	859.03	LAKE BRONSON ST PARK	35	Kittson	0.00	0.00
940	2308	861.03	MADISON	37	Lac Qui Parle	0.00	0.00
940	2326	866.03	PONTO LAKE	62	Ramsey	0.00	0.00
940	2305	867.03	PROCTOR	69	St. Louis	0.00	0.00
940	0084	874.03	unknown	99		0.00	0.00
305	0087	875.03	GRAVEL PIT	15	Clearwater	0.00	0.00
102	0106	876.03	PICKERAL LAKE	71	Sherburne	0.00	0.00
306	0124	878.03	COLLEGEVILLE PONDS	73	Stearns	0.00	0.00
203	0125	879.03	COLLEGEVILLE PONDS	73	Stearns	0.00	0.00
204	0126	880.03	GILLETS POND	99		0.00	0.00
940	0127	881.03	unknown	99		0.00	0.00
940	0128	882.03	unknown	99		0.00	0.00
940	0129	883.03	unknown	99		0.00	0.00
203	0137	884.03	unknown	99		0.00	0.00
940	0138	885.03	unknown	99		0.00	0.00
940	0139	886.03	unknown	99		0.00	0.00
940	0146	887.03	unknown	99		0.00	0.00
940	0147	888.03	unknown	99		0.00	0.00
940	0148	889.03	unknown	99		0.00	0.00
940	0149	890.03	unknown	99		0.00	0.00
516	0223	892.03	CEDAR CREEK	01	Aitkin	0.00	0.00
209	0227	894.03	HWY 15	31	Itaska	0.00	0.00
203	0228	895.03	POND	31	Itaska	0.00	0.00
220	0229	896.03	HOLMAN LAKE	31	Itaska	0.00	0.00

Report form: HabcodeJCH.frx, sites.dbf indexed on siterecno, county.dbf on countycode, key = sites->county.

Appendix III.2. Dr. Gundersen's Collecting Sites.

Habitat code	User number	Site record #	Name	County Code	County Name	Latitude	Longitude
102	0230	897.03	TWIN LAKES	31	Itaska	0.00	0.00
209	0231	898.03	ACROSS BUSINESS DIST	31	Itaska	0.00	0.00
211	0232	899.03	DITCH	69	St. Louis	0.00	0.00
537	0233	900.03	STURGEON R-E BRANCH	69	St. Louis	0.00	0.00
429	0234	901.03	unknown	99		0.00	0.00
434	0235	902.03	DITCH	69	St. Louis	0.00	0.00
305	0236	903.03	DITCH	69	St. Louis	0.00	0.00
102	0237	904.03	ROBINSON LAKES	69	St. Louis	0.00	0.00
514	0238	905.03	BEAR ISL RIVER	69	St. Louis	0.00	0.00
203	0239	906.03	LITTLE RIVER	69	St. Louis	0.00	0.00
211	0241	907.03	DITCH	38	Lake	0.00	0.00
940	0252	908.03	unknown	99		0.00	0.00
940	0253	909.03	unknown	99		0.00	0.00
207	0270	910.03	ISABELLA LAKE- 5mi E	38	Lake	0.00	0.00
226	0271	911.03	BEYOND 264	38	Lake	0.00	0.00
305	0286	912.03	SAND PIT	69	St. Louis	0.00	0.00
102	0320	913.03	unknown	99		0.00	0.00
203	0331	915.03	unknown	99		0.00	0.00
211	0332	916.03	unknown	99		0.00	0.00
225	0333	917.03	unknown	99		0.00	0.00
410	0334	918.03	unknown	99		0.00	0.00
940	2052	919.03	unknown	99		0.00	0.00
940	2079	920.03	unknown	99		0.00	0.00
940	2209	921.03	ST CLOUD	73	Stearns	0.00	0.00
940	2210	922.03	RAMSEY COUNTY	62	Ramsey	0.00	0.00
940	2211	923.03	CASS COUNTY	11	Cass	0.00	0.00
940	2212	924.03	unknown	99		0.00	0.00
940	2213	925.03	unknown	99		0.00	0.00
940	2260	926.03	unknown	99		0.00	0.00
940	2270	927.03	unknown	99		0.00	0.00
940	2271	928.03	unknown	99		0.00	0.00
940	2275	929.03	unknown	99		0.00	0.00
940	2292	932.03	unknown	99		0.00	0.00
940	2296	933.03	unknown	99		0.00	0.00
940	2302	934.03	KEELY CREEK	38	Lake	0.00	0.00
940	2303	935.03	unknown	99		0.00	0.00
940	2309	936.03	unknown	99		0.00	0.00
940	2311	937.03	unknown	99		0.00	0.00
940	2313	938.03	unknown	99		0.00	0.00
940	2314	939.03	unknown	99		0.00	0.00
102	0224	941.03	POOR FARM LAKE	99		0.00	0.00
940	2129	942.03	NORMAN COUNTY	54	Norman	0.00	0.00
940	2189	943.03	unknown	99		0.00	0.00
940	2216	944.03	unknown	47	Meeker	0.00	0.00
940	2216	944.03	unknown	47	Meeker	0.00	0.00
940	2331	947.00	STORY RIVER	99		0.00	0.00
940	2332	948.00	LANCHESTER	35	Kittson	0.00	0.00
940	2333	949.00	unknown	99		0.00	0.00
940	2334	950.00	LE SEUER CO	40	Le Sueur	0.00	0.00
940	2335	951.00	unknown	99		0.00	0.00
940	2336	952.00	MURRAY CO	51	Murray	0.00	0.00
940	2337	953.00	NORMAN CO	54	Norman	0.00	0.00
940	2339	954.00	unknown	99		0.00	0.00
0	0338	956.00	SEWAGE POND 1	81	Waseca	0.00	0.00
0	0340	958.00	SEWAGE POND 3	81	Waseca	0.00	0.00
0	0341	959.00	SEWAGE POND 1	40	Le Sueur	0.00	0.00
0	0342	960.00	SEWAGE POND 2	40	Le Sueur	0.00	0.00
0	0343	961.00	SEWAGE POND 3	40	Le Sueur	0.00	0.00
305	0001	963.03	1	15	Clearwater	0.00	0.00
101	0019	965.03	LAKE ITASCA	15	Clearwater	0.00	0.00
203	0294	966.03	TITLOW LAKE	72	Sibley	44.56	94.21

Report form: HabcodeJCH.frx, sites.dbf indexed on siterecno, county.dbf on countycode, key = sites->county.

Appendix III.2. Dr. Gundersen's Collecting Sites.

Habitat code	User number	Site record #	Name	County Code	County Name	Latitude	Longitude
940	2286	967.03	unknown	99		0.00	0.00
940	2286	968.03	unknown	99		0.00	0.00
0	LV6	970.03	LV6	21	Douglas	0.00	0.00
0	SH1	971.03	SPRUCE HILL TWP	21	Douglas	0.00	0.00
0	0330	972.03	UNKNOWN	99		0.00	0.00
940	2045	973.03	COLLEGEVILLE	73	Stearns	0.00	0.00
940	2338	974.03	WILKIN COUNTY	84	Wilkin	0.00	0.00
940	2341	976.03	HOVLAND	99		0.00	0.00
410	A2	978.03	A2	21	Douglas	0.00	0.00
0	B17	979.03	B17	21	Douglas	0.00	0.00
0	B18	980.03	B18	21	Douglas	0.00	0.00
102	B10	981.03	B10	21	Douglas	0.00	0.00
0		982.03	don't delete me!	99		0.00	0.00

Report form: HabcodeJCH.frx, sites.dbf indexed on siterecno, county.dbf on countycode, key = sites->county.

Appendix III.3. Example of species records from Gundersen collection for habitat type: temporary pond. Year = year collected.

Sprecno	Ord	Fam	Gen	Spe	Genus	Species	Site Number	Year	Habitat code
909.03	005	001	001	005	Anax	sp	0198	1971	308
698.03	005	006	001	005			0101	1984	305
5257.03	009	006	001	009	Haliplus	subguttatus	0303	1982	305
5107.03	020	006	001	020	Haliplus	borealis	0007	1968	306
5111.03	020	006	001	020	Haliplus	borealis	0052	1968	306
5112.03	020	006	001	020	Haliplus	borealis	0007	1968	306
5016.03	031	006	001	031	Haliplus	blanchardi	0066	1970	305
5034.03	031	006	001	031	Haliplus	blanchardi	0066	1968	305
5036.03	031	006	001	031	Haliplus	blanchardi	0052	1968	306
5053.03	031	006	001	031	Haliplus	blanchardi	0018	1968	306
5227.03	035	006	001	035	Haliplus	connexus	0094	1982	308
5242.03	036	006	001	036	Haliplus	salarinus	0105	1979	308
1012.03	001	008	005	001	Acilius	semisulcatus	0007	1968	306
1031.03	001	008	005	001	Acilius	semisulcatus	0092	1970	305
1048.03	001	008	005	001	Acilius	semisulcatus	SH4	1969	306
1076.03	001	008	005	001	Acilius	semisulcatus	C14	1969	306
1080.03	001	008	005	001	Acilius	semisulcatus	SH5	1969	306
1082.03	001	008	005	001	Acilius	semisulcatus	M1	1969	306
1102.03	001	008	005	001	Acilius	semisulcatus	0101	1979	305
1103.03	001	008	005	001	Acilius	semisulcatus	0101	1979	305
1104.03	001	008	005	001	Acilius	semisulcatus	0101	1978	305
1106.03	001	008	005	001	Acilius	semisulcatus	0101	1978	305
1131.03	001	008	005	001	Acilius	semisulcatus	0258	1979	308
1135.03	001	008	005	001	Acilius	semisulcatus	0262	1979	306
1136.03	001	008	005	001	Acilius	semisulcatus	0262	1979	306
4352.03	003	008	007	003	Rhantus	binotatus	0105	1979	308
4353.03	003	008	007	003	Rhantus	binotatus	0245	1979	318
4359.03	003	008	007	003	Rhantus	binotatus	0094	1979	308
4371.03	010	008	007	010	Rhantus	sinuatus	S2	1969	306
4378.03	010	008	007	010	Rhantus	sinuatus	0094	1979	308
4391.03	012	008	007	012	Rhantus	wallisi	0198	1977	308
4398.03	012	008	007	012	Rhantus	wallisi	LV8	1969	306
4404.03	012	008	007	012	Rhantus	wallisi	L3	1969	304
4443.03	012	008	007	012	Rhantus	wallisi	0105	1979	308
4454.03	012	008	007	012	Rhantus	wallisi	0094	1979	308
4479.03	013	008	007	013	Rhantus	consimilis	LG4	1969	306
4481.03	013	008	007	013	Rhantus	consimilis	C2	1969	306
4483.03	013	008	007	013	Rhantus	consimilis	I6	1969	305
4484.03	013	008	007	013	Rhantus	consimilis	MO4	1968	305
4486.03	013	008	007	013	Rhantus	consimilis	C2	1969	306
4487.03	013	008	007	013	Rhantus	consimilis	LG10	1969	306
4488.03	013	008	007	013	Rhantus	consimilis	M1	1969	306
4489.03	013	008	007	013	Rhantus	consimilis	LV8	1969	306
4494.03	013	008	007	013	Rhantus	consimilis	L3	1969	304

Spechab2.frx report on species in the temporary pond habitat, using species related to sites.dbf and spcodegund.dbf.

Sites.dbf idx on siterecno, key is siterecno, sp files both idx and key on ord, fam, gen, sp

Habitat type = temporary pond, code 4 in dbf, 2 for Gunderson class. Report/label for habitat = 5.

Appendix III.3. Example of species records from Gundersen collection for habitat type: temporary pond. Year = year collected.

Sprecno	Ord	Fam	Gen	Spe	Genus	Species	Site Number	Year	Habitat code
4508.03	013	008	007	013	Rhantus	consimilis	0018	1968	306
4509.03	013	008	007	013	Rhantus	consimilis	0007	1968	306
4511.03	013	008	007	013	Rhantus	consimilis	MV10	1969	305
4521.03	013	008	007	013	Rhantus	consimilis	0018	1968	306
4522.03	013	008	007	013	Rhantus	consimilis	0052	1968	306
4523.03	013	008	007	013	Rhantus	consimilis	0007	1968	306
4526.03	013	008	007	013	Rhantus	consimilis	0007	1968	306
4533.03	013	008	007	013	Rhantus	consimilis	0052	1968	306
4585.03	014	008	007	014	Rhantus	frontalis	L3	1969	304
4629.03	014	008	007	014	Rhantus	frontalis	S3	1969	306
4636.03	014	008	007	014	Rhantus	frontalis	C2	1968	306
4637.03	014	008	007	014	Rhantus	frontalis	S13	1969	308
4638.03	014	008	007	014	Rhantus	frontalis	LG4	1969	306
4641.03	014	008	007	014	Rhantus	frontalis	MO4	1968	305
4656.03	014	008	007	014	Rhantus	frontalis	LG10	1969	306
4672.03	014	008	007	014	Rhantus	frontalis	0094	1979	308
4675.03	014	008	007	014	Rhantus	frontalis	0094	1979	308
4681.03	014	008	007	014	Rhantus	frontalis	0305	1982	305
4682.03	014	008	007	014	Rhantus	frontalis	0296	1982	308
1450.03	005	008	009	005	Dytiscus	hybridus	A4	1969	308
1660.03	019	008	009	019	Dytiscus	harrisii	C14	1969	306
1667.03	019	008	009	019	Dytiscus	harrisii	0205	1911	305
1719.03	020	008	009	020	Dytiscus	fasciventris	0092	1970	305
514.03	000	008	012	000	Desmopachria	sp	0101	1979	305
515.03	003	008	012	003	Desmopachria	convexa	0101	1979	305
517.03	003	008	012	003	Desmopachria	convexa	0094	1979	308
522.03	003	008	012	003	Desmopachria	convexa	0101	1979	305
524.03	003	008	012	003	Desmopachria	convexa	0094	1979	308
532.03	003	008	012	003	Desmopachria	convexa	0262	1979	306
536.03	003	008	012	003	Desmopachria	convexa	0101	1978	305
540.03	003	008	012	003	Desmopachria	convexa	MV10	0	305
544.03	003	008	012	003	Desmopachria	convexa	0066	1970	305
548.03	003	008	012	003	Desmopachria	convexa	0027	1968	305
549.03	003	008	012	003	Desmopachria	convexa	0027	1968	305
550.03	003	008	012	003	Desmopachria	convexa	0027	1968	305
551.03	003	008	012	003	Desmopachria	convexa	0034	1968	305
552.03	003	008	012	003	Desmopachria	convexa	0034	1968	305
553.03	003	008	012	003	Desmopachria	convexa	0018	1968	306
554.03	003	008	012	003	Desmopachria	convexa	0018	1968	306
556.03	003	008	012	003	Desmopachria	convexa	0066	1968	305
557.03	003	008	012	003	Desmopachria	convexa	0055	1968	327
559.03	003	008	012	003	Desmopachria	convexa	0052	1968	306
560.03	003	008	012	003	Desmopachria	convexa	0030	1968	305
561.03	003	008	012	003	Desmopachria	convexa	0030	1968	305

Spechab2.frx report on species in the temporary pond habitat, using species related to sites.dbf and spcodegund.dbf.

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Appendix III.3. Example of species records from Gundersen collection for habitat type: temporary pond. Year = year collected.

Sprecno	Ord	Fam	Gen	Spe	Genus	Species	Site Number	Year	Habitat code
562.03	003	008	012	003	Desmopachria	convexa	0031	1968	306
563.03	003	008	012	003	Desmopachria	convexa	0031	1968	306
579.03	003	008	012	003	Desmopachria	convexa	0034	1968	305
585.03	003	008	012	003	Desmopachria	convexa	0101	1979	305
586.03	003	008	012	003	Desmopachria	convexa	0094	1979	308
587.03	003	008	012	003	Desmopachria	convexa	0262	1979	306
595.03	003	008	012	003	Desmopachria	convexa	0101	1978	305
600.03	003	008	012	003	Desmopachria	convexa	0101	1982	305
606.03	003	008	012	003	Desmopachria	convexa	0101	1978	305
615.03	003	008	012	003	Desmopachria	convexa	H8	1969	305
622.03	003	008	012	003	Desmopachria	convexa	S2	1969	306
623.03	003	008	012	003	Desmopachria	convexa	C16	1969	306
625.03	003	008	012	003	Desmopachria	convexa	MO4	1969	305
626.03	003	008	012	003	Desmopachria	convexa	H8	1969	305
629.03	003	008	012	003	Desmopachria	convexa	MV10	1969	305
636.03	003	008	012	003	Desmopachria	convexa	M2	1969	306
637.03	003	008	012	003	Desmopachria	convexa	LG10	1969	306
640.03	003	008	012	003	Desmopachria	convexa	HC8	1969	305
647.03	003	008	012	003	Desmopachria	convexa	C3	1968	306
654.03	003	008	012	003	Desmopachria	convexa	C14	1969	306
655.03	003	008	012	003	Desmopachria	convexa	L3	1969	304
659.03	003	008	012	003	Desmopachria	convexa	LG9	1969	308
662.03	003	008	012	003	Desmopachria	convexa	LV11	1969	306
668.03	003	008	012	003	Desmopachria	convexa	BR6	1969	305
670.03	003	008	012	003	Desmopachria	convexa	S8	1969	305
681.03	003	008	012	003	Desmopachria	convexa	S2	1969	306
730.03	003	008	012	003	Desmopachria	convexa	0101	1978	305
739.03	003	008	012	003	Desmopachria	convexa	0101	1978	305
750.03	003	008	012	003	Desmopachria	convexa	0101	1983	305
756.03	003	008	012	003	Desmopachria	convexa	0101	1983	305
759.03	003	008	012	003	Desmopachria	convexa	0101	1985	305
2381.03	001	008	016	001	Graphoderus	occidentalis	0101	1978	305
2384.03	001	008	016	001	Graphoderus	occidentalis	0313	1982	305
2385.03	001	008	016	001	Graphoderus	occidentalis	0305	1982	305
2419.03	001	008	016	001	Graphoderus	occidentalis	MV10	1969	305
2421.03	001	008	016	001	Graphoderus	occidentalis	C14	1969	306
2422.03	001	008	016	001	Graphoderus	occidentalis	LG10	1969	306
2426.03	001	008	016	001	Graphoderus	occidentalis	B4	1969	305
2428.03	001	008	016	001	Graphoderus	occidentalis	I7	1969	305
2429.03	001	008	016	001	Graphoderus	occidentalis	S8	1969	305
2431.03	001	008	016	001	Graphoderus	occidentalis	S13	1969	308
2446.03	001	008	016	001	Graphoderus	occidentalis	I1	1969	306
1865.03	002	008	016	002	Graphoderus	liberus	0101	1978	305
1867.03	002	008	016	002	Graphoderus	liberus	0101	1979	305

Spechab2.frx report on species in the temporary pond habitat, using species related to sites.dbf and spcodegund.dbf.

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Habitat type = temporary pond, code 4 in dbf, 2 for Gunderson class. Report/label for habitat = 5.

Appendix III.3. Example of species records from Gundersen collection for habitat type: temporary pond. Year = year collected.

Sprecno	Ord	Fam	Gen	Spe	Genus	Species	Site Number	Year	Habitat code
1874.03	002	008	016	002	Graphoderus	liberus	0198	1977	308
1947.03	002	008	016	002	Graphoderus	liberus	0007	1968	306
1955.03	002	008	016	002	Graphoderus	liberus	0056	1968	305
1958.03	002	008	016	002	Graphoderus	liberus	0066	1968	305
2061.03	002	008	016	002	Graphoderus	liberus	C6	1969	306
2064.03	002	008	016	002	Graphoderus	liberus	C14	1969	306
2065.03	002	008	016	002	Graphoderus	liberus	C16	1969	306
2321.03	005	008	016	005	Graphoderus	fasciatocollis	0066	1968	305
2327.03	005	008	016	005	Graphoderus	fasciatocollis	0018	1968	306
2347.03	005	008	016	005	Graphoderus	fasciatocollis	MV10	1969	305
2352.03	005	008	016	005	Graphoderus	fasciatocollis	MO4	1969	305
2355.03	005	008	016	005	Graphoderus	fasciatocollis	C4	1969	306
2356.03	005	008	016	005	Graphoderus	fasciatocollis	LM5	1969	305
2357.03	005	008	016	005	Graphoderus	fasciatocollis	C6	1969	306
2358.03	005	008	016	005	Graphoderus	fasciatocollis	C4	1969	306
2100.03	006	008	016	006	Graphoderus	perplexus	0101	1978	305
2110.03	006	008	016	006	Graphoderus	perplexus	0262	1979	306
2131.03	006	008	016	006	Graphoderus	perplexus	MV10	1969	305
2138.03	006	008	016	006	Graphoderus	perplexus	LV8	1969	306
2146.03	006	008	016	006	Graphoderus	perplexus	I7	1969	305
2151.03	006	008	016	006	Graphoderus	perplexus	B4	1969	305
2154.03	006	008	016	006	Graphoderus	perplexus	LG10	1969	306
2159.03	006	008	016	006	Graphoderus	perplexus	C6	1969	306
2161.03	006	008	016	006	Graphoderus	perplexus	C4	1969	306
2163.03	006	008	016	006	Graphoderus	perplexus	LG10	1969	306
2165.03	006	008	016	006	Graphoderus	perplexus	LV8	1968	306
2170.03	006	008	016	006	Graphoderus	perplexus	C6	1969	306
2174.03	006	008	016	006	Graphoderus	perplexus	C6	1969	306
2176.03	006	008	016	006	Graphoderus	perplexus	S2	1969	306
2262.03	006	008	016	006	Graphoderus	perplexus	C6	1968	306
2266.03	006	008	016	006	Graphoderus	perplexus	B4	1969	305
7.03	001	008	017	001	Hydaticus	modestus	S13	1969	308
9.03	001	008	017	001	Hydaticus	modestus	C14	1969	306
10.03	001	008	017	001	Hydaticus	modestus	S2	1969	306
16.03	001	008	017	001	Hydaticus	modestus	MV10	1969	305
21.03	001	008	017	001	Hydaticus	modestus	0101	1978	305
27.03	001	008	017	001	Hydaticus	modestus	0262	1979	306
2540.03	005	008	017	005	Hydaticus	piceus	A4	1969	308
2543.03	005	008	017	005	Hydaticus	piceus	0198	1977	308
90.03	001	008	019	001	Ilybius	fraterculus	S11	1969	305
95.03	001	008	019	001	Ilybius	fraterculus	M2	1969	306
97.03	001	008	019	001	Ilybius	fraterculus	M1	1969	306
100.03	001	008	019	001	Ilybius	fraterculus	C2	1969	306
103.03	001	008	019	001	Ilybius	fraterculus	S2	1969	306

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Appendix III.3. Example of species records from Gundersen collection for habitat type: temporary pond. Year = year collected.

Sprecno	Ord	Fam	Gen	Spe	Genus	Species	Site Number	Year	Habitat code
104.03	001	008	019	001	Ilybius	fraterculus	C6	1969	306
115.03	001	008	019	001	Ilybius	fraterculus	A4	1969	308
117.03	001	008	019	001	Ilybius	fraterculus	C6	1969	306
119.03	001	008	019	001	Ilybius	fraterculus	S5	1969	305
142.03	001	008	019	001	Ilybius	fraterculus	0198	1977	308
146.03	001	008	019	001	Ilybius	fraterculus	0101	1979	305
149.03	001	008	019	001	Ilybius	fraterculus	0305	1982	305
3468.03	001	008	019	001	Ilybius	fraterculus	0124	1980	306
84.03	004	008	019	004	Ilybius	biguttulus	0277	1980	305
3591.03	012	008	019	012	Ilybius	pleuriticus	0015	1976	308
3592.03	012	008	019	012	Ilybius	pleuriticus	0027	1977	305
3676.03	015	008	019	015	Ilybius	angustior	M1	1969	306
3682.03	015	008	019	015	Ilybius	angustior	I1	1969	306
3684.03	015	008	019	015	Ilybius	angustior	S3	1969	306
3688.03	015	008	019	015	Ilybius	angustior	0101	1978	305
3698.03	015	008	019	015	Ilybius	angustior	0074	1968	305
3699.03	015	008	019	015	Ilybius	angustior	0074	1957	305
3728.03	015	008	019	015	Ilybius	angustior	0071	1968	306
3010.03	006	008	020	006	Hygrotus	acaroides	B4	1969	305
3012.03	006	008	020	006	Hygrotus	acaroides	0179	1977	305
2634.03	008	008	020	008	Hygrotus	patruelis	0316	1982	305
2637.03	008	008	020	008	Hygrotus	patruelis	0101	1983	305
2671.03	008	008	020	008	Hygrotus	patruelis	0094	1979	308
2673.03	008	008	020	008	Hygrotus	patruelis	0094	1979	308
2676.03	008	008	020	008	Hygrotus	patruelis	0274	1980	305
2679.03	008	008	020	008	Hygrotus	patruelis	0205	1977	305
2686.03	008	008	020	008	Hygrotus	patruelis	0101	1980	305
2691.03	008	008	020	008	Hygrotus	patruelis	0101	1979	305
2706.03	008	008	020	008	Hygrotus	patruelis	0066	1968	305
2714.03	008	008	020	008	Hygrotus	patruelis	0262	1979	306
2724.03	008	008	020	008	Hygrotus	patruelis	0101	1980	305
2729.03	008	008	020	008	Hygrotus	patruelis	H8	1969	305
2730.03	008	008	020	008	Hygrotus	patruelis	H8	1969	305
2734.03	008	008	020	008	Hygrotus	patruelis	LV8	1969	306
2737.03	008	008	020	008	Hygrotus	patruelis	S13	1969	308
2739.03	008	008	020	008	Hygrotus	patruelis	C14	1969	306
2744.03	008	008	020	008	Hygrotus	patruelis	C15	1969	305
2749.03	008	008	020	008	Hygrotus	patruelis	LV2	1969	305
2752.03	008	008	020	008	Hygrotus	patruelis	MV10	1969	305
2755.03	008	008	020	008	Hygrotus	patruelis	MO4	1969	305
2759.03	008	008	020	008	Hygrotus	patruelis	LV2	1969	305
2767.03	008	008	020	008	Hygrotus	patruelis	MV10	1969	305
2770.03	008	008	020	008	Hygrotus	patruelis	LG10	1969	306
2775.03	008	008	020	008	Hygrotus	patruelis	I6	1969	305

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Appendix III.3. Example of species records from Gundersen collection for habitat type: temporary pond. Year = year collected.

Sprecno	Ord	Fam	Gen	Spe	Genus	Species	Site Number	Year	Habitat code
2784.03	008	008	020	008	Hygrotus	patruelis	0101	1983	305
2792.03	009	008	020	009	Hygrotus	nubilus	0101	1983	305
2796.03	009	008	020	009	Hygrotus	nubilus	I1	1969	306
3092.03	010	008	020	010	Hygrotus	impressopunctatus	0305	1982	305
3093.03	010	008	020	010	Hygrotus	impressopunctatus	0296	1982	308
3097.03	010	008	020	010	Hygrotus	impressopunctatus	0101	1983	305
3100.03	010	008	020	010	Hygrotus	impressopunctatus	0101	1983	305
3123.03	010	008	020	010	Hygrotus	impressopunctatus	C2	1969	306
3124.03	010	008	020	010	Hygrotus	impressopunctatus	C3	1969	306
3127.03	010	008	020	010	Hygrotus	impressopunctatus	I1	1969	306
3129.03	010	008	020	010	Hygrotus	impressopunctatus	C6	1969	306
3130.03	010	008	020	010	Hygrotus	impressopunctatus	A4	1969	308
3132.03	010	008	020	010	Hygrotus	impressopunctatus	SH4	1969	306
3137.03	010	008	020	010	Hygrotus	impressopunctatus	S13	1969	308
3138.03	010	008	020	010	Hygrotus	impressopunctatus	C14	1969	306
3151.03	010	008	020	010	Hygrotus	impressopunctatus	I6	1969	305
3160.03	010	008	020	010	Hygrotus	impressopunctatus	LG10	1969	306
3170.03	010	008	020	010	Hygrotus	impressopunctatus	MV10	1969	305
3179.03	010	008	020	010	Hygrotus	impressopunctatus	C3	1969	306
3180.03	010	008	020	010	Hygrotus	impressopunctatus	C2	1969	306
3182.03	010	008	020	010	Hygrotus	impressopunctatus	I1	1969	306
3183.03	010	008	020	010	Hygrotus	impressopunctatus	A4	1969	308
3185.03	010	008	020	010	Hygrotus	impressopunctatus	SH4	1969	306
3193.03	010	008	020	010	Hygrotus	impressopunctatus	C6	1969	306
3196.03	010	008	020	010	Hygrotus	impressopunctatus	C14	1969	306
3197.03	010	008	020	010	Hygrotus	impressopunctatus	S13	1969	308
3203.03	010	008	020	010	Hygrotus	impressopunctatus	I6	1969	305
3212.03	010	008	020	010	Hygrotus	impressopunctatus	LG10	1969	306
3222.03	010	008	020	010	Hygrotus	impressopunctatus	MV10	1969	305
3228.03	010	008	020	010	Hygrotus	impressopunctatus	LG10	1969	306
3248.03	010	008	020	010	Hygrotus	impressopunctatus	LV2	1969	305
3249.03	010	008	020	010	Hygrotus	impressopunctatus	L3	1969	304
3255.03	010	008	020	010	Hygrotus	impressopunctatus	LV11	1969	306
3266.03	010	008	020	010	Hygrotus	impressopunctatus	0101	1979	305
3267.03	010	008	020	010	Hygrotus	impressopunctatus	0101	1979	305
3268.03	010	008	020	010	Hygrotus	impressopunctatus	0101	1979	305
3269.03	010	008	020	010	Hygrotus	impressopunctatus	0094	1979	308
3271.03	010	008	020	010	Hygrotus	impressopunctatus	0094	1979	308
3284.03	010	008	020	010	Hygrotus	impressopunctatus	0094	1979	308
3305.03	010	008	020	010	Hygrotus	impressopunctatus	0236	1977	305
3327.03	010	008	020	010	Hygrotus	impressopunctatus	0094	1979	308
3333.03	010	008	020	010	Hygrotus	impressopunctatus	0031	1968	306
3346.03	010	008	020	010	Hygrotus	impressopunctatus	LV8	1969	306
3390.03	010	008	020	010	Hygrotus	impressopunctatus	0101	1981	305

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Sprecno	Ord	Fam	Gen	Spe	Genus	Species	Site Number	Year	Habitat code
3425.03	010	008	020	010	Hygrotus	impressopunctatus	MV10	1969	305
3427.03	010	008	020	010	Hygrotus	impressopunctatus	0030	1978	305
3027.03	011	008	020	011	Hygrotus	dissimilis	0305	1982	305
3029.03	011	008	020	011	Hygrotus	dissimilis	0316	1982	305
3050.03	015	008	020	015	Hygrotus	canadensis	I6	1969	305
3052.03	015	008	020	015	Hygrotus	canadensis	LG10	1969	306
3057.03	015	008	020	015	Hygrotus	canadensis	LG9	1969	308
3062.03	015	008	020	015	Hygrotus	canadensis	H8	1969	305
3068.03	015	008	020	015	Hygrotus	canadensis	S3	1969	306
3078.03	015	008	020	015	Hygrotus	canadensis	I6	1969	305
3080.03	015	008	020	015	Hygrotus	canadensis	MO4	1969	305
3021.03	016	008	020	016	Hygrotus	compar	0124	1980	306
2900.03	019	008	020	019	Hygrotus	laccophilinus	0101	1982	305
2909.03	019	008	020	019	Hygrotus	laccophilinus	0101	1979	305
2911.03	019	008	020	019	Hygrotus	laccophilinus	0262	1979	306
2915.03	019	008	020	019	Hygrotus	laccophilinus	0105	1979	308
2916.03	019	008	020	019	Hygrotus	laccophilinus	0101	1979	305
2932.03	019	008	020	019	Hygrotus	laccophilinus	0198	1977	308
2936.03	019	008	020	019	Hygrotus	laccophilinus	0094	1979	308
2951.03	019	008	020	019	Hygrotus	laccophilinus	S5	1969	305
2954.03	019	008	020	019	Hygrotus	laccophilinus	BR6	1969	305
2955.03	019	008	020	019	Hygrotus	laccophilinus	S2	1969	306
2956.03	019	008	020	019	Hygrotus	laccophilinus	C6	1969	306
2961.03	019	008	020	019	Hygrotus	laccophilinus	BR6	1969	305
2963.03	019	008	020	019	Hygrotus	laccophilinus	OR3	1971	305
2971.03	019	008	020	019	Hygrotus	laccophilinus	0101	1983	305
2975.03	019	008	020	019	Hygrotus	laccophilinus	0101	1983	305
2981.03	019	008	020	019	Hygrotus	laccophilinus	0101	1983	305
2984.03	019	008	020	019	Hygrotus	laccophilinus	0018	1968	306
2987.03	019	008	020	019	Hygrotus	laccophilinus	0031	1968	306
2990.03	019	008	020	019	Hygrotus	laccophilinus	0071	1968	306
2991.03	019	008	020	019	Hygrotus	laccophilinus	0074	1968	305
2995.03	019	008	020	019	Hygrotus	laccophilinus	0034	1968	305
2997.03	019	008	020	019	Hygrotus	laccophilinus	0027	1968	305
2584.03	020	008	020	020	Hygrotus	picatus	MV10	1969	305
2599.03	020	008	020	020	Hygrotus	picatus	0105	1979	308
2600.03	020	008	020	020	Hygrotus	picatus	0101	1979	305
2611.03	020	008	020	020	Hygrotus	picatus	0101	1981	305
2620.03	020	008	020	020	Hygrotus	picatus	MV10	1969	305
2809.03	024	008	020	024	Hygrotus	turbidus	0305	1983	305
2825.03	024	008	020	024	Hygrotus	turbidus	0277	1980	305
2826.03	024	008	020	024	Hygrotus	turbidus	0018	1968	306
2827.03	024	008	020	024	Hygrotus	turbidus	0094	1979	308
2831.03	024	008	020	024	Hygrotus	turbidus	0124	1980	306

Spechab2.frx report on species in the temporary pond habitat, using species related to sites.dbf and spcodegund.dbf.

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Habitat type = temporary pond, code 4 in dbf, 2 for Gunderson class. Report/label for habitat = 5.

Appendix III.3. Example of species records from Gundersen collection for habitat type: temporary pond. Year = year collected.

Sprecno	Ord	Fam	Gen	Spe	Genus	Species	Site Number	Year	Habitat code
2837.03	024	008	020	024	Hygrotus	turbidus	C2	1969	306
2839.03	024	008	020	024	Hygrotus	turbidus	H8	1969	305
2843.03	024	008	020	024	Hygrotus	turbidus	A4	1969	308
2845.03	024	008	020	024	Hygrotus	turbidus	S13	1969	308
2849.03	024	008	020	024	Hygrotus	turbidus	I6	1969	305
2850.03	024	008	020	024	Hygrotus	turbidus	LG10	1969	306
2866.03	024	008	020	024	Hygrotus	turbidus	BR6	1969	305
2867.03	024	008	020	024	Hygrotus	turbidus	S5	1969	305
2868.03	024	008	020	024	Hygrotus	turbidus	LM5	1969	305
2871.03	024	008	020	024	Hygrotus	turbidus	S2	1969	306
2874.03	024	008	020	024	Hygrotus	turbidus	S8	1969	305
2879.03	024	008	020	024	Hygrotus	turbidus	MV10	1969	305
2880.03	024	008	020	024	Hygrotus	turbidus	LG9	1969	308
2884.03	024	008	020	024	Hygrotus	turbidus	L3	1969	304
2890.03	024	008	020	024	Hygrotus	turbidus	0055	1968	327
2891.03	024	008	020	024	Hygrotus	turbidus	0031	1968	306
2892.03	024	008	020	024	Hygrotus	turbidus	0056	1968	305
2893.03	024	008	020	024	Hygrotus	turbidus	0055	1968	327
2894.03	024	008	020	024	Hygrotus	turbidus	0057	1968	306
2896.03	024	008	020	024	Hygrotus	turbidus	0018	1968	306
2897.03	024	008	020	024	Hygrotus	turbidus	0056	1968	305
3435.03	026	008	020	026	Hygrotus	dispar	C2	1968	306
3437.03	026	008	020	026	Hygrotus	dispar	M2	1969	306
38.03	002	008	021	002	Hydrovatus	pustulatus	0101	1983	305
43.03	002	008	021	002	Hydrovatus	pustulatus	0101	1983	305
50.03	002	008	021	002	Hydrovatus	pustulatus	0094	1979	308
54.03	002	008	021	002	Hydrovatus	pustulatus	0101	1979	305
200.03	001	008	024	001	Laccophilus	maculosus	I7	1969	305
209.03	001	008	024	001	Laccophilus	maculosus	B4	1969	305
244.03	001	008	024	001	Laccophilus	maculosus	0066	1970	305
248.03	001	008	024	001	Laccophilus	maculosus	0092	1970	305
260.03	001	008	024	001	Laccophilus	maculosus	0198	1977	308
264.03	001	008	024	001	Laccophilus	maculosus	0211	1977	305
271.03	001	008	024	001	Laccophilus	maculosus	C3	1968	306
273.03	001	008	024	001	Laccophilus	maculosus	C2	1969	306
275.03	001	008	024	001	Laccophilus	maculosus	LM5	1969	305
277.03	001	008	024	001	Laccophilus	maculosus	C6	1959	306
278.03	001	008	024	001	Laccophilus	maculosus	LV8	1969	306
279.03	001	008	024	001	Laccophilus	maculosus	H8	1969	305
282.03	001	008	024	001	Laccophilus	maculosus	C14	1969	306
296.03	001	008	024	001	Laccophilus	maculosus	I1	1969	306
307.03	001	008	024	001	Laccophilus	maculosus	0094	1978	308
309.03	001	008	024	001	Laccophilus	maculosus	0198	1977	308
317.03	001	008	024	001	Laccophilus	maculosus	0098	1978	305

Spechab2.frx report on species in the temporary pond habitat, using species related to sites.dbf and spcodegund.dbf.

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Habitat type = temporary pond, code 4 in dbf, 2 for Gunderson class. Report/label for habitat = 5.

Appendix III.3. Example of species records from Gundersen collection for habitat type: temporary pond. Year = year collected.

Sprecno	Ord	Fam	Gen	Spe	Genus	Species	Site Number	Year	Habitat code
319.03	001	008	024	001	Laccophilus	maculosus	0098	1978	305
327.03	001	008	024	001	Laccophilus	maculosus	0198	1977	308
346.03	001	008	024	001	Laccophilus	maculosus	0198	1977	308
348.03	001	008	024	001	Laccophilus	maculosus	I1	1969	306
357.03	001	008	024	001	Laccophilus	maculosus	MO4	1971	305
375.03	001	008	024	001	Laccophilus	maculosus	0274	1980	305
392.03	001	008	024	001	Laccophilus	maculosus	0277	1980	305
394.03	001	008	024	001	Laccophilus	maculosus	0101	1979	305
396.03	001	008	024	001	Laccophilus	maculosus	0101	1979	305
405.03	001	008	024	001	Laccophilus	maculosus	0245	1979	318
415.03	001	008	024	001	Laccophilus	maculosus	0101	1979	305
418.03	001	008	024	001	Laccophilus	maculosus	0101	1978	305
428.03	001	008	024	001	Laccophilus	maculosus	0101	1979	305
429.03	001	008	024	001	Laccophilus	maculosus	0101	1978	305
444.03	001	008	024	001	Laccophilus	maculosus	0101	1979	305
452.03	001	008	024	001	Laccophilus	maculosus	0313	1982	305
454.03	001	008	024	001	Laccophilus	maculosus	0305	1982	305
455.03	001	008	024	001	Laccophilus	maculosus	0316	1982	305
466.03	001	008	024	001	Laccophilus	maculosus	0101	1983	305
474.03	001	008	024	001	Laccophilus	maculosus	0101	1983	305
482.03	001	008	024	001	Laccophilus	maculosus	0101	1983	305
3777.03	001	008	024	001	Laccophilus	maculosus	0087	1968	305
3821.03	001	008	024	001	Laccophilus	maculosus	S13	1977	308
3986.03	001	008	024	001	Laccophilus	maculosus	0124	1980	306
3989.03	001	008	024	001	Laccophilus	maculosus	0124	1980	306
158.03	003	008	024	003	Laccophilus	proximus	MV10	1969	305
166.03	003	008	024	003	Laccophilus	proximus	0101	1983	305
173.03	003	008	024	003	Laccophilus	proximus	0101	1983	305
4042.03	010	008	024	010	Laccophilus	biguttatus	I1	1969	306
4054.03	010	008	024	010	Laccophilus	biguttatus	MO4	1971	305
4062.03	010	008	024	010	Laccophilus	biguttatus	S13	1969	308
4066.03	010	008	024	010	Laccophilus	biguttatus	LG10	1969	306
4082.03	010	008	024	010	Laccophilus	biguttatus	S2	1969	306
4085.03	010	008	024	010	Laccophilus	biguttatus	MV10	1969	305
4088.03	010	008	024	010	Laccophilus	biguttatus	0018	1968	306
4089.03	010	008	024	010	Laccophilus	biguttatus	0018	1968	306
4090.03	010	008	024	010	Laccophilus	biguttatus	0018	1968	306
4091.03	010	008	024	010	Laccophilus	biguttatus	0027	1968	305
4093.03	010	008	024	010	Laccophilus	biguttatus	0033	1968	306
4101.03	010	008	024	010	Laccophilus	biguttatus	0031	1968	306
4105.03	010	008	024	010	Laccophilus	biguttatus	0007	1968	306
4110.03	010	008	024	010	Laccophilus	biguttatus	MV10	1969	305
4117.03	010	008	024	010	Laccophilus	biguttatus	LG9	1969	308
4122.03	010	008	024	010	Laccophilus	biguttatus	MV10	1969	305

Spechab2.frx report on species in the temporary pond habitat, using species related to sites.dbf and spcodegund.dbf.

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Habitat type = temporary pond, code 4 in dbf, 2 for Gunderson class. Report/label for habitat = 5.

Appendix III.3. Example of species records from Gundersen collection for habitat type: temporary pond. Year = year collected.

Sprecno	Ord	Fam	Gen	Spe	Genus	Species	Site Number	Year	Habitat code
4124.03	010	008	024	010	Laccophilus	biguttatus	I1	1969	306
4138.03	010	008	024	010	Laccophilus	biguttatus	B4	1969	305
4149.03	010	008	024	010	Laccophilus	biguttatus	L3	1969	304
4151.03	010	008	024	010	Laccophilus	biguttatus	MV9	1969	306
4168.03	010	008	024	010	Laccophilus	biguttatus	BR6	1969	305
4177.03	010	008	024	010	Laccophilus	biguttatus	0057	1968	306
4178.03	010	008	024	010	Laccophilus	biguttatus	0056	1968	305
4179.03	010	008	024	010	Laccophilus	biguttatus	0055	1968	327
4180.03	010	008	024	010	Laccophilus	biguttatus	0052	1968	306
4181.03	010	008	024	010	Laccophilus	biguttatus	0066	1968	305
4185.03	010	008	024	010	Laccophilus	biguttatus	0074	1968	305
4213.03	010	008	024	010	Laccophilus	biguttatus	0262	1979	306
4224.03	010	008	024	010	Laccophilus	biguttatus	0262	1979	306
4225.03	010	008	024	010	Laccophilus	biguttatus	0262	1979	306
4226.03	010	008	024	010	Laccophilus	biguttatus	0262	1979	306
4255.03	010	008	024	010	Laccophilus	biguttatus	MV10	1969	305
4261.03	010	008	024	010	Laccophilus	biguttatus	0105	1979	308
4266.03	010	008	024	010	Laccophilus	biguttatus	0105	1979	308
4270.03	010	008	024	010	Laccophilus	biguttatus	BR6	1969	305
4276.03	010	008	024	010	Laccophilus	biguttatus	MV10	1969	305
4280.03	010	008	024	010	Laccophilus	biguttatus	0262	1979	306
4281.03	010	008	024	010	Laccophilus	biguttatus	0262	1979	306
4304.03	010	008	024	010	Laccophilus	biguttatus	S13	1969	308
778.03	002	008	033	002	Coptotomus	longulus	0092	1970	305
781.03	002	008	033	002	Coptotomus	longulus	0179	1977	305
812.03	002	008	033	002	Coptotomus	longulus	0198	1977	308
820.03	002	008	033	002	Coptotomus	longulus	LV8	1969	306
823.03	002	008	033	002	Coptotomus	longulus	H8	1969	305
824.03	002	008	033	002	Coptotomus	longulus	C2	1969	306
827.03	002	008	033	002	Coptotomus	longulus	C14	1969	306
829.03	002	008	033	002	Coptotomus	longulus	LV8	1969	306
849.03	002	008	033	002	Coptotomus	longulus	S3	1969	306
853.03	002	008	033	002	Coptotomus	longulus	MV9	1969	306
860.03	002	008	033	002	Coptotomus	longulus	B4	1969	305
869.03	002	008	033	002	Coptotomus	longulus	0101	1979	305
877.03	002	008	033	002	Coptotomus	longulus	0101	1980	305
886.03	002	008	033	002	Coptotomus	longulus	0094	1983	308
1216.03	006	008	034	006	Colymbetes	sculptilis	MV10	1969	305
1225.03	006	008	034	006	Colymbetes	sculptilis	MV10	1969	305
1230.03	006	008	034	006	Colymbetes	sculptilis	S13	1969	308
1235.03	006	008	034	006	Colymbetes	sculptilis	C16	1969	306
1236.03	006	008	034	006	Colymbetes	sculptilis	C14	1969	306
1246.03	006	008	034	006	Colymbetes	sculptilis	LG10	1969	306
1261.03	006	008	034	006	Colymbetes	sculptilis	0092	1958	305

Spechab2.frx report on species in the temporary pond habitat, using species related to sites.dbf and spcodegund.dbf.

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Appendix III.3. Example of species records from Gundersen collection for habitat type: temporary pond. Year = year collected.

Sprecno	Ord	Fam	Gen	Spe	Genus	Species	Site Number	Year	Habitat code
1299.03	006	008	034	006	Colymbetes	sculptilis	0101	1979	305
1303.03	006	008	034	006	Colymbetes	sculptilis	0007	1978	306
1327.03	006	008	034	006	Colymbetes	sculptilis	0092	1970	305
4736.03	010	008	038	010	Liodessus	affinis	C14	1969	306
4739.03	010	008	038	010	Liodessus	affinis	A4	1969	308
4749.03	010	008	038	010	Liodessus	affinis	MO4	1969	305
4750.03	010	008	038	010	Liodessus	affinis	MO4	1971	305
4755.03	010	008	038	010	Liodessus	affinis	LG4	1969	306
4757.03	010	008	038	010	Liodessus	affinis	C3	1969	306
4758.03	010	008	038	010	Liodessus	affinis	LV8	1969	306
4760.03	010	008	038	010	Liodessus	affinis	S5	1969	305
4763.03	010	008	038	010	Liodessus	affinis	S3	1969	306
4765.03	010	008	038	010	Liodessus	affinis	C2	1969	306
4771.03	010	008	038	010	Liodessus	affinis	S13	1969	308
4772.03	010	008	038	010	Liodessus	affinis	MV10	1969	305
4773.03	010	008	038	010	Liodessus	affinis	M2	1969	306
4776.03	010	008	038	010	Liodessus	affinis	LG10	1969	306
4780.03	010	008	038	010	Liodessus	affinis	BR6	1969	305
4781.03	010	008	038	010	Liodessus	affinis	LV2	1969	305
4782.03	010	008	038	010	Liodessus	affinis	HC8	1969	305
4783.03	010	008	038	010	Liodessus	affinis	I6	1969	305
4797.03	010	008	038	010	Liodessus	affinis	L3	1969	304
4800.03	010	008	038	010	Liodessus	affinis	B4	1969	305
4801.03	010	008	038	010	Liodessus	affinis	LV11	1969	306
4804.03	010	008	038	010	Liodessus	affinis	LG9	1969	308
4818.03	010	008	038	010	Liodessus	affinis	LV5	1969	306
4820.03	010	008	038	010	Liodessus	affinis	LV5	1969	306
4826.03	010	008	038	010	Liodessus	affinis	MV10	1969	305
4844.03	010	008	038	010	Liodessus	affinis	MV10	1969	305
4845.03	010	008	038	010	Liodessus	affinis	0092	1970	305
4858.03	010	008	038	010	Liodessus	affinis	0094	1979	308
4992.03	013	008	038	013	Liodessus	fuscatus	0030	1968	305
948.03	000	016	012	000	Tropisternus	sp	0007	1968	306
949.03	000	016	012	000	Tropisternus	sp	0074	1968	305
950.03	000	016	012	000	Tropisternus	sp	0066	1968	305
951.03	000	016	012	000	Tropisternus	sp	0032	1968	306
953.03	000	016	012	000	Tropisternus	sp	0007	1968	306
964.03	000	016	012	000	Tropisternus	sp	0018	1968	306

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Appendix IV.1 Species of chironomids in the Entomology Collection at the University of Minnesota.

Phylum Arthropoda (47), Class Insecta (06), Order Diptera (30), Family Chironomidae (014)

Genus name	Species name	Codes Subfam	Gen	Spe
Ablabesmyia	americana	006	042	004
Ablabesmyia	annulata	006	042	003
Ablabesmyia	illinoensis	006	042	011
Ablabesmyia	mallochi	006	042	014
Ablabesmyia	monilis	006	042	001
Ablabesmyia	pulchripennis	006	042	017
Ablabesmyia	rhamphe	006	042	019
Anatopynia	dyari	006	005	006
Arctopelopia	americana	006	094	
Brillia	flavifrons	005	022	002
Chaetocladius	stamfordi	005	121	
Chaetolabis	artroviridis	001	083	001
Chernovskiia	orbicus	001	095	002
Chironomus	atrella	001	032	
Chironomus	attenuatus	001	032	002
Chironomus	brunneipen	001	032	
Chironomus	crassicaudatus	001	032	010
Chironomus	decorus	001	032	011
Chironomus	dorsalis	001	032	
Chironomus	dux	001	032	
Chironomus	ferrugineo	001	032	
Chironomus	hyperboreus	001	032	
Chironomus	plumosus	001	032	003
Chironomus	riparius	001	032	017
Chironomus	staegeri	001	032	018
Chironomus	tendens	001	032	
Chironomus	tentans	001	032	001
Chironomus	tritomus	001	032	
Chironomus	utahensis	001	032	
Chironomus	viridulus	001	159	004
Coelotanypus	concinnus	006	002	001
Conchapelopia	dusena	006	096	006
Conchapelopia	goniodes	006	096	007
Conchapelopia	pillicaudat	006	096	
Cricotopus	bicinctus	005	025	004

Appendix IV.1 Species of chironomids in the Entomology Collection at the University of Minnesota.

Phylum Arthropoda (47), Class Insecta (06), Order Diptera (30), Family Chironomidae (014)

Genus name	Species name	Codes Subfam	Gen	Spe
Cricotopus	similis	005	025	
Cricotopus	triannulatus	005	025	034
Cricotopus	vierriensis	005	025	022
Cryptochironomus	abortivus	001	035	
Cryptochironomus	amachaerus	001	035	
Cryptochironomus	chaetoala	001	035	
Cryptochironomus	cuneatus	001	035	
Cryptochironomus	digitatus	001	035	001
Cryptochironomus	fulvus	001	035	002
Cryptochironomus	macropodus	001	035	002
Cryptochironomus	potomogeti	001	035	
Cryptochironomus	psittacinus	001	035	006
Cryptochironomus	tenuicauda	001	035	
Cryptochironomus	viridulus	001	035	
Cryptotendipes	pseudotenen	001	143	
Diamesa	chiobates	002	012	030
Diamesa	haydaki	002	012	
Diamesa	heteropus	002	012	031
Diamesa	leona	002	012	017
Diamesa	mendotae	002	012	020
Diamesa	nivoriunda	002	012	021
Dicrotendipes	fumidus	001	043	004
Dicrotendipes	modestus	001	043	009
Dicrotendipes	neomodestus	001	043	010
Dicrotendipes	nervosus	001	043	011
Enchironomus	atrimanus	001	086	001
Endochironomus	nigricans	001	086	004
Endochironomus	subtendens	001	086	006
Endochironomus	tendens	001	086	
Eukiefferiella	claripennis	005	050	005
Eukiefferiella	paucuna	005	050	
Glyptotendipes	barbipes	001	038	007
Glyptotendipes	lobiferus	001	038	009
Glyptotendipes	musculus	001	038	
Glyptotendipes	papipes	001	038	011
Glyptotendipes	paripes	001	038	011

Appendix IV.1 Species of chironomids in the Entomology Collection at the University of Minnesota.

Phylum Arthropoda (47), Class Insecta (06), Order Diptera (30), Family Chironomidae (014)

Genus name	Species name	Codes Subfam	Gen	Spe
Guttipelopia	guttipennis	006	097	
Harnishia	claviger	001	162	
Heterotrissocladius	changi	005	105	005
Heterotrissocladius	cooki	005	105	004
Heterotrissocladius	oliveri	005	105	001
Hydrobaenus	johannseni	005	021	011
Hydrobaenus	pilipes	005	021	012
Kiefferulus	dux	001	053	001
Labrundinia	pilosella	006	103	002
Lauterborniella	varipennis	001	031	003
Limnochironomus	fumidus	001		
Limnophyes	carolinensis	005	093	
Limnophyes	hastulatus	005	093	
Limnophyes	nudiradius	005	093	
Limnophyes	pilicistul	005	093	
Mesosmittia	lobiga	005		
Microtendipes	pallidus	001	027	
Microtendipes	pedullus	001	027	002
Monodiamesa	ekmani	002	127	
Nanocladius	downesi	005	044	010
Nanocladius	rectinervis	005	044	006
Odontomesa	fulva	004	107	001
Orthocladius	annectens	005	049	037
Orthocladius	carlatus	005	049	005
Orthocladius	clarki	005	049	
Orthocladius	cooki	005	049	
Orthocladius	dentifer	005	049	039
Orthocladius	dorenus	005	049	011
Orthocladius	manitobens	005	049	
Orthocladius	nigritus	005	049	023
Orthocladius	obumbratus	005	049	025
Orthocladius	oliveri	005	049	
Orthocladius	rivicola	005	049	
Orthocladius	rivulorum	005	049	036
Orthocladius	smolandicu	005	049	
Orthocladius	tyroni	005	049	

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Phylum Arthropoda (47), Class Insecta (06), Order Diptera (30), Family Chironomidae (014)

Genus name	Species name	Codes Subfam	Gen	Spe
Pagastia	orthogonia	002	056	001
Parachironomus	abortivus	001	052	008
Parachironomus	frequens	001	052	004
Parachironomus	hirtalatus	001	052	005
Parachironomus	potamogeti	001	052	012
Parachironomus	tenuicaudatus	001	052	007
Paracladopelma	nereis	001	151	002
Paralauterborniella	nigrohalteralis	001	045	002
Paramerina	fragilis	006	061	
Paramerina	smithae	006	061	002
Paratanytarsis	intricatus	001	091	
Paratanytarsis	similatus	001	091	
Paratanytarsis	spencei	001	091	
Paratendipes	albimanus	001	028	001
Paratendipes	basidens	001	028	
Paratendipes	nigrohalte	001	028	
Paratendipes	subaequalis	001	028	002
Phaenopsectra	flavipes	001	152	003
Phaenopsectra	obediens	001	152	
Phaenopsectra	punctipes	001	152	
Polypedilum	acifer	001	036	001
Polypedilum	albicorne	001	036	
Polypedilum	albinodus	001	036	002
Polypedilum	artifer	001	036	006
Polypedilum	aviceps	001	036	007
Polypedilum	braseniae	001	036	008
Polypedilum	convictum	001	036	011
Polypedilum	digitifer	001	036	012
Polypedilum	fallax	001	036	003
Polypedilum	griseopunctatum	001	036	016
Polypedilum	halterale	001	036	017
Polypedilum	illinoense	001	036	031
Polypedilum	isocerus	001	036	018
Polypedilum	laetum	001	036	043
Polypedilum		001	036	034
Polypedilum	obtusum	001	036	019

Appendix IV.1 Species of chironomids in the Entomology Collection at the University of Minnesota.

Phylum Arthropoda (47), Class Insecta (06), Order Diptera (30), Family Chironomidae (014)

Genus name	Species name	Codes Subfam	Gen	Spe
Polypedilum	ophiodes	001	036	020
Polypedilum	pedatum	001	036	037
Polypedilum	scalaenum	001	036	038
Polypedilum		001	036	023
Polypedilum	simulans	001	036	023
Polypedilum	sordens	001	036	042
Polypedilum	trigonum	001	036	039
Polypedilum	tritum	001	036	040
Polypedilum	walleyi	001	036	025
Potthastia	gaedii	002	067	002
Potthastia	longimanus	002	067	001
Procladius	bellus	006	004	001
Procladius	denticulatys	006	004	004
Procladius	freemani	006	004	005
Procladius	riparius	006	004	006
Procladius	ruris	006	004	
Procladius	sublettei	006	004	007
Prodiamesa	olivacea	004	011	003
Protanypus		002	069	
Protanypus	ramosus	002	069	
Psectrocladius	vernalis	005	115	005
Psectrotanypus	dyari	006	070	001
Pseudodiamesa	pertinax	002	082	
Pseudovent			037	006
Robackia	claviger	001	153	002
Saetheria	reissi	001	112	
Stenochironomus	hilaris	001	029	004
Stenochironomus	taeniapennis	001	029	002
Stictochironomus	annulicrus	001	039	
Stictochironomus	devinctus	001	039	004
Stictochironomus	unquiculat	001	039	
Synorthocladius	semiviriens	005	079	001
Tanypus	carinatus	006	033	005
Tanypus	okoboji	006	033	
Tanypus	punctipennis	006	033	004
Tanypus	stellatus	006	033	001

Appendix IV.1 Species of chironomids in the Entomology Collection at the University of Minnesota.

Phylum Arthropoda (47), Class Insecta (06), Order Diptera (30), Family Chironomidae (014)

Genus name	Species name	Codes Subfam	Gen	Spe
Tanytarsus	protextus	001		
Telopelopia	okoboji	006	157	001
Thienemanniella	senata	005	166	001
Tribelos	fuscicorni	001	117	002
Tribelos	jucundus	001	117	001
Xenochironomus	festivus	001	089	001
Xenochironomus	scopula	001	089	003
Xenochironomus	taenionotus	001	089	004
Xenochironomus	xenolabis	001	089	005
Zalutschia	lingulata	005	118	

Appendix IV.2. List of genera of MN Chironomidae in the Entomology Museum.

Genera of Chironomidae in Minnesota. Subfamilies coded as follows: 1= Chironominae, 2 = Diamesinae, 3 = Podonominae, 4 = Prodiamesinae, 5 =Orthocladiinae, 6 = Tanypodinae

	Codes	
Genus name	Subfamily	Genus
Ablabesmyia	006	042
Anatopynia	006	005
Arctopelopia	006	094
Brillia	005	022
Chaetocladius	005	121
Chaetolabis	001	083
Chernovskiia	001	095
Chironomus	001	032
Coelotanypus	006	002
Conchapelopia	006	096
Cricotopus	005	025
Cryptochironomus	001	035
Cryptotendipes	001	143
Diamesa	002	012
Dicrotendipes	001	043
Enchironomus	001	086
Endochironomus	001	086
Eukiefferiella	005	050
Glyptotendipes	001	038
Guttipelopia	006	097
Harnishia	001	162
Heterotrissocladius	005	105
Hydrobaenus	005	021
Kiefferulus	001	053
Labrundinia	006	103
Lauterborniella	001	031
Limnochironomus	001	
Limnophyes	005	093
Mesosmittia	005	
Microtendipes	001	027
Monodiamesa	002	127
Nanocladius	005	044
Odontomesa	004	107
Orthocladius	005	049
Pagastia	002	056
Parachironomus	001	052

Dbf = Chironames.dbf, index = genfullname unique, report = Chirogen.frx

Appendix IV.2. List of genera of MN Chironomidae in the Entomology Museum.

Genera of Chironomidae in Minnesota. Subfamilies coded as follows: 1= Chironominae, 2 = Diamesinae, 3 = Podonominae, 4 = Prodiamesinae, 5 =Orthocladiinae, 6 = Tanypodinae

	Codes	
Genus name	Subfamily	Genus
Paracladopelma	001	151
Paralauterborniella	001	045
Paramerina	006	061
Paratanytarsis	001	091
Paratendipes	001	028
Phaenopsectra	001	152
Polypedilum	001	036
Potthastia	002	067
Procladius	006	004
Prodiamesa	004	011
Protanypus	002	069
Psectrocladius	005	115
Psectrotanypus	006	070
Pseudodiamesa	002	082
Pseudovent		037
Robackia	001	153
Saetheria	001	112
Stenochironomus	001	029
Stictochironomus	001	039
Synorthocladius	005	079
Tanypus	006	033
Tanytarsus	001	
Telopelopia	006	157
Thienemanniella	005	166
Tribelos	001	117
Xenochironomus	001	089
Zalutschia	005	118

Dbf = Chironames.dbf, index = genfullname unique, report = Chirogen.frx

Appendix IV. 3. Subfamilies of chironomids with genera, from the Entomology Museum.

Subfamily Code	Subfamily Name	Genus Name	Genus Code
001	Chironominae	Chaetolabis	083
001	Chironominae	Chernovskiia	095
001	Chironominae	Chironomus	032
001	Chironominae	Chironomus	159
001	Chironominae	Cryptochironomus	035
001	Chironominae	Cryptotendipes	143
001	Chironominae	Dicrotendipes	043
001	Chironominae	Enchironomus	086
001	Chironominae	Glyptotendipes	038
001	Chironominae	Harnishia	162
001	Chironominae	Kiefferulus	053
001	Chironominae	Lauterborniella	031
001	Chironominae	Limnochironomus	
001	Chironominae	Microtendipes	027
001	Chironominae	Parachironomus	052
001	Chironominae	Paracladopelma	151
001	Chironominae	Paralauterborniella	045
001	Chironominae	Paratanytarsis	091
001	Chironominae	Paratendipes	028
001	Chironominae	Phaenopsectra	152
001	Chironominae	Polypedilum	036
001	Chironominae	Robackia	153
001	Chironominae	Saetheria	112
001	Chironominae	Stenochironomus	029
001	Chironominae	Stictochironomus	039
001	Chironominae	Tanytarsus	
001	Chironominae	Tribelos	117
001	Chironominae	Xenochironomus	089
002	Diamesinae	Diamesa	012
002	Diamesinae	Pagastia	056
002	Diamesinae	Potthastia	067
002	Diamesinae	Protanypus	069
002	Diamesinae	Pseudodiamesa	082
005	Orthocladiinae	Brillia	022
005	Orthocladiinae	Chaetocladius	121
005	Orthocladiinae	Cricotopus	025
005	Orthocladiinae	Eukiefferiella	050
005	Orthocladiinae	Heterotrissocladius	105
005	Orthocladiinae	Hydrobaenus	021
005	Orthocladiinae	Limnophyes	093
005	Orthocladiinae	Mesosmittia	
005	Orthocladiinae	Nanocladius	044
005	Orthocladiinae	Orthocladius	049
005	Orthocladiinae	Psectrocladius	115
005	Orthocladiinae	Synorthocladius	079
005	Orthocladiinae	Thienemanniella	166
005	Orthocladiinae	Zalutschia	118
004	Prodiamesinae	Odontomesa	107
004	Prodiamesinae	Prodiamesa	011
006	Tanypodinae	Ablabesmyia	042
006	Tanypodinae	Anatopynia	005
006	Tanypodinae	Arctopelopia	094
006	Tanypodinae	Coelotanypus	002
006	Tanypodinae	Conchapelopia	096
006	Tanypodinae	Guttipelopia	097
006	Tanypodinae	Labrundinia	103

Appendix IV. 3. Subfamilies of chironomids with genera, from the Entomology Museum.

Subfamily		Genus	
Code	Name	Name	Code
006	Tanypodinae	Paramerina	061
006	Tanypodinae	Procladius	004
006	Tanypodinae	Psectrotanypus	070
006	Tanypodinae	Tanypus	033
006	Tanypodinae	Telopelopia	157

Appendix IV.4. List of chironomid species in the Entomology collection at the University of Minnesota.

Pollution tolerances from Beck,1977 (USEPA 600/4-77-024) listed as 'nutrients', 'organics' and 'oxygen'. A Y under eutrophic (Eutr) and low oxygen (Low02) means these species are indicators (from Dawson and Hellenthal, 1986) See text for details.

Genus	Species	Nutrients	Eutr	Organics	Oxygen	Low02
Ablabesmyia	americana	eutr	Y	clean	moder	
Ablabesmyia	annulata	eutr,meso,dystro	Y	vclean	moder	
Ablabesmyia	illinoensis	eutr	Y	clean	moder	
Ablabesmyia	mallochi	eutr,meso,dystro	Y	clean,vclean	moder,low	Y
Ablabesmyia	monilis	eutr	Y	clean	low	Y
Ablabesmyia	pulchripennis					
Ablabesmyia	rhamphe	eutr,meso,dystro	Y	clean	moder,low	Y
Anatopynia	dyari					
Arctopelopia	americana					
Brillia	flavifrons	meso			low	Y
Chaetocladius	stamfordi					
Chaetolabis	artroviridis					
Chernovskiia	orbicus					
Chironomus	atrella			pollut		
Chironomus	attenuatus	eutr,meso	Y	pollut,toler,clean	moder,low,anaer	Y
Chironomus	atrella					
Chironomus	crassicaudatus	eutr,meso	Y	clean	moder,low	Y
Chironomus	decorus					
Chironomus	atrella					
Chironomus	atrella					
Chironomus	atrella					
Chironomus	atrella					
Chironomus	plumosus	eutr,meso	Y		moder,low,anaer	Y
Chironomus	riparius	eutr,meso	Y		moder,low,anaer	Y
Chironomus	staegeri	eutr	Y	clean	moder	
Chironomus	atrella					
Chironomus	tentans	eutr,meso	Y	toler	low,anaer	Y
Chironomus	atrella					
Chironomus	atrella					
Chironomus	viridulus					
Coelotanypus	concinnus	eutr,meso,dystro	Y	toler,clean	moder,low	Y
Conchapelopia	dusena					
Conchapelopia	goniodes					
Conchapelopia	pillicaudat					
Cricotopus	bicinctus	eutr,meso,dystro	Y	clean,vclean	moder,low	Y
Cricotopus	similis					
Cricotopus	triannulatus					
Cricotopus	vierriensis					

Appendix IV.4. List of chironomid species in the Entomology collection at the University of Minnesota.

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Genus	Species	Nutrients	Eutr	Organics	Oxygen	Low02
Cryptochironomus	abortivus					
Cryptochironomus	abortivus					
Cryptochironomus	abortivus					
Cryptochironomus	abortivus					
Cryptochironomus	digitatus					
Cryptochironomus	fulvus	meso,dystro	Y	toler,clean,vclean		Y
Cryptochironomus	fulvus					
Cryptochironomus	abortivus					
Cryptochironomus	psittacinus					
Cryptochironomus	abortivus					
Cryptochironomus	abortivus					
Cryptotendipes	pseudotenen					
Diamesa	chiobates					
Diamesa	haydaki					
Diamesa	heteropus					
Diamesa	leona					
Diamesa	mendotae					
Diamesa	nivoriunda	eutr		vclean	satur	
Dicrotendipes	fumidus	meso			low	Y
Dicrotendipes	modestus	eutr,meso,dystro	Y	clean	moder,low	Y
Dicrotendipes	neomodestus	meso			low	Y
Dicrotendipes	nervosus	eutr,dystro	Y	clean	moder,low	
Enchironomus	atrimanus					
Endochironomus	nigricans	eutr,meso,dystro	Y	toler,clean,vclean	moder,low,anaer	Y
Endochironomus	subtendens					
Endochironomus	tendens					
Eukiefferiella	claripennis					
Eukiefferiella	paucuna					
Glyptotendipes	barbipes		Y			Y
Glyptotendipes	lobiferus		Y			Y
Glyptotendipes	musculus					
Glyptotendipes	papipes					
Glyptotendipes	papipes	eutr,meso,dystro	Y	toler,clean	moder,anaer	Y
Guttipelopia	guttipennis					
Harnishia	claviger					
Heterotrissocladius	changi					
Heterotrissocladius	cooki					
Heterotrissocladius	oliveri					
Hydrobaenus	johannseni					

Chirosp.dbf, chiroonly.ndx, chirotoler.frx. Chirosp related to Chironames.dbf.

Appendix IV.4. List of chironomid species in the Entomology collection at the University of Minnesota.

Pollution tolerances from Beck,1977 (USEPA 600/4-77-024) listed as 'nutrients', 'organics' and 'oxygen'. A Y under eutrophic (Eutr) and low oxygen (Low02) means these species are indicators (from Dawson and Hellenthal, 1986) See text for details.

Genus	Species	Nutrients	Eutr	Organics	Oxygen	Low02
Hydrobaenus	pilipes					
Kiefferulus	dux	eutr,meso,dystro	Y	toler,clean	moder,low	Y
Labrundinia	pilosella	eutr,meso,dystro	Y	clean	moder	
Lauterborniella	varipennis	eutr,meso,dystro	Y	clean	moder	
Limnophyes	carolinensis					
Limnophyes	carolinensis					
Limnophyes	carolinensis					
Limnophyes	carolinensis					
Microtendipes	pallidus					
Microtendipes	pedullus	eutr,meso		clean,vclean	moder	
Monodiamesa	ekmani					
Nanocladius	downesi					
Nanocladius	rectinervis					
Odontomesa	fulva	meso		clean	satur	
Orthocladius	annectens	eutr,meso,dystro		clean	moder	
Orthocladius	carlatus					
Orthocladius	clarki					
Orthocladius	clarki					
Orthocladius	dentifer					
Orthocladius	dorenus					
Orthocladius	clarki					
Orthocladius	nigritus					
Orthocladius	obumbratus	meso,oligo		vclean	moder	
Orthocladius	clarki					
Orthocladius	clarki					
Orthocladius	rivulorum					
Orthocladius	clarki					
Orthocladius	clarki					
Pagastia	orthogonia					
Parachironomus	abortivus					
Parachironomus	frequens					
Parachironomus	hirtalatus	eutr,dystro	Y	clean	moder	
Parachironomus	potamogeti					
Parachironomus	tenuicaudatus	eutr,meso,oligo	Y	clean,vclean	moder,low	Y
Paracladopelma	nereis					
Paralauterborniella	nigrohalteralis	eutr,meso,dystro	Y	clean	satur,moder	
Paramerina	fragilis					

Chirosp.dbf, chiroonly.ndx, chirotoler.frx. Chirosp related to Chironames.dbf.

Appendix IV.4. List of chironomid species in the Entomology collection at the University of Minnesota.

Pollution tolerances from Beck,1977 (USEPA 600/4-77-024) listed as 'nutrients', 'organics' and 'oxygen'. A Y under eutrophic (Eutr) and low oxygen (Low02) means these species are indicators (from Dawson and Hellenthal, 1986) See text for details.

Genus	Species	Nutrients	Eutr	Organics	Oxygen	Low02
Paramerina	smithae	oligo		vclean	moder	
Paratanytarsis	intricatus					
Paratanytarsis	intricatus					
Paratanytarsis	intricatus					
Paratendipes	albimanus	meso		vclean	moder,low	Y
Paratendipes	basidens					
Paratendipes	basidens					
Paratendipes	subaequalis	eutr,meso,dystro	Y	clean	moder	
Phaenopsectra	flavipes					
Phaenopsectra	obediens					
Phaenopsectra	obediens					
Polypedilum	acifer					
Polypedilum	albicorne					
Polypedilum	albinodus					
Polypedilum	artifer					
Polypedilum	aviceps	meso			low	Y
Polypedilum	braseniae	meso,dystro		vclean	moder	
Polypedilum	convictum	meso,dystro			moder	
Polypedilum	digitifer	eutr,meso	Y	clean	moder,low	Y
Polypedilum	fallax	eutr,meso,dystro		toler,clean,vclean	moder,low	
Polypedilum	griseopunctatum					
Polypedilum	halterale	eutr,meso	Y	clean,vclean	moder,low	Y
Polypedilum	illinoense	all	Y	toler,clean	moder,low	Y
Polypedilum	isocerus					
Polypedilum	laetum					
Polypedilum						
Polypedilum	obtusum	meso			moder,low	Y
Polypedilum	ophiodes					
Polypedilum	pedatum					
Polypedilum	scalaenum	meso,oligo		vclean	moder,low	Y
Polypedilum			Y			
Polypedilum						
Polypedilum	sordens					
Polypedilum	trigonum		Y			
Polypedilum	tritum					Y
Polypedilum	walleyi					
Potthastia	gaedii					
Potthastia	longimanus					
Procladius	bellus	eutr,meso,oligo	Y	clean,vclean	moder,low	Y

Chirosp.dbf, chiroonly.ndx, chirotoler.frx. Chirosp related to Chironames.dbf.

Appendix IV.4. List of chironomid species in the Entomology collection at the University of Minnesota.

Pollution tolerances from Beck,1977 (USEPA 600/4-77-024) listed as 'nutrients', 'organics' and 'oxygen'. A Y under eutrophic (Eutr) and low oxygen (Low02) means these species are indicators (from Dawson and Hellenthal, 1986) See text for details.

Genus	Species	Nutrients	Eutr	Organics	Oxygen	Low02
Procladius	denticulatys	eutr,oligo	Y	clean,vclean	moder	
Procladius	freemani					
Procladius	riparius	eutr	Y	clean	moder	
Procladius	ruris					
Procladius	sublettei					
Prodiamesa	olivacea	meso,oligo		vclean	satur,moder	
Protanypus						
Protanypus						
Psectrocladius	vernalis	all	Y	clean	moder	
Psectrotanypus	dyari					
Pseudodiamesa	pertinax					
Pseudovent						
Robackia	claviger					
Saetheria	reissi					
Stenochironomus	hilaris	eutr,meso,dystro	Y	clean,vclean	moder	
		meso		clean	moder	
Stenochironomus	taeniapennis					
Stictochironomus	annulicrus					
Stictochironomus	devinctus	eutr		vclean	moder	
Stictochironomus	annulicrus					
Synorthocladius	semiviriens					
Tanypus	carinatus	eutr,dystro	Y	pollut,toler,clean	moder,low,anaer	Y
Tanypus	okoboji					
Tanypus	punctipennis	eutr,meso	Y	pollut,toler,clean	moder,low,anaer	Y
Tanypus	stellatus	eutr,meso,dystro	Y	toler,vclean	moder,low,anaer	Y
Telopelopia	okoboji					
Thienemanniella	senata	meso,dystro		vclean	satur	
Tribelos	fuscicorni	oligo		vclean	moder	
Tribelos	jucundus	eutr,meso,dystro		clean,vclean	moder	
Xenochironomus	festivus					
Xenochironomus	scopula	meso		clean	moder	
Xenochironomus	taenionotus	meso,dystro		clean,vclean	moder	
Xenochironomus	xenolabis	meso,dystro		clean	moder	
Zalutschia	lingulata					

Appendix IV.5. Species of chironomids recorded in MN 1940 or earlier.

Data from the Entomology collections, University of Minnesota. See Appendix V.6 for locations keyed on Entrycodes below.

Codes						
Gen	Spe	Genus	Species	Year	Determiner	Entrycode
042	011	Ablabesmyia	illinoensis	1937	JESUBLETTE	E270
083	001	Chaetolabis	artroviridis		HKTOWNES	E1450
083	001	Chaetolabis	artroviridis		HKTOWNES	E1448
083	001	Chaetolabis	artroviridis	1911	HKTOWNES	E1447
083	001	Chaetolabis	artroviridis	1934	HKTOWNES	E1446
083	001	Chaetolabis	artroviridis	1934	HKTOWNES	E1449
083	001	Chaetolabis	artroviridis	1939	JESUBLETTE	E1445
032		Chironomus	atrella	1925	HKTOWNES	E1444
032	002	Chironomus	attenuatus		HKTOWNES	E1
032	002	Chironomus	attenuatus	1921	HKTOWNES	E1461
032	002	Chironomus	attenuatus	1922	HKTOWNES	E1462
032	002	Chironomus	attenuatus	1925	HKTOWNES	E1457
032	002	Chironomus	attenuatus	1931	HKTOWNES	E2
032	002	Chironomus	attenuatus	1934	JESUBLETTE	E1455
032	002	Chironomus	attenuatus	1934	HKTOWNES	E1459
032	002	Chironomus	attenuatus	1934	HKTOWNES	E1460
032	002	Chironomus	attenuatus	1935	HKTOWNES	E1458
032	002	Chironomus	attenuatus	1936	HKTOWNES	E3
032	002	Chironomus	attenuatus	1938	JESUBLETTE	E1456
032		Chironomus	atrella	1922	HKTOWNES	E6
032		Chironomus	atrella	1922	HKTOWNES	E5
032		Chironomus	atrella	1934	HKTOWNES	E4
032	010	Chironomus	crassicaudatus		HKTOWNES	E32
032	010	Chironomus	crassicaudatus	1922	HKTOWNES	E31
032	011	Chironomus	decorus	1940	HKTOWNES	E278
032		Chironomus	atrella	1937	JESUBLETTE	E37
032		Chironomus	atrella	1936	HKTOWNES	E39
032		Chironomus	atrella	1936	HKTOWNES	E41
032		Chironomus	atrella	1938	JESUBLETTE	E38
032		Chironomus	atrella	1940	HKTOWNES	E274
032		Chironomus	atrella	1922	HKTOWNES	E50
032	003	Chironomus	plumosus		HKTOWNES	E94
032	003	Chironomus	plumosus		JESUBLETTE	E126
032	003	Chironomus	plumosus		HKTOWNES	E95
032	003	Chironomus	plumosus		HKTOWNES	E93
032	003	Chironomus	plumosus	1897	HKTOWNES	E79
032	003	Chironomus	plumosus	1900	HKTOWNES	E80
032	003	Chironomus	plumosus	1903	HKTOWNES	E122
032	003	Chironomus	plumosus	1910	HKTOWNES	E111
032	003	Chironomus	plumosus	1910	HKTOWNES	E82
032	003	Chironomus	plumosus	1910	HKTOWNES	E107
032	003	Chironomus	plumosus	1911	HKTOWNES	E81
032	003	Chironomus	plumosus	1918	HKTOWNES	E89

Sortsp.dbf related to chironames.dbf. Sortsp. indexed on genusname, speciename,yearcoll unique. Chironames indexed on genuscode and speciecode, same key. Report = chiroold.frx. Database Report/Label expr. FOR yearcoll <= '1940'.

Appendix IV.5. Species of chironomids recorded in MN 1940 or earlier.

Data from the Entomology collections, University of Minnesota. See Appendix V.6 for locations keyed on Entrycodes below.

Codes						
Gen	Spe	Genus	Species	Year	Determiner	Entrycode
032	003	Chironomus	plumosus	1920	HKTOWNES	E106
032	003	Chironomus	plumosus	1921	HKTOWNES	E83
032	003	Chironomus	plumosus	1922	HKTOWNES	E90
032	003	Chironomus	plumosus	1922	HKTOWNES	E85
032	003	Chironomus	plumosus	1922	HKTOWNES	E74
032	003	Chironomus	plumosus	1922	HKTOWNES	E121
032	003	Chironomus	plumosus	1922	HKTOWNES	E97
032	003	Chironomus	plumosus	1923	HKTOWNES	E101
032	003	Chironomus	plumosus	1923	HKTOWNES	E104
032	003	Chironomus	plumosus	1923	HKTOWNES	E75
032	003	Chironomus	plumosus	1925	HKTOWNES	E87
032	003	Chironomus	plumosus	1925	HKTOWNES	E100
032	003	Chironomus	plumosus	1926	HKTOWNES	E76
032	003	Chironomus	plumosus	1928	HKTOWNES	E88
032	003	Chironomus	plumosus	1928	HKTOWNES	E72
032	003	Chironomus	plumosus	1929	HKTOWNES	E118
032	003	Chironomus	plumosus	1929	HKTOWNES	E117
032	003	Chironomus	plumosus	1930	HKTOWNES	E120
032	003	Chironomus	plumosus	1932	HKTOWNES	E84
032	003	Chironomus	plumosus	1932	HKTOWNES	E86
032	003	Chironomus	plumosus	1933	HKTOWNES	E109
032	003	Chironomus	plumosus	1934	HKTOWNES	E91
032	003	Chironomus	plumosus	1934	HKTOWNES	E110
032	003	Chironomus	plumosus	1934	HKTOWNES	E105
032	003	Chironomus	plumosus	1935	HKTOWNES	E103
032	003	Chironomus	plumosus	1935	HKTOWNES	E102
032	003	Chironomus	plumosus	1935	HKTOWNES	E115
032	003	Chironomus	plumosus	1935	HKTOWNES	E114
032	003	Chironomus	plumosus	1935	HKTOWNES	E116
032	003	Chironomus	plumosus	1935	HKTOWNES	E96
032	003	Chironomus	plumosus	1935	HKTOWNES	E78
032	003	Chironomus	plumosus	1935	HKTOWNES	E113
032	003	Chironomus	plumosus	1935	HKTOWNES	E108
032	003	Chironomus	plumosus	1935	HKTOWNES	E99
032	003	Chironomus	plumosus	1935	HKTOWNES	E73
032	003	Chironomus	plumosus	1935	HKTOWNES	E98
032	003	Chironomus	plumosus	1936	HKTOWNES	E119
032	003	Chironomus	plumosus	1936	HKTOWNES	E112
032	003	Chironomus	plumosus	1937	HKTOWNES	E92
032	003	Chironomus	plumosus	1937	JESUBLETE	E124
032	003	Chironomus	plumosus	1938	JESUBLETTE	E125
032	003	Chironomus	plumosus	1938	JESUBLETTE	E138
032	003	Chironomus	plumosus	1938	JESUBLETTE	E123
032	003	Chironomus	plumosus	1939	HKTOWNES	E276

Sortsp.dbf related to chironames.dbf. Sortsp. indexed on genusname, speciename,yearcoll unique. Chironames indexed on genuscode and speciecode, same key. Report = chirold.frx. Database Report/Label expr. FOR yearcoll <= '1940'.

Appendix IV.5. Species of chironomids recorded in MN 1940 or earlier.

Data from the Entomology collections, University of Minnesota. See Appendix V.6 for locations keyed on Entrycodes below.

Codes						
Gen	Spe	Genus	Species	Year	Determiner	Entrycode
032	003	Chironomus	plumosus	1939	JESUBLETTE	E136
032	003	Chironomus	plumosus	1939	JESUBLETTE	E129
032	003	Chironomus	plumosus	1940	HKTOWNES	E275
032	003	Chironomus	plumosus	1940	JESUBLETTE	E133
032	003	Chironomus	plumosus	1940	JESUBLETTE	E137
032	017	Chironomus	riparius	1912	HKTOWNES	E145
032	017	Chironomus	riparius	1934	HKTOWNES	E142
032	017	Chironomus	riparius	1935	HKTOWNES	E144
032	017	Chironomus	riparius	1935	HKTOWNES	E146
032	017	Chironomus	riparius	1935	HKTOWNES	E143
032	018	Chironomus	staegeri	1935	JESUBLETTE	E150
032	018	Chironomus	staegeri	1935	JESUBLETTE	E153
032	018	Chironomus	staegeri	1936	HKTOWNES	E151
032	018	Chironomus	staegeri	1936	HKTOWNES	E152
032		Chironomus	atrella	1938	JESUBLETTE	E156
032	001	Chironomus	tentans	1898	HKTOWNES	E168
032	001	Chironomus	tentans	1918	HKTOWNES	E164
032	001	Chironomus	tentans	1922	HKTOWNES	E163
032	001	Chironomus	tentans	1923	HKTOWNES	E158
032	001	Chironomus	tentans	1923	HKTOWNES	E159
032	001	Chironomus	tentans	1925	HKTOWNES	E157
032	001	Chironomus	tentans	1929	HKTOWNES	E165
032	001	Chironomus	tentans	1933	HKTOWNES	E161
032	001	Chironomus	tentans	1935	HKTOWNES	E162
032	001	Chironomus	tentans	1935	HKTOWNES	E160
032	001	Chironomus	tentans	1935	HKTOWNES	E167
032	001	Chironomus	tentans	1936	HKTOWNES	E169
032	001	Chironomus	tentans	1936	HKTOWNES	E166
032	001	Chironomus	tentans	1937	JESUBLETTE	E185
032	001	Chironomus	tentans	1937	JESUBLETTE	E183
032	001	Chironomus	tentans	1938	JESUBLETTE	E187
032	001	Chironomus	tentans	1938	JESUBLETTE	E182
032		Chironomus	atrella	1922	HKTOWNES	E193
032		Chironomus	atrella	1922	HKTOWNES	E191
032		Chironomus	atrella	1935	HKTOWNES	E192
032		Chironomus	atrella	1935	HKTOWNES	E194
035		Cryptochironomus	abortivus	1924		E1440
035		Cryptochironomus	abortivus	1936	HKTOWNES	E1442
035		Cryptochironomus	abortivus	1940	JESUBLETTE	E7
035	001	Cryptochironomus	digitatus	1933	JESUBLETTE	E36
035	001	Cryptochironomus	digitatus	1935	HKTOWNES	E35
035	001	Cryptochironomus	digitatus	1937	JESUBLETTE	E34
035	002	Cryptochironomus	fulvus	1911	HKTOWNES	044
035	002	Cryptochironomus	fulvus	1925	HKTOWNES	E47

Sortsp.dbf related to chironames.dbf. Sortsp. indexed on genusname, speciename,yearcoll unique. Chironames indexed on genuscode and speciecode, same key. Report = chiroold.frx. Database Report/Label expr. FOR yearcoll <= '1940'.

Appendix IV.5. Species of chironomids recorded in MN 1940 or earlier.

Data from the Entomology collections, University of Minnesota. See Appendix V.6 for locations keyed on Entrycodes below.

Codes						
Gen	Spe	Genus	Species	Year	Determiner	Entrycode
035	002	Cryptochironomus	fulvus	1934	HKTOWNES	E45
035	002	Cryptochironomus	fulvus	1936	HKTOWNES	E46
035	002	Cryptochironomus	fulvus	1940	JESUBLETTE	E43
035		Cryptochironomus	abortivus	1040	JESUBLETTE	E148
035	006	Cryptochironomus	psittacinus	1935	HKTOWNES	E141
035		Cryptochironomus	abortivus	1936	HKTOWNES	E189
035		Cryptochironomus	abortivus	1934	HKTOWNES	E197
012	020	Diamesa	mendotae	1940	DCHANSEN	E405
012	020	Diamesa	mendotae	1940	DCHANSEN	E406
012	021	Diamesa	nivoriunda		DCHANSEN	E287
012	021	Diamesa	nivoriunda		DCHANSEN	E248
012	021	Diamesa	nivoriunda		DCHANSEN	E407
043	004	Dicrotendipes	fumidus	1922	HKTOWNES	E48
043	009	Dicrotendipes	modestus	1922	HKTOWNES	E57
043	009	Dicrotendipes	modestus	1929	HKTOWNES	E59
043	009	Dicrotendipes	modestus	1929	HKTOWNES	E60
043	009	Dicrotendipes	modestus	1929	HKTOWNES	E58
043	009	Dicrotendipes	modestus	1937	JESUBLETTE	E51
043	009	Dicrotendipes	modestus	1938	JESUBLETTE	E54
043	009	Dicrotendipes	modestus	1940	JESUBLETTE	E56
086	004	Endochironomus	nigricans	1910	HKTOWNES	E64
086	004	Endochironomus	nigricans	1922	HKTOWNES	E65
086	004	Endochironomus	nigricans	1933	HKTOWNES	E67
086	004	Endochironomus	nigricans	1934	HKTOWNES	E62
086	004	Endochironomus	nigricans	1934	HKTOWNES	E66
086	004	Endochironomus	nigricans	1935	HKTOWNES	E68
086	004	Endochironomus	nigricans	1936	HKTOWNES	E63
086	004	Endochironomus	nigricans	1937	JESUBLETTE	E70
086	006	Endochironomus	subtendens	1939	JESUBLETTE	E155
086		Endochironomus	tendens	1910	HKTOWNES	E175
086		Endochironomus	tendens	1918	HKTOWNES	E170
086		Endochironomus	tendens	1922	HKTOWNES	E180
086		Endochironomus	tendens	1923	HKTOWNES	E176
086		Endochironomus	tendens	1923	HKTOWNES	E177
086		Endochironomus	tendens	1926	HKTOWNES	E179
086		Endochironomus	tendens	1934	HKTOWNES	E171
086		Endochironomus	tendens	1935	HKTOWNES	E174
086		Endochironomus	tendens	1935	HKTOWNES	E181
086		Endochironomus	tendens	1936	HKTOWNES	E178
086		Endochironomus	tendens	1936	HKTOWNES	E172
086		Endochironomus	tendens	1936	HKTOWNES	E173
038	007	Glyptotendipes	barbipes	1923	HKTOWNES	E199
038	007	Glyptotendipes	barbipes	1923	HKTOWNES	E200
038	007	Glyptotendipes	barbipes	1933	HKTOWNES	E198

Sortsp.dbf related to chironames.dbf. Sortsp. indexed on genusname, speciename,yearcoll unique. Chironames indexed on genuscode and speciecode, same key. Report = chiroold.frx. Database Report/Label expr. FOR yearcoll <= '1940'.

Appendix IV.5. Species of chironomids recorded in MN 1940 or earlier.

Data from the Entomology collections, University of Minnesota. See Appendix V.6 for locations keyed on Entrycodes below.

Codes						
Gen	Spe	Genus	Species	Year	Determiner	Entrycode
038	007	Glyptotendipes	barbipes	1935	HKTOWNES	E201
038	007	Glyptotendipes	barbipes	1936	HKTOWNES	E202
038	007	Glyptotendipes	barbipes	1936	HKTOWNES	E203
038	009	Glyptotendipes	lobiferus	1910	HKTOWNES	E207
038	009	Glyptotendipes	lobiferus	1914	HKTOWNES	E218
038	009	Glyptotendipes	lobiferus	1922	HKTOWNES	E216
038	009	Glyptotendipes	lobiferus	1923	HKTOWNES	E208
038	009	Glyptotendipes	lobiferus	1925	HKTOWNES	E211
038	009	Glyptotendipes	lobiferus	1929	HKTOWNES	E210
038	009	Glyptotendipes	lobiferus	1929	HKTOWNES	E213
038	009	Glyptotendipes	lobiferus	1934	HKTOWNES	E215
038	009	Glyptotendipes	lobiferus	1935	HKTOWNES	E204
038	009	Glyptotendipes	lobiferus	1935	HKTOWNES	E205
038	009	Glyptotendipes	lobiferus	1935	HKTOWNES	E212
038	009	Glyptotendipes	lobiferus	1939	JESUBLETTE	E209
038	009	Glyptotendipes	lobiferus	1940	HKTOWNES	E277
038	009	Glyptotendipes	lobiferus	1940	HKTOWNES	E279
038	009	Glyptotendipes	lobiferus	1940	JESUBLETTE	E206
038		Glyptotendipes	musculus		HKTOWNES	E222
038		Glyptotendipes	musculus	1918	HKTOWNES	E219
038		Glyptotendipes	musculus	1921	HKTOWNES	E220
038		Glyptotendipes	musculus	1922	HKTOWNES	E221
038	011	Glyptotendipes	papipes	1916	HKTOWNES	E227
038	011	Glyptotendipes	papipes	1923	HKTOWNES	E226
038	011	Glyptotendipes	papipes	1934	HKTOWNES	E225
038	011	Glyptotendipes	papipes	1936	HKTOWNES	E223
038	011	Glyptotendipes	papipes	1936	HKTOWNES	E224
105	001	Heterotrissocladius	oliveri	1938	OASAETHER	E674
027		Microtendipes	pallidus		HKTOWNES	E229
027	002	Microtendipes	pedullus		HKTOWNES	E234
027	002	Microtendipes	pedullus	1899	HKTOWNES	E233
027	002	Microtendipes	pedullus	1936	HKTOWNES	E235
027	002	Microtendipes	pedullus	1938	JESUBLETTE	E231
049		Orthocladius	clarki	1940	ARSOPONIS	E727
049	023	Orthocladius	nigritus	1938	ARSOPONIS	E797
049		Orthocladius	clarki		ARSOPONIS	E852
049		Orthocladius	clarki		ARSOPONIS	E849
061	002	Paramerina	smithae	1935	JESUBLETTE	E273
091		Paratanytarsis	intricatus	1940	JESUBLETTE	E891
028	001	Paratendipes	albimanus		HKTOWNES	E244
028	002	Paratendipes	subaequalis	1940	JESUBLETTE	E239
152		Phaenopsectra	obediens		HKTOWNES	E245
036	007	Polypedilum	aviceps		NKIRSCH	E1016
036	008	Polypedilum	braseniae		DMASCHWITZ	E1031

Sortsp.dbf related to chironames.dbf. Sortsp. indexed on genusname, speciename,yearcoll unique. Chironames indexed on genuscode and speciecode, same key. Report = chiroold.frx. Database Report/Label expr. FOR yearcoll <= '1940'.

Appendix IV.5. Species of chironomids recorded in MN 1940 or earlier.

Data from the Entomology collections, University of Minnesota. See Appendix V.6 for locations keyed on Entrycodes below.

Codes						
Gen	Spe	Genus	Species	Year	Determiner	Entrycode
004	004	Procladius	denticulatys	1935	JESUBLETTE	E256
004	006	Procladius	riparius	1934	JESUBLETTE	E260
039		Stictochironomus	annulicrus	1937	JESUBLETTE	E241
033	005	Tanypus	carinatus	1933	JESUBLETTE	E265
117	002	Tribelos	fuscicorni	1925	HKTOWNES	E49
089	003	Xenochironomus	scopula	1939	JESUBLETTE	E147

Sortsp.dbf related to chironames.dbf. Sortsp. indexed on genusname, speciename,yearcoll unique. Chironames indexed on genuscode and speciecode, same key. Report = chiroold.frx. Database Report/Label expr. FOR yearcoll <= '1940'.

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2. Dawson, C.L. and R.A. Hellenthal, 1986. In P.R. Adamus and K. Brandt, 1990, Impacts on Quality of Inland Wetlands of the U.S. U.S. EPA/600/3-90/073. 406 pp.

3. MN Environment, July/Aug. 1991. "Mollusks, mayflies and mosquitoes part of a new study to set water quality standards for wetlands." Vol 2: No.4. pp. 4-5.