PALEOCLIMATIC INTERPRETATION OF THE MOORHEAD LOW WATER PHASE OF LAKE AGASSIZ IN THE SOUTHERN BASIN BASED ON FOSSIL COLEOPTERA ASSEMBLAGES

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Paleoclimatic Interpretation of the Moorhead Low Water Phase

of Glacial Lake Agassiz in the Southern Basin based on Fossil

Coleoptera Assemblages

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The Supervisory Committee certifies that this ***disquisition*** complies with North Dakota State University's regulations and meets the accepted standards for the degree of

MASTER OF SCIENCE

ABSTRACT

Rock, Jessie Lee, M. S., Department of Geosciences, College of Science and Mathematics, North Dakota State University, September 2009. Paleoclimatic Interpretation of the Moorhead Low Water Phase of Glacial Lake Agassiz in the Southern Basin Based on Fossil Coleoptera Assemblages. Major Professor: Dr. Allan Ashworth.

Detrital peats of the Poplar River Formation were deposited in the Lake Agassiz basin during the Moorhead Low Water Phase (MLWP). Two new fossil sites, in Moorhead, Minnesota (MS28) and Fargo, North Dakota (UPC), provide a wealth of information about the chronology, paleoenvironment, and paleoclimate of the southern basin of lake Agassiz. Sediments at both sites were deposited as part of a delta which prograded into Lake Agassiz. The insect and plant taxa represent a biological community that existed during a time when the southern basin of Lake Agassiz experienced subaerial exposure. Eight AMS radiocarbon dates were obtained from these deposits and range from 11,178 ± 49 cal yr BP (9,737 ± 53 ^{14}C yr BP) to 11,467 ± 107 cal yr BP (10,011 ± 35 ^{14}C yr BP). The large number of insect and plant taxa identified from fossils at the sites indicates that the environment was a biologically rich, complex wetland that developed *in situ* on the delta top. This wetland included rivers, ponds, marshes, and swamps and supported wooded areas with stands of *Picea* (spruce), *Larix laricina* (larch), *Salix* (willow), and *Populus* (poplar). The paleotemperature in the Fargo-Moorhead region during the MLWP, based on a modified Mutual Climatic Range analysis, had a mean July temperature of 17°C, approximately 4°C cooler than the region at the present day. This estimate of mean July temperature is at least 2°C lower than previous estimates.

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The UPC site was brought to the attention of Allan Ashworth by David Hopkins from NDSU Soil Sciences and access to the site was arranged by Trevor Speidel from Urban Plains Development.

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CHAPTER 1. INTRODUCTION

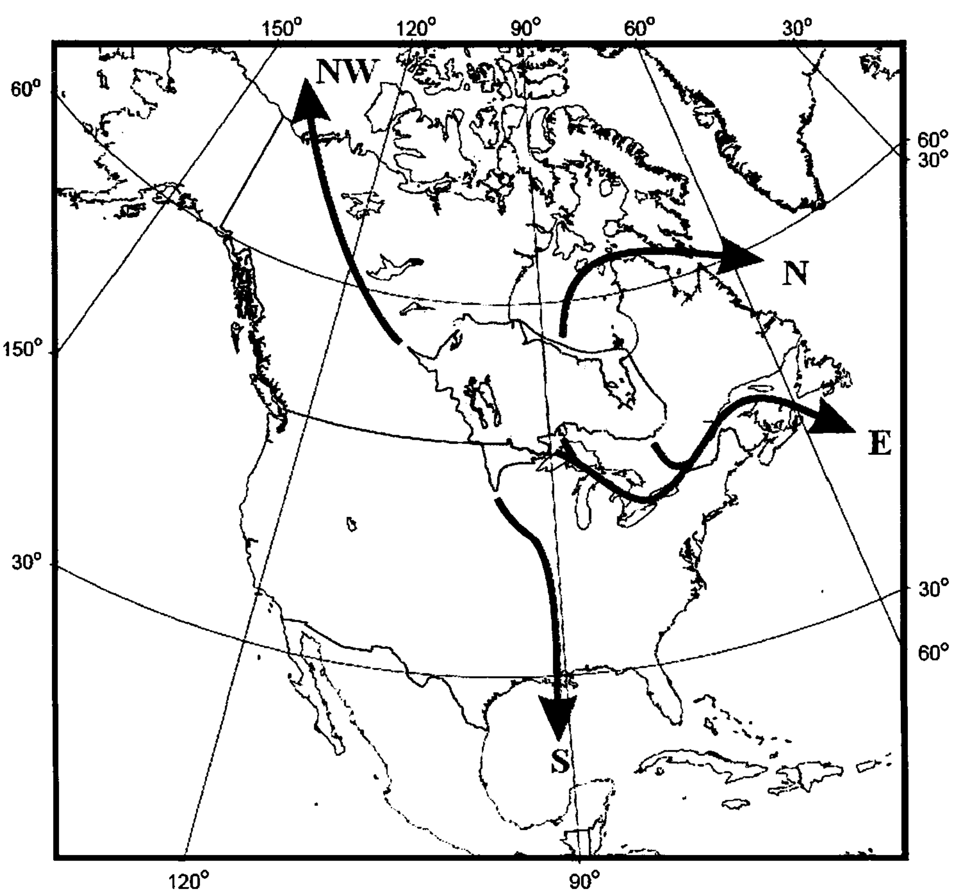
1.1. Lake Agassiz history

At the end of the last ice age, Lake Agassiz formed from meltwater of the Laurentide Ice Sheet (Teller and Clayton, 1983). The water ponded between an ice margin in the north and the highlands south, east and west of the Red River Valley. The lake formed approximately 14,200 cal yr BP (12,350 ^{14}C yr BP) (Lepper et al., 2007) and is considered to be the largest glacial lake ever to have existed in North America. Lake Agassiz occupied a total area of nearly 1,500,000 km^2 across Minnesota, North Dakota, Manitoba, Ontario, and Saskatchewan (Figure 1.1) (Fisher, 2005) and up to 150,000 km^2 at any one time (Teller and Clayton, 1983). In 1873, Winchell recognized the lake basin to be glacial in origin (Thorleifson, 1996). Various aspects of the lake's history have been studied since 1879 when it was first mapped by Upham of the Minnesota Geological Survey (Upham 1895). In 1967, Elson published "The Geology of Glacial Lake Agassiz" which describes the geomorphology of the basin and shorelines. This was during a time in the early stages of radiocarbon dating, and when geomorphic studies depended on aerial photography and topographic maps (Thorleifson, 1996). In more recent years, various aspects of Lake Agassiz have been reexamined. In particular, these include ice margins, positions and ages of shorelines, and positions and ages of outlets (Clayton and Moran, 1983; Thorleifson, 1996; Teller, 2001; Teller and Leverington, 2004; Teller et al., 2005; Fisher, 2004; 2005; Lepper et al., 2007; Fisher et al., 2008).

Lake Agassiz water levels were dynamic. During the lake's long, complex history, water was able to drain from the basin at different times through various outlet channels (Figure 1.1). The southern outlet drained meltwater through the Minnesota and Mississippi

Rivers to the Gulf of Mexico. The northwestern outlet drained through the Mackenzie Valley to the Arctic Ocean. The northern outlet drained to the Arctic Ocean through Hudson Bay, and the eastern outlet drained into the North Atlantic through the St. Lawrence Valley (Teller et al., 2002). The north, northwestern and southern outlets are well known, although, Karrow (2002), and Fisher and Lowell (2006) have questioned the existence and location of the eastern outlet.

Figure 1.1. Generalized Lake Agassiz drainage outlets. (modified from Teller, 2002)
Shaded area represents the total extent of Lake Agassiz throughout its history
NW. Northwestern Outlet through the Mackenzie River Valley to Arctic Ocean
N. Northern Outlet through Hudson Bay to North Atlantic
E. Eastern Outlet through the St. Lawrence Valley to the North Atlantic Ocean
S. Southern Outlet through the Mississippi River Valley to Gulf of Mexico



1.2. Lake Agassiz phases

This study focuses on the paleoecology during a low water stand of the lake, referred to as the Moorhead Low Water Phase (MLWP) (Figure 1.2). The MLWP is bracketed by two, deep water phases referred to as the Lockhart and Emerson Phases, respectively (Figure 1.3) (Teller and Clayton, 1983).

During the late Lockhart Phase, the lake maintained a relatively high stand (Teller and Clayton, 1983). Drainage is thought to have occurred via the southern outlet through the end of this phase (Figure 1.1) (Fisher and Lowell, 2006). Meltwater flowed through Glacial River Warren (near the tri-state junction of North Dakota, South Dakota, and Minnesota) and ultimately drained into the Gulf of Mexico. During this time, silty clays of the Brenna Formation were deposited (Arndt, 1977) (Figure 1.3). As the southern outlet was eroded, the Herman, Norcross, Tintah, and Campbell strandlines were established (Brophy and Bluemle, 1983). This strandline sequence is supported by Fisher (2005) who would also include the more recently described Upham strandline between the Norcross and Tintah (Figure 4.4).

A rapid drainage event and abandonment of the southern outlet marks the end of the Lockhart Phase and the beginning of the MLWP (Figure 1.2) (Fisher et al., 2008). Currently, there is uncertainty about where the water drained (Teller and Clayton, 1983; Karrow, 2002; Fisher and Lowell, 2006). Teller (1983) proposed that the lake drained through an eastern outlet through the St. Lawrence Valley into the North Atlantic Ocean (Figure 1.1). However, Fisher and Lowell (2006) and Karrow (2002) argue that there is no conclusive evidence for an eastern outlet during the MLWP. More recently, Teller and

Boyd (2006) in reference to the eastern outlet stated "Evidence in the Thunder Bay area is not as compelling as we think it should be".

During the MLWP, lake levels fell until the southern margin of Lake Agassiz was north of the Fargo-Moorhead region (Figure 1.2). Subaerial exposure of the lake floor allowed new communities of organisms to occupy the region surrounding Fargo-Moorhead. It was during this phase that the organic-rich sediments of the Poplar River Formation were deposited (Figure 1.3) and the Ojata strandline was established (Arndt, 1977). Based on regional subsurface studies, the Moorhead Delta formed during the MLWP as the Sheyenne River cut its way down to the Ojata level and deposited sand and gravel in the Fargo-Moorhead region (Brophy and Bluemle, 1983). During this time, ancestral streams to the Buffalo, Maple, and Red Rivers also contributed to the building of the Moorhead Delta (Fenton et al., 1983).

The termination of the MLWP was caused by the transgression of the Emerson Phase (Figure 1.2) which refilled the southern basin (Clayton, 1983). During this second high water stand, drainage occurred once again via the southern outlet (Figure 1.1), as it had during the Lockhart Phase. Also, the laminated silts and clays of the Sherack Formation were deposited (Figure 1.3), and lake levels returned to the Campbell level (Fenton et al., 1983).

1.3. Lake Agassiz drainage history

In recent years, a debate has been reopened about the lake's drainage history, which has led to a reinvestigation of its various outlet channels (Lewis and Teller, 2007). In a broader context, the drainage of Lake Agassiz has been implicated as a cause of the

Figure 1.2. Reconstructions of Lake Agassiz during and after the MLWP. (Modified from Thorleifson, 1996)
A. Moorhead Low Water Phase (MLWP). B. Early Emerson Phase after MLWP. The star marks the position of Fargo-Moorhead.

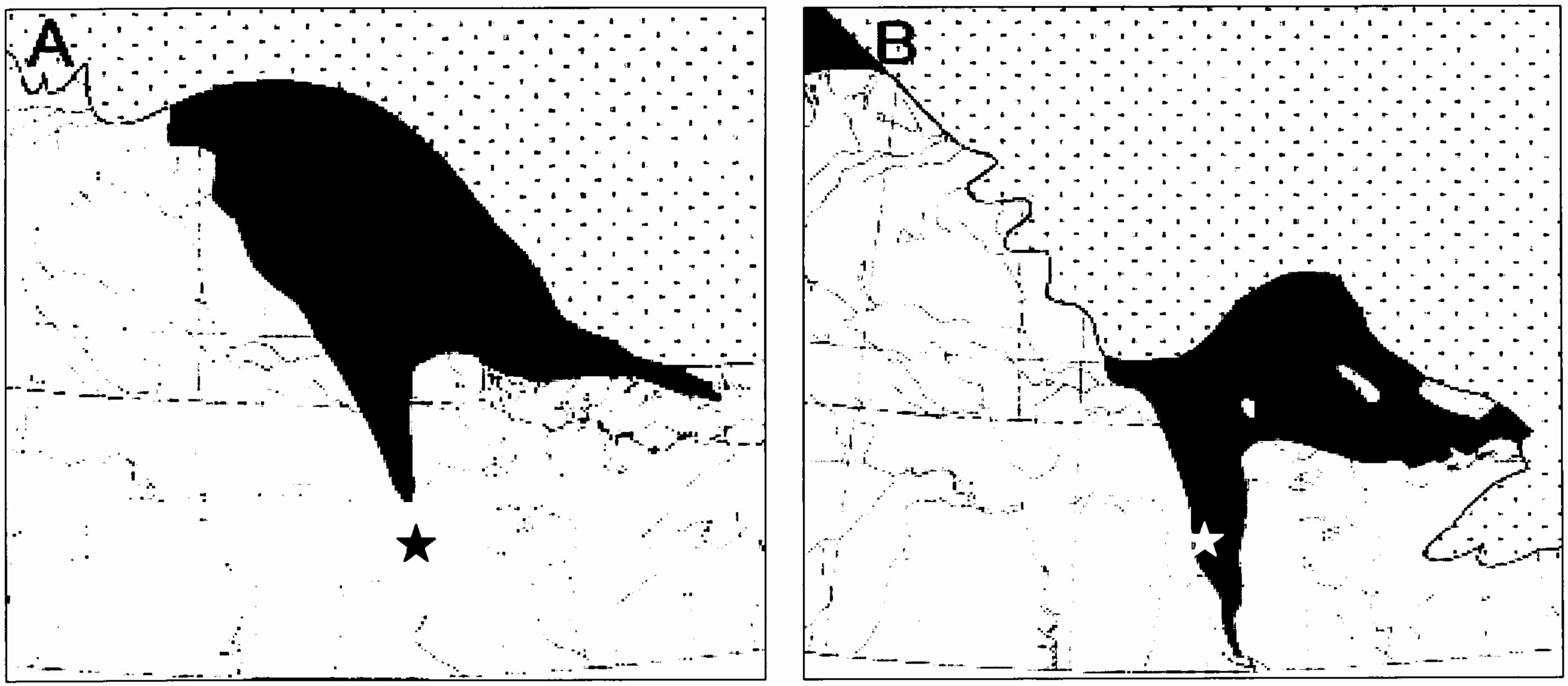
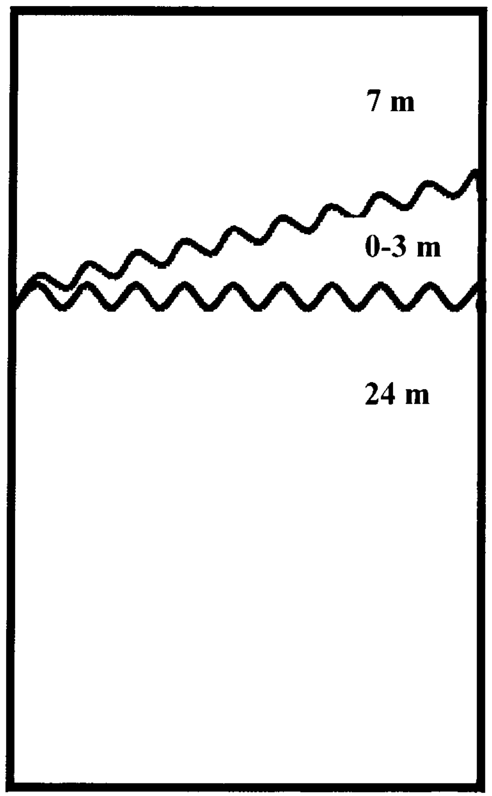


Figure 1.3. Generalized stratigraphy of upper Lake Agassiz deposits in the southern basin. (Modified from Arndt, 1977)



SHERACK FORMATION
Brown-yellow oxidized silty clay
Deposited during the Emerson (Deep Water) Phase

POPLAR RIVER FORMATION
Organic-rich beds of peat, silt, and clay
Contains insect fragments, plant macrofossils, and mollusks
Deposited during the Moorhead Low Water Phase
(deposited by streams and marshes)

BRENNA FOR$MATION
Dark grey-black “plastic” clay
Deposited during the Lockhart (Deep Water) Phase

Younger Dryas climatic reversal (Broecker et al., 1989). This hypothesis links the late-glacial drainage event that initiated the MLWP to rapid cooling in the North Atlantic region. In this model, the lake drained through an eastern outlet through the St. Lawrence Valley into the North Atlantic Ocean. This sent a large volume of freshwater into the North Atlantic Ocean which may have suppressed the formation of North Atlantic Deep Water (NADW) and temporarily shut down or disrupted North Atlantic thermohaline circulation. In the absence of this circulation system, which is responsible for warming the climate in the North Atlantic region, the Younger Dryas climatic reversal was thought to have been initiated (Broecker et al., 1989). Based on oxygen isotope records from ice cores in Greenland, the Younger Dryas Stade is thought to have lasted between 1200 and 1300 years ending circa 11,500 cal yr BP (≈10,000 ^{14}C yr BP) (Alley, 2000). During this time, northwestern Europe experienced a significant cooling trend, and North America showed evidence of cooling on its eastern margins (Lowe and Walker, 1997).

A study from the Redwood Loop site in Grand Forks, North Dakota provided the most complete chronology for any Lake Agassiz site. Based on the ages, Fisher et al. (2008) concluded that the MLWP spanned a time of 1000 cal yr BP (500 ^{14}C yr BP) which began approximately 12,390 cal yr BP (10,470 ± 75 ^{14}C yr BP and ended around 11,460 cal yr BP (10,000 ± 70 ^{14}C yr BP). Furthermore, the chronology indicated that the beginning of the MLWP occurred after the beginning of the Younger Dryas climatic reversal. Also, a study by Lowell et al. (2009) used ages of organic materials from lakes developed on glacial moraines to test the existence of the eastern outlet during the Younger Dryas as proposed by Teller and Thorleifson (1983). They concluded that the Younger Dryas climatic reversal had already begun by the time drainage could have occurred through the Superior Basin.

CHAPTER 2. MOORHEAD LOW WATER PHASE SITES

2.1. Existing sites in the region

Previous paleoecological studies of MLWP deposits begin with the earliest study by Rosendahl in 1948. His site, referred to as the Moorhead site, contains MLWP deposits that were exposed during excavation for a sewage disposal plant along the banks of the Red River of the North in Moorhead, Minnesota. The taxa identified included 39 species of algae, fungi, bryophytes, pteridophytes, gymnosperms, and angiosperms, both monocotyledons and dicotyledons. Rosendahl (1948) concluded that there was a complete absence of tundra species and that the nearby Buffalo River may have carried these deposits into the lake. This study was not put into paleoecological context until later, when a stratigraphy became available for the region and Rosendahl's study could be placed in a regional context. This was possible following the McAndrews study (1967), when Shay compiled existing data into a synthesis of the vegetational history of the southern basin (Ashworth and Cvancara, 1983).

In Fargo-Moorhead, McAndrews (1967) described the paleoecology of the communities that make up MLWP peat deposits at two sites. His taxonomic data came from the Seminary site (McAndrews, 1967), located adjacent to the Fargo Cardinal Muench Seminary and the Moorhead site (Rosendahl, 1948). Deposits from the Seminary site were exposed along the banks of the Red River during the excavation of a flood control diversion project. McAndrews study was based on plant macrofossils and pollen and concluded that the MLWP vegetation was represented by boreal forest rich in spruce, wet meadow, and marsh species (McAndrews, 1967). Kompelien and Schwert (1986) re-sampled deposits from the Seminary site and published a list of insect species and an interpretation of the paleoecology which agreed with McAndrews' (1967) conclusions. They also agreed with McAndrews (1967) that the organics were likely transported to the site by rising waters during the Emerson transgression.

Ashworth and Cvancara (1983) reviewed the paleoecology of the southern basin of Lake Agassiz. At this time, there were 29 fossil bearing localities in the region which contained plant macrofossils, diatoms, vertebrates, and invertebrates including molluscs and insects. From 11,500 ^{14}C yr BP (13,360 cal yr BP) until 10,000 ^{14}C yr BP (11,480 cal yr BP) spruce parkland existed around the southern basin and spruce forests and grasslands existed to the east of the basin. Based on the presence of beetles associated with forests, they concluded that during the MLWP, the spruce forest had reached its maximum thermal tolerance just before the Emerson Phase transgression (Ashworth and Cvancara, 1983).

Based on a study of plant and insect fossils, Bajc et al. (2000) concluded that MLWP taxa from the Rainy River Basin in Ontario were shared with those of the low boreal wetlands that exist in that region at present with the exception of the beetles *Asaphidion yukonense* and *Opisthius richardsoni* which today are restricted to fast flowing, cold rivers from foothills of the Rocky Mountains.

Yansa and Ashworth (2005) analyzed MLWP deposits from the Trollwood site, located along the banks of the Red River in Fargo, North Dakota. This paleoecological study was based on the most fossil-rich deposits analyzed since the Rosendahl (1948) study at the Moorhead site. Fossils included pollen, plant macrofossils, and invertebrates, all of which still occur within the region today with the exception of spruce (*Picea*) and blunt-leaved pondweed (*Potamogeton obtusifolius*). Their paleoenvironmental analysis described an extensive wetland associated with the Moorhead Delta. Furthermore, they looked at the Trollwood site in a regional context and presented a comprehensive paleoclimatic analysis describing paleotemperatures 1-2 °C cooler than at present.

Bartlein and Whitlock (1993) analyzed pollen records from Elk Lake, Minnesota, 135 km southeast of Fargo-Moorhead. They reported that a cooling event between 12,430 cal yr BP (10,500 ^{14}C yr BP) and 10,360 cal yr BP (9,200 ^{14}C yr BP) affected biota around Lake Agassiz. Yansa and Ashworth (2005) disagreed with Bartlein and Whitlock's (1993) interpretation. In their study, from the Trollwood site, they suggested that conditions during the Younger Dryas in midcontinental North America were cooler and wetter than at present, but that it did not experience the cooling event Bartlein and Whitlock (1993) proposed (Yansa and Ashworth, 2005).

More recently, Fisher et al. (2008) reported on MLWP deposits from the Redwood Loop site in Grand Forks, North Dakota. These deposits were rich in plant macrofossils and insects. Based on these taxa, they reported that eutrophic wetlands existed in spruce-sedge parkland along the shorelines of the lake during the MLWP. They also suggested that an ecotonal boundary between deciduous and coniferous woodland existed between Fargo, North Dakota, and Grand Forks, North Dakota, at this time. Furthermore, the geochronology reported from this study represents the most comprehensive set of dates that exist for MLWP deposits, 19 ^{14}C dates and 2 Optically Stimulated Luminescence (OSL) dates.

2.2. New sites in the region

During 2006 and 2007, two new sites containing MLWP deposits became available for study in Moorhead, Minnesota, and Fargo, North Dakota, respectively.

2.2.1. Moorhead South 28th Street site

The Moorhead South 28th Street site (MS28) deposits were exposed during the development of the Village Green housing subdivision at the junction of 30th Avenue East and South 28th Street in Moorhead, Minnesota (Figure 2.1). The backhoe excavation was located at 46.84° N and -096.74° W at a surface elevation of 278 m. (913 ft.) above sea level. The excavation was approximately 10.5 m (34.5 ft) in depth from the ground surface to the base. At the base of the pit, gypsum crystals were present. Typically, in this region, gypsum beds are associated with the top of the Brenna Formation (Ashworth, 2009). Between 10.5 m and 6.25 m from the surface, deposits of the Poplar River Formation were present. Above 6.25 m, were deposits of the Sherack Formation (Table 2.1).

The basal 1.5 m. of the Poplar River Formation was selected for sampling in 25 cm. intervals (Table A.3). Two samples were collected from each interval. Samples weighed between 2.6 and 4.2 kg for a combined weight of 60.2 kg. Additional bulk samples weighing 79.5 kg are available for future studies.

Deposits at the MS28 site were re-sampled for organic materials for radiocarbon analysis. A borehole core was collected adjacent to the original excavation between depths of 6 m. (19.5 ft.) and 10.5 m. (34.5 ft.) (Table A.3). The uppermost and lowermost organic horizons were located at 6.25 m. (20.5 ft) and 10.5 m. (34.5 ft), respectively. There was a total of 4.25 m of organic-bearing silty clays. Materials for radiocarbon analysis were collected from the core at 6.25 m (20.5 ft), 7.9 m (26 ft), 9.3 m (30.5 ft), and 10.5 m (34.5 ft) (Table A.3). Each of these horizons contained abundant plant macrofossils including wood, charcoal, mosses, and seeds as well as numerous fossil insect fragments, and molluscs.

Table 2.1. Description of the MS28 site stratigraphy.

Depth (m) from surface	Description of MS28 site stratigraphy
0 – 1.5	Modern soil development
1.5 – 6.25	Brown/yellow oxidized silty clays of the Sherack Formation
6.25 – 8.5	Dark grey laminated silt and clay and peat of the Poplar River Formation with distinctive banding and thin layers of iron oxides, containing wood fragments, charcoal, seeds, mosses, insects, and molluscs Cross-laminations of light and dark grey silt and clay indicating deposition from a gentle paleocurrent flow (Figure 2.2)
8.5 – 9.5	Dark grey laminated silt and clay and peat of the Poplar River Formation Peaty stringers containing wood, charcoal, seeds, mosses, insects, and molluscs A thin horizon of coarse sand and gravel with no residual organics occurs at a depth of 9 m
9.5 – 10.5	Dark blue-grey clay, thin organic horizons, wood, charcoal, seeds, mosses, insects, and molluscs Gypsum crystals found at 10.5 m

2.2.2. The Fargo Urban Plains Center site

The Fargo Urban Plains Center (UPC) site is located at 46.84° N, -096.88° W at a surface elevation of 277.4 m. (910 ft.) above sea level. The site became accessible during excavation for the development of the Urban Plains Center (UPC) Hockey Arena at 5220 30th Ave S, Fargo, North Dakota. Access to the site was limited, and bulk peat samples were collected from the Poplar River Formation on the southeast side of the structure following a backhoe excavation (Figures 2.3 – 2.4). Based on the borehole core data provided by Northern Technologies Incorporated, the peat beds were located at various depths between 3.8 m (12.5 ft) and 6.2 m (20.5 ft) from the surface (Table 2.2). The UPC peat deposits were detrital, dark brown to black, and contained abundant plant macrofossils including wood, charcoal, mosses, seeds as well as numerous fossil insect fragments, and molluscs (Figures 2.5 – 2.8). Samples labeled UPC-1, UPC-2, and UPC-3 were collected (Table A.4). A ten cm slab of peat from the UPC-3 layer was divided it into eight 1.25 cm horizons to represent the stratigraphy from top to bottom. They were labeled A through H, respectively. Samples from each horizon were prepared for fossil analysis and seeds from horizons A, D, F, and H were selected for radiocarbon analysis.

Table 2.2. Description of the UPC site stratigraphy.

Depth (m) from surface	Description of UPC site stratigraphy
0 - 3.8	Brown/yellow oxidized silty clays of the Sherack Formation
3.8 – 4.3	Detrital peat containing wood fragments, charcoal, seeds, mosses, insects, and molluscs

Figure 2.1. Deposits from the MS28 site.

Figure 2.2. Crosslaminated clays from the Poplar River Formation at the MS28 site.

Figure 2.3. Deposits from the UPC site.

Figure 2.4. Organic horizon from the UPC site.

Figure 2.5. Wood fragments from the UPC site.

Figure 2.6. Detrital peat from the UPC site.

Figure 2.7. Detrital peat from the UPC site.

Figure 2.8. Sphaeriid and Unionidae bivalves (freshwater molluscs) from the UPC site.

CHAPTER 3. MATERIALS AND METHODS

3.1. Preparation for radiocarbon analysis

Types of seeds used for radiocarbon analysis were selected after consultation with Ms. Pietra Mueller, ISM Research and Collections Center, Springfield, Illinois (Mueller, 2008). She recommended that aquatic plants be avoided due to hard water effect. The identification of plant materials selected for radiocarbon analysis was made by Dr. Catherine Yansa, Michigan State University Quaternary Landscapes Research Group (Table A-1). Seeds selected were those of *Eleocharis sp., Carex sp., and Lycopus americanus*.

Radiocarbon analysis was performed at the NSF-Arizona AMS Laboratory, University of Arizona, Tucson using the Accelerator Mass Spectrometer (AMS) tandem accelerator built by National Electrostatics Corporation in Wisconsin, USA.

3.2. Fossil extraction and preparation

Fossils were extracted from the deposits using the standard flotation method originally developed in the Quaternary Entomology Laboratory at the University of Birmingham, England (Elias, 1994). Using a variation of this method, sediments were washed through a 300 μm sieve to remove the silt and clay sized particles. Residual sediments, those greater than 300 μm, were then massaged with kerosene which adhered to the chitinous beetle exoskeletons. Cold water was added to the mixture and the kerosene-coated chitinous materials floated to the surface together with seeds and other plant macrofossils. These materials were decanted, cleaned with commercial detergent to remove the kerosene, and placed in ethanol to prevent mold. Fossil insect fragments, molluscs, and plant macrofossils were sorted under a binocular microscope and stored in vials of ethanol. Residual materials were dried in a low temperature oven and archived for future reference.

3.3. Fossil identification

The fossil insect fragments were mounted on micropaleontological slides and identified to various taxonomic levels using the North American Coleoptera reference collection in the Quaternary Entomology Laboratory at the Department of Geosciences, North Dakota State University. This collection is composed of both modern Coleoptera species and fossil fragments. 1,694 Coleoptera fragments including heads, pronota, and elytra were isolated from deposits from both sites. From these, a minimum of 815 individuals represented by 23 families, 53 genera and 22 species were identified.

The plant macrofossils, mostly seeds, were identified by Dr. Catherine Yansa of the Michigan State University Quaternary Landscapes Research Group. Wood fragments from both MS28 and UPC deposits were identified at the Center for Wood Anatomy Research at the U.S. Department of Agriculture Forest Products Laboratory in Madison, Wisconsin. Samples containing molluscs were placed in vials filled with ethanol and archived for future studies.

3.4. Paleoclimatic analysis

The paleoclimatic analyses were performed with a series of steps that began with compiling modern collection localities for each Coleoptera species identified as a fossil. Locality information was compiled from literature associated with each species, from labels on specimens in collections from the North Dakota State University Quaternary Entomology Laboratory and the E.H. Strickland Entomological Museum at the University of Alberta. This information was commonly presented as place names which were located using Google Earth™ and converted into decimal degree coordinates. With these coordinates, modern distribution maps for MLWP fossil species were created using Arc GIS (Figures B.1 – B.12). For each distribution point, geographic and climate data were recorded and compiled into Excel spreadsheets. Geographic data compiled included information on collection locations and elevations, climate station locations and elevations, and differences in elevations and distances from one another. Climate data included mean January temperatures, and mean July temperatures (Tables C.1 – C.11).

Climate data for localities in the United States were obtained through the National Oceanic and Atmospheric Administration's (NOAA) National Climate Data Center (NCDC). The NCDC calculates monthly climate normals as normals of average monthly mean temperature for individual locations for the 1971-2000 period (National Climate Data and Information Archive, 2008).

Climate data for Canadian localities were obtained online through the Climate Canada National Climate Data and Information Archive. These climate normals or averages are based on Canadian climate stations with at least 15 years of data between 1971 to 2000 (U.S. Climate Normals, 2005).

Temperatures were adjusted because of elevation differences between climate stations and collection localities using the normal adiabatic lapse rate which averages 6.5°C per kilometer in the troposphere (Normal Lapse Rate, 2006).

Two methods were used in the paleoclimatic analysis. The first technique used was a variation of the Mutual Climatic Range (MCR) method described by Atkinson et al. (1986). In MCR, the climate data associated with the geographic range of each species are plotted with T-max (mean July temperature) on the y-axis against T-range (differences between mean July and mean January temperatures) on the x-axis. For each species, clusters of points are plotted which represent the "climatic space" for the individual species. Each cluster of points is enclosed in an ellipse which includes all of the points. These ellipses are then overlain to show the mutual climatic range for multiple species. This overlap technique has been widely used to provide paleoclimatic interpretations for fossil assemblages (Elias, 1984).

The analysis used in this study varied from the traditional MCR method as it utilized a statistical technique developed for SAS by Michael Friendly at York University, Toronto. The ELLIPSES macro, "plots a bivariate scatterplot with a bivariate data ellipse for one or more groups" (SAS Macro Program Ellipses, 2006) and was utilized to eliminate the introduced error of hand drawn ellipses. In this analysis, the overlapping ellipses which represented the mutual climatic range for each species (in terms of temperatures) were used to provide the paleoclimatic interpretation.

In the second method used for the paleoclimatic analysis, the mean of mean July temperatures for each species and was calculated and plotted on a box graph using SigmaPlot.

3.5. Paleoenvironmental analysis

The paleoenvironmental analysis was performed by compiling known habitat information for each Coleoptera species identified as a fossil. Paleoenvironmental information for the plant macrofossils was provided by Dr. Catherine Yansa of the Michigan State University Quaternary Landscapes Research Group. Habitat information for Coleoptera species was compiled from literature associated with each species and from labels on specimens in collections from the North Dakota State University Quaternary

Entomology Laboratory and the E.H. Strickland Entomological Museum at the University of Alberta.

CHAPTER 4. RESULTS AND DISCUSSION

4.1. Chronology

In the text, ages are shown as both calendar ages (cal yr BP) and radiocarbon ages (^{14}C yr BP). The calibration to calendar years utilizes the Fairbanks 0107' Calibration Curve (Radiocarbon Age to Calendar Age Conversion, 2005). When standard deviations were not available, ages were converted assuming a standard deviation of 100 years and then rounded to the nearest tenth.

The radiocarbon ages from the MS28 and UPC sites represent a comprehensive set of dates that range from 11,178 ± 49 cal yr BP (9,737 ± 53 ^{14}C yr BP) to 11,467 ± 107 cal yr BP (10,011 ± 35 ^{14}C yr BP) and cluster around 11,310 cal yr BP (9,900 ^{14}C yr BP) (Table 4.1). They are consistent with other recent dates for the termination of the MLWP reviewed by Yansa and Ashworth (2005) which also cluster around 11,310 cal yr BP (9,900 ^{14}C yr BP). However, the span of dates from the MS28 and UPC sites is narrower and would suggest that the deposits date from the end of the MLWP. Yansa and Ashworth (2005) reported ages for the MLWP from the Trollwood site beginning around 11,960 cal yr BP (10,230 ^{14}C yr BP) and ending around 11,310 cal yr BP (9,900 ^{14}C yr BP). Because there is no significant change in the fauna at the Trollwood site between 11,960 cal yr BP (10,230 ^{14}C yr BP) and 11,310 cal yr BP (9,900 ^{14}C yr BP) (Yansa and Ashworth, 2005), and because the ages for the termination of the MLWP at the Trollwood, MS28 and UPC sites were in agreement, the sites are considered to be contemporaneous.

Fisher and Lowell (2006) reviewed all of the existing ages for the onset of the MLWP of the lake. They have discarded the oldest age proposed and based on their own more recent dates, they suggested that the beginning of the MLWP occurred between

12,620 cal yr BP (10,675 ^{14}C yr BP ± 60) and 12,160 cal yr BP (10,340 ^{14}C yr BP ±100) (Fisher and Lowell, 2006).

More recently, the Redwood Loop site in Grand Forks, North Dakota, provided the most complete chronology for any MLWP site. Based on the ages, Fisher et al. (2008), concluded that the MLWP spanned a time of 1000 cal yr BP (500 ^{14}C yr BP) which began approximately 12,390 cal yr BP (10,470 ± 75 ^{14}C yr BP) and ended around 11,460 cal yr BP (10,000 ± 70 ^{14}C yr BP). The youngest date for the MS28 and UPC sites would suggest that the MLWP in the Fargo-Moorhead region ended a few hundred years later than at the Redwood Loop site (Table 4.1).

Table 4.1. Radiocarbon materials and ages from the MS28 and UPC sites.

Sample	**Ages (^{14}C yr, B. P.)**	**Age (cal yr BP)**	**Seeds Dated**
MS28--20.5	9,737 ± 53	11,178 ± 49	18 *Carex* sp.
MS28--26	9,911 ± 68	11,304 ± 93	48 *Eleocharis* sp.
MS28--30.5	9,872 ± 56	11,259 ± 49	5 *Carex* sp.
MS28--34.5	9,952 ± 104	11,391 ± 184	15 *Lycopus americanus*, 5 *Carex* sp.
UPC-A	9,885 ± 98	11,295 ± 125	15 *Eleocharis* sp.
UPC-D	10,011 ± 35	11,467 ± 107	11 *Eleocharis* sp.
UPC-F	9,953 ± 72	11,368 ± 134	24 *Eleocharis* sp.
UPC-H	9,849 ± 57	11,243 ± 40	23 *Eleocharis* sp.

*Fairbanks 0107' Calibration Curve does not provide 2σ radiocarbon age ranges

4.2. Fossil insects

The objective of the paleoenvironmental analysis is to reconstruct the environment in Fargo-Moorhead during the MLWP. The analysis is based on an examination of the ecological requirements of the taxa identified in the MS28 and UPC fossil assemblages. Both sites are of similar age (Table 4.1) and sedimentary environments (Figure 1.3). A total of 54 genera of Coleoptera were identified from the two sites (Table 4.2). The similarities in faunal composition, within and between the MS28 and UPC sites, together with similarities in age and sedimentary environments, indicate that for the purpose of paleoenvironmental interpretation they can be treated as one assemblage. The genera shared between the MS28 and UPC sites represent 59% and 78% of the total genera in those sites, respectively. Of these, the 23 identified to species level are especially useful for the paleoenvironmental interpretation. The sum of the ecological characteristics of these species was used to reconstruct the environment. In the following analysis, the known ecological characteristics of modern species were used as analogues for the fossil species. Taxa from the MS28 and UPC sites are assigned to aquatic, semi-aquatic, water marginal, sandbar, and forested habitats.

Shallow, open water habitats are indicated by a diverse assemblage of water beetles. These included gyrinids, dytiscids, haliplids, hydrophylids, and hydraenids. The most diverse of these are the dytiscids and hydrophilids. The dytiscids were represented by the genera *Agabus, Colymbetes*, *Graphoderus*, *Ilybius,* and *Rhantus.* The hydrophilids were represented by aquatic genera including *Georissus*, *Helophorus*, *Hydrobius,* and *Hydrophilus* and semi-aquatic genera including *Cercyon* and *Hydrochus*. *Hydrochus squamifer* inhabits still or slow moving water in shallow swamps, marshes and bogs, and is often found associated with saturated vegetation including *Sphagnum* mosses (Smetana, 1988). Similarly, the Limnichidae and Hydraenidae represent aquatic environments. The hydraenids were represented by a minimum of 64 individuals from the genus *Ochthebius*

Table 4.2. Arthropods identified from the MS28 and UPC sites.

identified insect taxa	skeletal parts	minimum number of individuals	
		MS28 site	UPC site
INSECTA			
DIPTERA			
Diptera fam. indet.	H	1	
Blephariceridae gen indet.	L wing	1	
HEMIPTERA			
Corixidae sp. indet.	P	1	2
Lygaeoidea gen. indet.	L forewing	1	
Saldidae gen. indet.	L forewing		1
LEPIDOPTERA			
Noctuidae *Bellura* sp. indet.	mandibles	9	3
ORIBATIDA			
Oribatida fam. indet.	P	10	5
COLEOPTERA			
CARABIDAE			
Carabidae gen. indet.	HPLR	14	3
Agonum consimile (Gyllenhal)	HPLR	1	12
Agonum cupripenne (Say)	P	1	
Agonum lutulentum (LeConte)	P	1	
Agonum sp.	PLR	1	2
Amara obesa (Say)	P	1	
Bembidion mutatum Gemminger & Harold	R		1
Bembidion quadrimaculatum (Linnaeus)	P	2	
Bembidion transparens (Gebler)	HPLR	12	1
Bembidion versicolor (LeConte)	R	1	
Bembidion sp.	HPLR	8	
Bradycellinini sp.	R	1	
Carabus sp.	L	1	
Blethisa multipunctata (Linnaeus)	L		1
Diplous sp.	L	1	
Chlaenius sp.	L		1
Dyschirius sp.	LR	3	
Elaphrus clairvillei Kirby	PLR	1	6
Elaphrus sp.	L	1	1
Metabletus americanus (Dejean)	R		1

Table 4.2. (continued)

identified Coleoptera taxa	skeletal parts	minimum number of individuals	
		MS28 site	UPC site
CARABIDAE (continued)			
Patrobus sp.	L		1
Pterostichus patruelis (Dejean)	P	1	
Pterostichus sp.	R		1
Trechus sp.	L		1
GYRINIDAE			
Gyrinidae gen. indet.	HLR	1	1
Gyrinus sp.	R	1	
HALIPLIDAE			
Haliplidae gen. indet.	LR	1	2
DYTISCIDAE			
Dytiscidae gen. indet.	PLR	2	5
Agabus sp.	PLR		1
Colymbetes sp.	LR	1	6
Graphoderus sp.	L		3
Ilybius sp.	LR	1	3
Rhantus sp.	LR	1	1
HYDROPHILIDAE			
Hydrophilidae gen. indet.	HPLR		9
Cercyon sp.	PLR	2	1
Georissus sp.	LR	2	2
Helophorus sp.	PR	1	
Hydrobius sp.	L		1
Hydrochus squamifer LeConte	P	1	
Hydrochus sp.	PLR	3	3
Hydrophilus sp.	L	1	
HYDRAENIDAE			
Hydraenidae gen. indet.	PLR	19	3
Limnebiini gen. indet.	R	1	
Hydraena sp.	PLR	3	
Ochthebius sp.	HPLR	64	41
PTILIIDAE			
Ptiliidae gen. indet.	P	2	

Table 4.2. (continued)

identified Coleoptera taxa	skeletal parts	minimum number of individuals	
		MS28 site	UPC site
ELMIDAE			
Dubiraphia sp.	L	1	
LEIODIDAE			
Leiodidae gen. indet.	R	1	
Catops sp.	L	1	
SCYDMAENIDAE			
Scydmaenidae gen. indet.	PR	2	1
Euconnus clavipes (Say)	L	1	
STAPHYLINIDAE			
Staphylinidae gen. indet.	HPLR	28	13
Pselaphinae gen. indet.	PLR	19	7
Omaliinae gen. indet.	HPLR	10	1
Acidota sp.	L		1
Aleocharinae sp.	HPLR	62	13
Arpedium sp.	PLR	3	
Euaesthetus sp.	PL	3	1
Micropeplus sculptus LeConte	L	1	
Micropeplus tesserula Curtis	PLR	3	1
Olophrum consimile (Gyllenhal)	P	8	3
Olophrum rotundicolle (Sahlberg)	P	1	
Olophrum sp.	HPLR	13	31
Philonthus sp.	PLR	4	12
Stenus sp.	HPLR		97
Tachininae sp.	R	2	
SCARABAEIDAE			
Scarabaeidae gen. indet.	H	1	
Micraegialia pusilla (Horn)	L	1	
SCIRTIDAE			
Scirtidae gen. indet.	HPLR	59	9
BYRRHIDAE			
Byrrhidae gen. indet.	LR	1	
Cytilus sp.	R	1	

Table 4.2. (continued)

identified Coleoptera taxa	skeletal parts	minimum number of individuals	
		MS28 site	UPC site
LIMNICHIDAE			
Limnichidae gen. indet.	L	1	
HETEROCERIDAE			
Heteroceridae gen. indet.	LR	1	
CANTHARIDAE			
Cantharidae gen. indet.	P	1	
COCCINELLIDAE			
Coccinellidae gen. indet.	HL	2	1
Brachiacantha ursina (Fabricius)	HR	1	
Scymnus sp.	R	1	
NITIDULIDAE			
Nitidulidae gen. indet.	R	1	
LATRIDIIDAE			
Latridiidae gen. indet.	HPLR	21	5
Corticaria sp.	PLR	2	
CHRYSOMELIDAE			
Chrysomelidae gen. indet.	HPLR	2	1
Donacia pubescens LeConte	HLR	5	1
Donacia sp.	HLR	2	3
Plateumaris sp.	LR	1	2
BRENTIDAE			
Apion sp.	L	1	
CURCULIONIDAE			
Curculionidae gen. indet.	HPLR	7	4
Ceutorhynchus sp.	PLR	7	1
Notaris sp.	HLR	1	2
Notaris aethiops (Fabricius)	LR	1	
Pityophthorus sp.	LR	1	1
Phloeotribus piceae Swaine	L	1	
Tanysphyrus sp.	LR		4
Scolytinae gen. indet.	HPLR	6	4

H = head P = pronota **L** = left elytra R = right elytra sp. = species **gen. indet.** = genus indeterminable which live in still water bodies as does *Hydraena*, while members of the *Limnebiini* tribe prefer flowing water (Perkins, 1980). The occurrence of these aquatic taxa indicated the presence of water bodies associated with streams and rivers, marshes, swamps and bogs.

Supporting this interpretation, a number of non-coleopteran insects associated with aquatic environments were identified. The Corixidae (water boatmen) are fully aquatic true bugs found in a wide range of freshwater environments (Tinerella and Gunderson, 2005). Also, the moth genus *Bellura* have aquatic larvae which feed on the leaves and stems of aquatic plants (Bug Guide, 2005) such as *Typha latifolia* (Gerald Fauske, 2009). The Saldidae, or shore bugs, are found, "at sandy shorelines, edges of ponds, bogs, marshes, mud flats, and on rocks in rivers and streams" (Bug Guide, 2005).

Correspondingly, a number of taxa represented habitats that would border onto water. These water marginal environments include matted vegetation at the substrate and emergent vegetation. The Donaciinae were represented by the genus *Plateumaris* whose host plants, *Cyperacea* (sedges) (Askevold, 1991), were common throughout deposits from both sites. *Micropeplis sculptus*, a small staphylinid species, is associated with wet organic debris in or near bogs and swamps (Campbell, 1968). Likewise, the Scirtidae which inhabit emergent vegetation were represented by a minimum of 59 individuals. *Olophrum consimile and O. rotundicolle* live at the edges of water bodies with emergent vegetation and are found in moist organic litter from *Salix* (willow) and carices (sedges) (Campbell, 1983). *Carex* seeds were abundant in deposits from both fossil sites and a woody branch of *Salix* was identified from deposits at the UPC site. The curculionid, *Notaris aethiops*, and a number of carabid species including *Agonum consimile*, *A, lutulentum*, *Bembidion transparens*, *B. versicolor*, *Blethisa multipunctata*, and *Pterostichus patruelis* are associated with rich, dense vegetation such as *Typha latifolia, Eleocharis* and carices growing along the borders of eutrophic or mesotrophic water bodies (Arnett, 2001; Lindroth, 1961; 1963; 1966).

Furthermore, open habitats such as sand bars along stream channels are indicated by the presence of a number of ground beetles. *Dyschirius* dig burrows in non-vegetated areas near water and *Diplous* live on non-vegetated rocky or sandy stream margins (Lindroth, 1961). *Agonum cupripenne* is found in open areas on sand and gravel near water (Lindroth, 1966) while *Bembidion quadrimaculatum*, represents better drained environments on high lake shores and the upper banks of rivers with sandy muddy bare soil (Lindroth, 1963). *Patrobus* lives in open habitats but is more or less hygrophilous (Lindroth, 1961) and *Bembidion mutatum* prefers open, wet, sandy habitats which are often composed of moraine (Lindroth, 1963). From the byrrhid family, *Cytilus* are associated with wet disturbed soils rich in sand and gravel, and Heteroceridae burrow tunnels in sand and mud near water edges (CNC Checklist, 2004).

Several of the taxa represented in the assemblage may be found in the shade of trees at the water's margins. A number of these taxa are associated with moist organic matter such as leaf litter, decaying wood, and fungi. The pselaphids are found on the margins of bogs and marshes, below bark of dead trees and on decaying wood (CNC Checklist, 2004) and *Micropeplis tesserula* is associated with forested areas and rotting leaf litter (Campbell, 1968). Similarly, the Scydmaenidae, *Euconnus clavipes,* are found in rotting mosses and wood (CNC Checklist, 2004) and the ground beetle, *Elaphrus clairvillei,* lives in the shade of tall, dense sedges and shrubs or forest (Goulet, 1983; Lindroth, 1961). Also, a rare and tiny scarab beetle, *Micraegalia pusilla* represents the only species in its genus. This beetle has only four known modern collection localities (Gordon and Cartwright, 1988), and its only habitat description has been inferred from the fossil data. The suggested habitat of *M. pusilla* is that of "open, sandy patches in spruce woodland" (Ashworth and Schwert, 1992). Evidence for forested environments was confirmed by the bark beetles (*Scolytinae*). They were represented by the genera *Pityophthorus*, and *Phloeotribus*. *Phloeotribus piceae* lives and feeds on shaded branches of its host plant, *Picea glauca* (white spruce) (Great Basin Naturalist Memoirs, 1982) which grows in moist coniferous woodlands and bogs (Flora of North America, 2008). In Fargo-Moorhead today, white spruce can be found associated with bogs and riverbanks in the boreal forests of Canada and northern Minnesota more than 400 km north and 100 km east of Fargo-Moorhead (Figure B-13). *Picea glauca* has been identified from MLWP sites at the Moorhead site (Rosendahl, 1948), at the Seminary site (McAndrews, 1967), and at the Rainy River site (Bajc et al., 2000).

This interpretation based on the Coleoptera fossils is supported by the macroscopic plant remains from the two new sites including seeds, leaves, nutlets, wood, and mosses (Yansa, written comm, 2009).

4.3. Macroscopic plant remains

The plant macrofossils in the MS28 and UPC fossil assemblage are considered to be autochthonous based on the excellent preservation of delicate features such as bristles and perianth veins still attached to seeds. The remains from both the MS28 and UPC sites contained numerous shared taxa and represented a similar environment.

The assemblage is rich in macrofossils dominated by seeds from aquatic-emergent vegetation and mudflat herbs (Table D.1). There were lesser amounts of submerged aquatic plants and deciduous shrubs. With the exception of wood, macrofossils of trees were rare, but evidence for the presence of both coniferous and deciduous trees was present.

Submerged aquatic plants were represented mostly by *Hippuris vulgaris* (mare's tail), and pondweeds such as *Potamogeton pusillus* and *Zannichellia palustris*. The occurrence of these plants indicated the presence of standing water, though *Hippuris vulgaris* can reproduce above water and is able to survive desiccation (Yansa, 2009).

The aquatic-emergent vegetation at this site included four *Carex* (sedge) species and three *Scirpus* (bulrush) species. Other emergents included *Polygonum lapathifolium* (pale smartweed), *Sagittaria latifolia* (broad-leaved arrowhead), *Eleocharis* (spike-rush), *Typha latifolia* (broad-leaved cattail), and *Juncus* (rush). These plants indicate a marsh environment with dense vegetation.

The majority of the mudflat herbs were composed of *Lycopus americanus* (water hoarhound; American bugleweed), *Mentha arvensis* (wild mint), and *Bidens* (beggarticks). There were also representatives of Asteraceae (aster family), Brassicaceae (mustard family), *Chenopodium* (goosefoot), and what appeared to be *Fragaria virginiana* (wild strawberry) and *Viola* (violet). The mudflat herbs represented the presence of water marginal environments with saturated soils (Yansa, 2009).

Forested environments were indicated by the presence of wood of deciduous trees including *Salix* (willow) (United States Department of Agriculture, 2008) and what appeared to be *Populus* (poplar) and coniferous trees including *Picea* (spruce) (USDA, 2008, and *Larix laricina* (tamarack) (Yansa, 2009). These trees have been identified from other MLWP sites including the Moorhead site (Rosendahl, 1948), the Seminary site (McAndrews, 1967), the Rainy River site (Bajc et al., 2000), and the Trollwood site (Yansa and Ashworth, 2005) with the exceptions of *Salix* from the Moorhead site (Rosendahl, 1948) and *Larix* from the Trollwood site (Yansa and Ashworth, 2005). Deciduous shrubs were also present in the assemblage and included *Viburnum opulus americanum* (highbush cranberry) and *Rubus idaeus* (red raspberry) which are found in, "swampy woods. Presence of these taxa indicated that better drained soils existed in these wetlands possibly associated with sandbars. Yansa (2009) questions whether the spruce is contemporaneous with the other plant remains. However, the presence of the bark beetle, *Phloeotribus piceae*, whose host plant is *Picea glauca* (white spruce), confirms that spruce existed as part of this biological community.

4.4. Synthesis of paleoenvironment

The majority of the plant taxa exist within the Fargo-Moorhead region at present with the exception of *Picea* and *Larix larcina* which today occur in the boreal forests of northern Minnesota and Canada 400 km north of the Fargo-Moorhead region.

The Coleoptera and plants represent a coherent assemblage in which communities with similar species structure can be found coinhabiting the southern parts of the boreal forest. All species are extant. Collectively, they occur throughout the boreal forest. During this time, the southern margin of the Laurentide Ice Sheet was in southern Canada approximately 600 km north of the Fargo-Moorhead region (Dyke and Prest, 1986), yet none of the fauna had arctic distributions.

The sum of the stratigraphic and paleoenvironmental characteristics equates the paleoenvironment to a wetland associated with a delta, the Moorhead Delta. This wetland was characterized by swamps, marshes, and bogs which developed between streams channels and rivers that flowed into the delta. Sandbars and open areas existed on banks of these channels with stands of mixed forest comprised of *Picea* (spruce), *Larix* (tamarack), *Salix* (willow) and *Populus* (poplar).

Yansa and Ashworth (2005) compared the paleoenvironment at the Trollwood site to Delta Marsh, in Manitoba. Delta Marsh is located along the southern shore of Lake Manitoba at 50.21° N, -98.19° W near Portage la Prairie, Manitoba. This marsh consists of a system of interconnected wetlands where stands of deciduous and coniferous trees growing on sand bars separate it from Lake Manitoba (Delta Marsh, 2004). This interpretation of a wetland with a mosaic of open water and water marginal habitats is supported by the study of the fossil assemblages from the MS28 and UPC sites.

4.5. Paleoclimatic interpretation

The goal of the paleoclimatic analysis is to reconstruct temperature regimes in Fargo-Moorhead during the MLWP using the geographic distributions of Coleoptera species as a guide. Coleoptera are useful as paleoclimate indicators because they are ectothermic, they have not experienced major evolutionary changes on the time scales of thousands of years, and because they respond to climate changes by simply shifting their geographical ranges (Ashworth, 2001). The Coleoptera species used in the paleoclimate analysis included *Agonum consimile, Agonum cupripenne, Agonum lutulentum, Bembidion quadrimaculatum, Bembidion transparens, Bembidion versicolor, Blethisa multipunctata, Elaphrus clairvillei, Olophrum consimile, Olophrum rotundicolle,* and *Pterostichus patruelis.*

The geographic ranges for the species used in the paleoclimatic analysis are shown in Figures B.1 through B.12 and Tables C.1 through C.11. Collection localities are distributed in a number of northern biomes defined by the Nature Conservancy (Figure

B.13). Distribution locations occur within the boreal forest, temperate conifer forest, temperate broadleaf and mixed forest, and the northern temperate grasslands. The majority of the data points are within the boreal and temperate forests.

When the data points were overlain on the terrestrial Ecozones of Canada map (2009), they clustered mainly within the Boreal Plains and Boreal Shield subdivisions. These subdivisions have mean July temperatures which range from 12°C to 18°C (Figure B.14).

Using a variation of the MCR method and assuming bivariate normal distribution, 95% confidence ellipses were computer generated around the clusters on the graphs representing the climatic range occupied by each species. These ellipses were then stacked to show the zone of maximum overlap or mutual climatic range of the fossil assemblage. Figure 4.1 shows the 68% confidence interval and figure 4.2 shows the 95% confidence interval. The 95% confidence interval shows that the mutual climatic intersection for the MLWP species have a range of mean July temperatures between 14°C and 21°C with an average of 17°C. The mean July temperature of Fargo-Moorhead presently is 21°C (U.S. Climate Normals, 2005). The closest location to Fargo-Moorhead with mean July temperatures of 17°C is at Minnedosa, southern Manitoba, 435 km to the north (National Climate Data and Information Archive, 2008). Minnedosa is at similar latitude to Delta Marsh, Manitoba, which was chosen by Yansa and Ashworth (2005) as the modern analogue for the environment of Fargo-Moorhead during the MLWP.

The second method used in the paleoclimatic analysis utilizes the same data, but presents it in a different way. The means of the mean July temperature data for each species were plotted in a box graph (Figure 4.3). The line at 17° C represents the average

Figure 4.1. 68% confidence ellipses for overlapping climatic ranges of Coleoptera species. Area of maximum overlap shown by shaded area. Present climate in Fargo-Moorhead represented by red dot. Mean temperatures represented by the dotted lines.

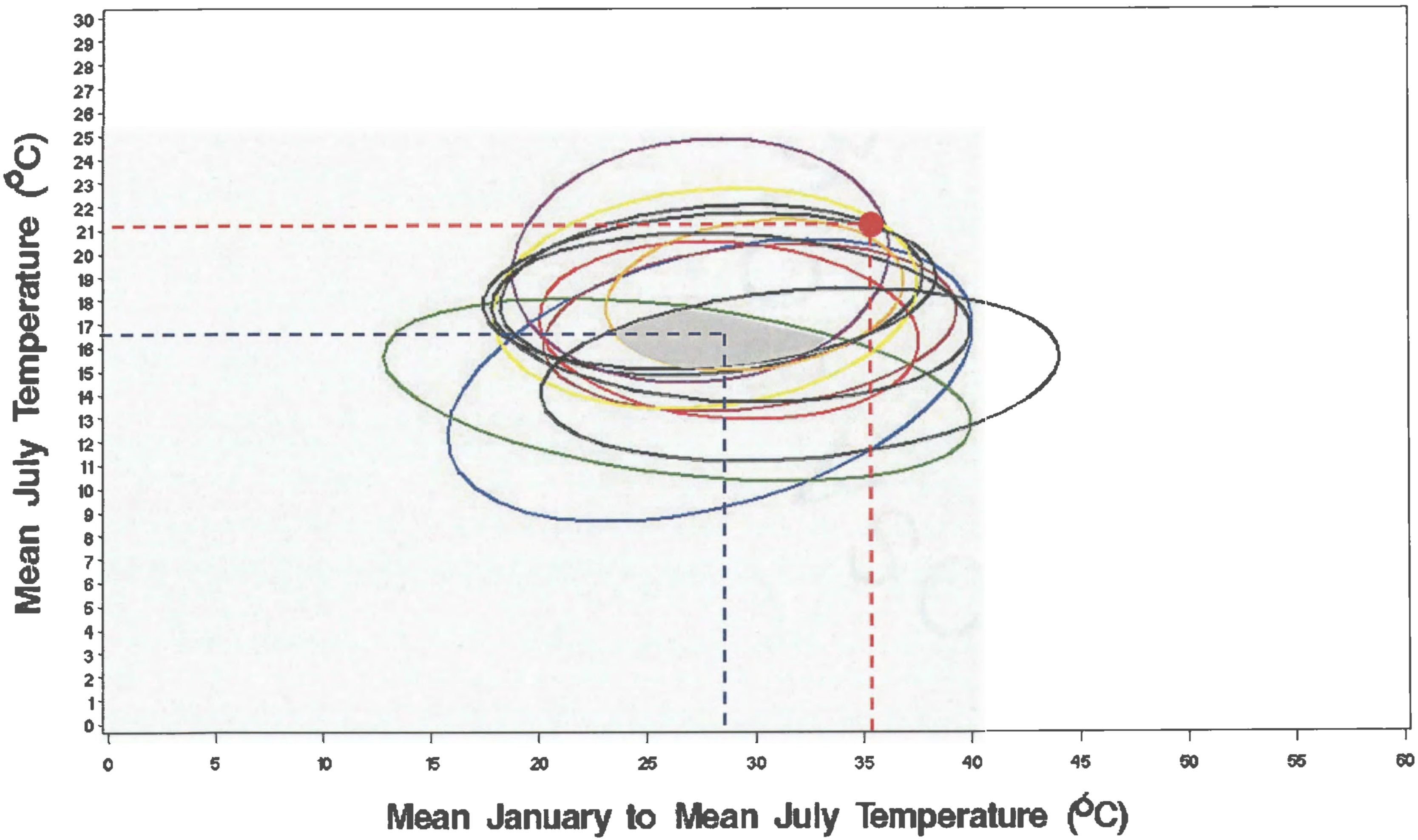
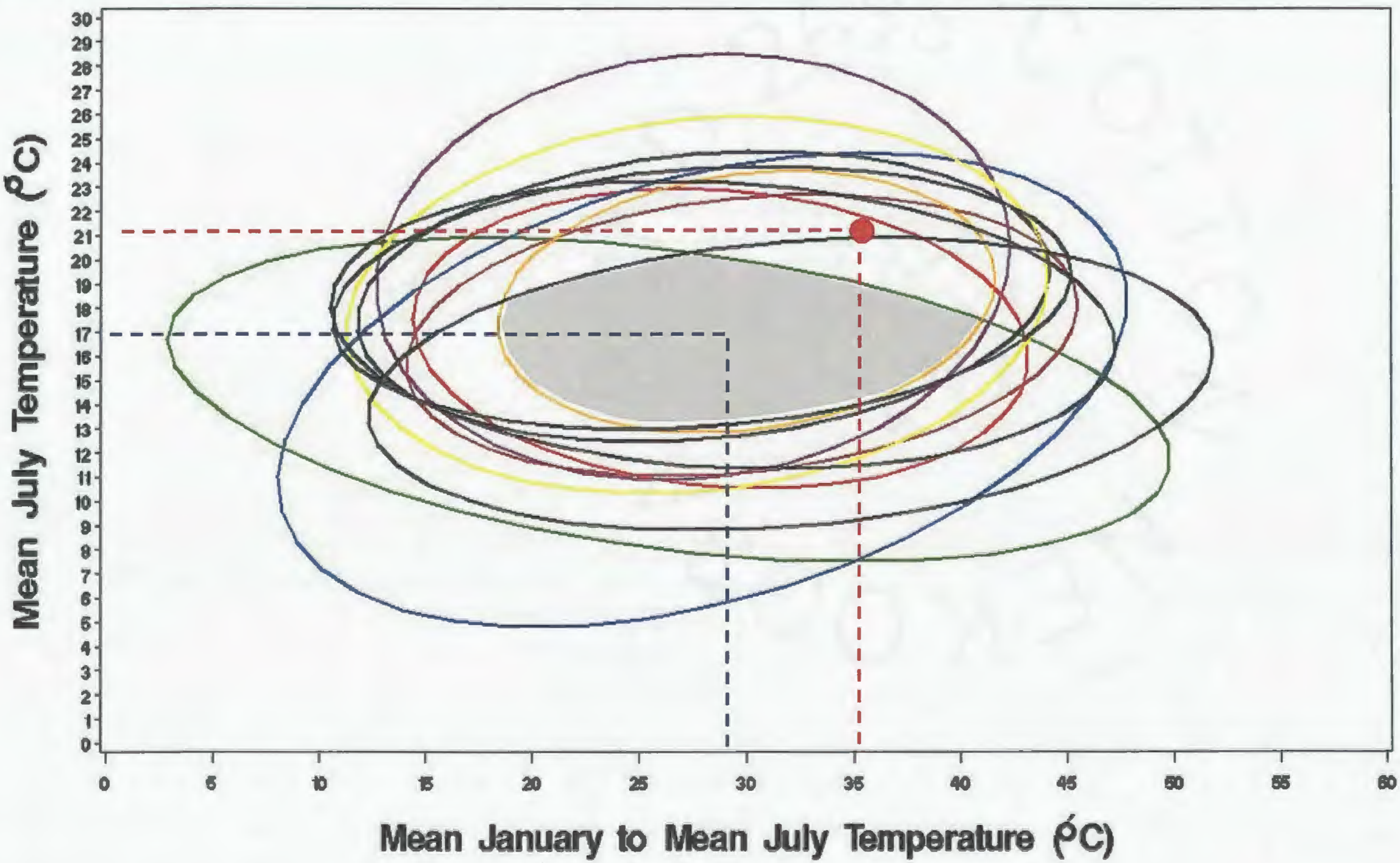


Figure 4.2. 95% confidence ellipses for overlapping climatic ranges of Coleoptera species. Area of maximum overlap shown by shaded area. Present climate in Fargo-Moorhead represented by red dot. Mean temperatures represented by the dotted lines.



of the means of the mean July temperatures for all 12 species used in the paleoclimatic analysis. The bars on each species represent one standard deviation. The shaded area represents the range of mean July temperatures in which all of the species could coexist. The graph shows that mean temperatures for the majority of the taxa with the exception of *Agonum consimile* are within 2°C of the average value. The second method used in the paleoclimatic analysis supports that a mean July temperature of 17°C best fits the data.

Based on the analysis, the temperature regime in the Fargo-Moorhead area during the MLWP was about 4°C cooler than at present. The only other analysis of paleoclimatic conditions during the MLWP comes from estimates based on a study of plant and insect remains by Yansa and Ashworth (2005). They estimated temperatures 1-2°C cooler for a MLWP site in Fargo based on a non quantitative assessment of the geographic ranges of the taxa.

4.6. Drainage models

Over the years, several drainage models have been proposed for Lake Agassiz. The most recent of these are by Fisher (2005) and by Teller (2001) (Figure 4.4). In both models, strandline geomorphology and stratigraphy were used to reconstruct lake levels in the southern Lake Agassiz basin throughout the lake's history. Fisher and Teller agree that the Lockhart Phase was established by 13,800 cal yr BP (11,800 ^{14}C yr BP) but disagree on the timing of its termination, the onset and termination of the other phases, the position of the drainage outlets, and whether the formation of various strandlines were caused by transgression or regression (Fisher, 2005).

The MLWP ages from the MS28 and UPC sites were compared to the Teller model (2001). His model shows that the MLWP had ended at 11,800 cal yr BP (10,200 ^{14}C yr

Figure 4.3. Boxplot of overlapping climatic ranges of Coleoptera species. Shaded area represents one standard deviation for all species. Line represents the mean of the means at 17 °C.

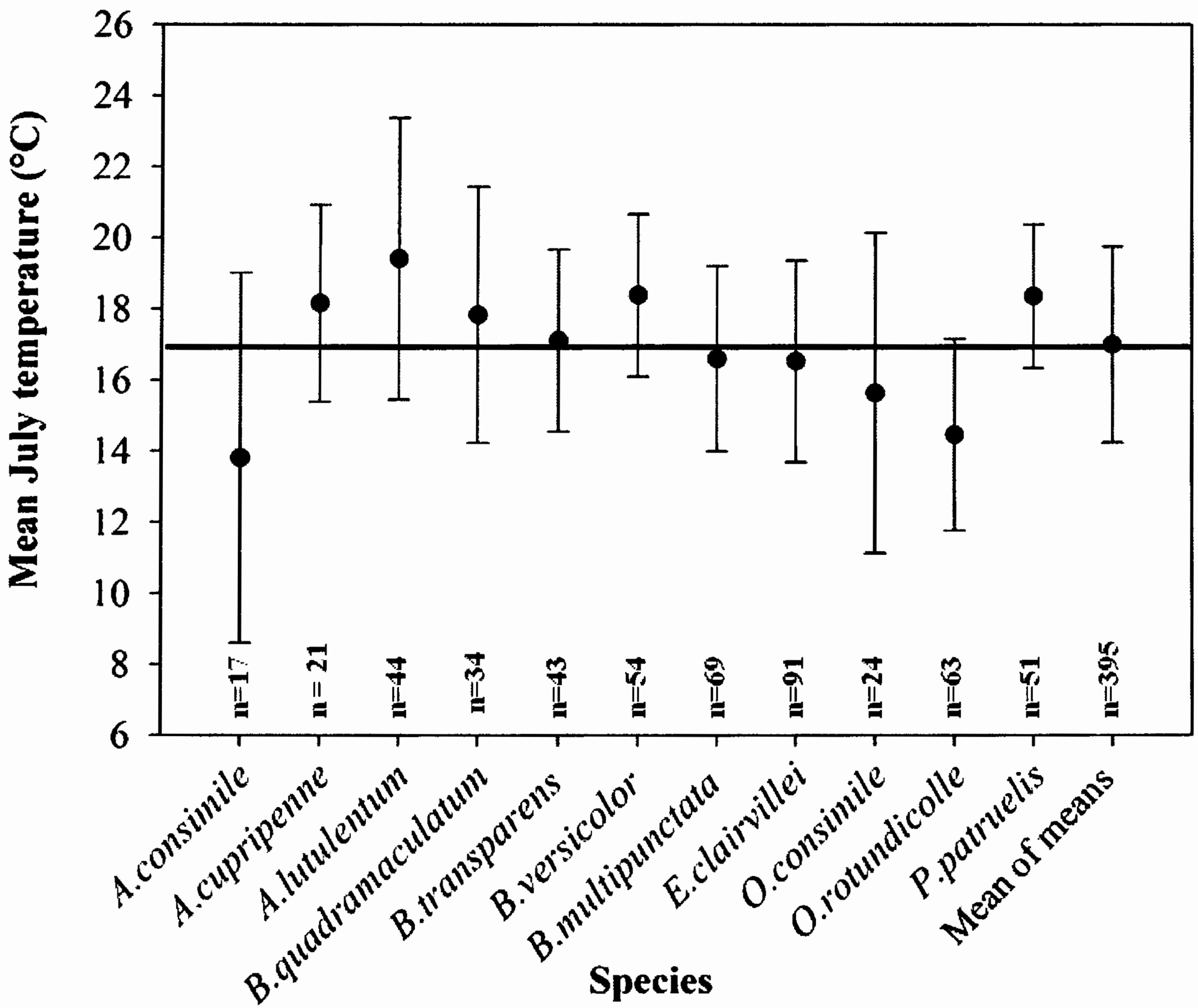
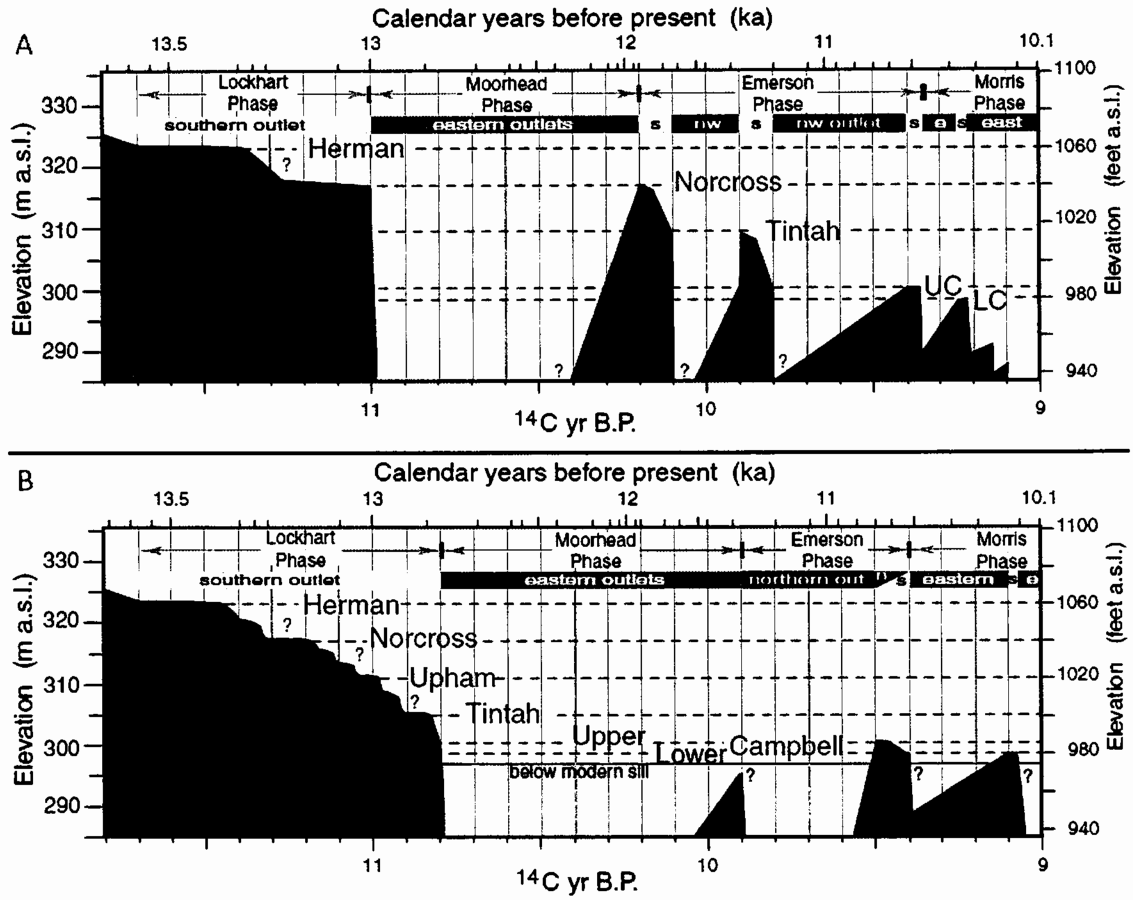


Figure 4.4. Lake Agassiz phases and drainage outlets. (modified from Fisher, 2005)
A. Lake Agassiz Southern Outlet Model Proposed by Teller, 2001
B. Lake Agassiz Southern Outlet Model Proposed by Fisher, 2005
(a.s.l. = above sea level ka = thousands of years)



BP) although it is widely accepted that the Poplar River Formation was deposited in Fargo-Moorhead through the end of this phase until 11,310 cal yr BP (9,900 ^{14}C yr BP). According to Teller's model, these wetland deposits would have been deposited during the Emerson Phase, a deep water phase of the lake (Teller, 2001). This is impossible since these shallow wetland deposits are clearly associated with the MLWP which, by definition, refers to the time that the lake floor in the Fargo-Moorhead region was subaerialy exposed (Arndt, 1977).

According to Fisher's model, the end of the MLWP is dated at 11,178 cal yr BP (9,737 ± 53 ^{14}C yr BP) to 11,467 cal yr BP (10,011 ± 35 ^{14}C yr BP). The dates for the MS28 and UPC sites are consistent with the Fisher model well. Shortly after the deposition of the MS28 and UPC sediments, Lake Agassiz transgressed and the rise to the higher levels of the Emerson Phase drowned out the productive wetland that had become established in the Moorhead Delta.

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APPENDIX A. RADIOCARBON MATERIALS AND DATA

Table A.1. Plant materials identified for radiocarbon analysis. Compiled by Dr. Catherine Yansa

Sample #	Taxon	Comments re: ^{14}C dating
1	*Fragaria* cf. *F. virginiana* seed (wild strawberry) [mudflat plant]	Excellent for dating
2	*Eleocharis* sp. achene [emergent aquatic, shoreline plant; can't ID to species without its "cap," which is missing]	Excellent for dating
3	*Mentha* sp. seed [is related to *Mentha arvensis*=mudflat plant]	Excellent for dating
4	*Carex* cf. *C. synchnocephala* seed (long-beaked sedge) [emergent aquatic]	Excellent for dating
5	*Rumex* sp. (dock) seed [mudflat plant, weed; specimen looks charred, washed in after a fire??]	Excellent for dating
6	*Carex* sp. seed (sedge, of the triangular type, such as *C. rostrata* or *C. atherodes*, but can't ID beyond *Carex*)	Excellent for dating
7	*Lycopus americanus (*American bugleweed) seed [mudflat herb]	Excellent for dating
8	Species of Brassicaeae (=Cruciferae, mustard family) seed —[I would need spend some time to get it down to genus, too many members to make a positive species ID] [mudflat herb]	Excellent for dating
9	*Mentha arvensis* (field mint) seed [mudflat plant]	Excellent for dating
10	Unknown—probably fungi	DO NOT DATE
11	*Typha latifolia* achene (broad-leaved cat-tail) achenes [emergent aquatic]	Excellent for dating
12	Same as #6, *Carex* sp. seed (sedge, of the triangular type)	Excellent for dating
13	Probably *Sphagnum* (moss) megaspores	DO NOT DATE
14	Same as #11, *Typha latifolia* (broad-leaved cat-tail) achene [emergent aquatic]	Excellent for dating
15	Unidentifiable wood frag	Excellent for dating
16	Unidentifiable wood frag, but definitely of a deciduous tree [looks like the *Populus* sp. (poplar wood), but can't be positive without X-sectioning the wood)	Excellent for dating
17	Same as #11, 14, *Typha latifolia* (broad-leaved cat-tail) achene [emergent aquatic]	Excellent for dating
18	Same as #6 and 12, *Carex* sp. seed (sedge, of the triangular type)	Excellent for dating
19	*Potentilla* sp. (cinquefoil) seed [can't ID to species, too many species in this genus; mudflat plant]	Excellent for dating
20	Megaspore, of a moss or clubmoss	DO NOT DATE
21	*Hippuris vulgaris* (mare's-tail) achene [long tubular fruit with interior "hole"]	DO NOT DATE= SUBMERGED AQUATIC

Table A.2. Original radiocarbon ages as reported by NSF-Arizona AMS Laboratory.

Rock, J.									29-Dec-08
AA	Lab #	Sample ID	Suite	Run Date	d13C	F (d13C)	(+-) dF	^{14}C yrs B. P.	Deviation
AA82343	X11833A	MS28-20.5	1 of 8	N12-24-08	-28.80	0.2976	0.002	9737	53
AA82344	X11834	MS28--26	2 of 8	N12-24-08	-30.00	0.2912	0.0025	9911	68
AA82345	X11835	MS28-30.5	3 of 8	N12-24-08	-26.20	0.2926	0.002	9872	56
AA82346	X11836	MS28-34.5	4 of 8	N12-24-08	-26.50	0.2897	0.0037	9952	104
AA82347	X11837	UPC-A	5 of 8	N12-24-08	-30.20	0.2921	0.0036	9885	98
AA82348	X11838	UPC-D	6 of 8	N12-24-08	-29.80	0.2876	0.0048	10011	35
AA82349	X11839	UPC-F	7 of 8	N12-24-08	-29.70	0.2924	0.0026	9953	72
AA82350	X11840	UPC-H	8 of 8	N12-24-08	-29.40	0.2934	0.0021	9849	57

Table A.3. MS28 samples and ages.

sample interval	weight (kg)	depth (m)	age (^{14}C yr BP) ± std error	age (cal yr BP) ± std error
MS28 Borehole-20.5	≈0.25	6.25	9,737 ± 53	11,178 ± 49
MS28 Borehole-26	≈0.25	7.90	9,911 ± 68	11,304 ± 93
MS28 150cm1/2	3.60	8.50	*	*
MS28 150cm 2/2	3.95	8.50	*	*
MS28 125cm 1/2	3.30	8.75	*	*
MS28 125cm 2/2	3.20	8.75	*	*
MS28 100cm 1/2	3.02	9.00	*	*
MS28 100cm 2/2	3.02	9.00	*	*
MS28 75cm 1/2	3.15	9.25	*	*
MS28 75cm 2/2	3.20	9.25	*	*
MS28 75cmP 1/2	3.93	9.25	*	*
MS28 75cmP 2/2	3.12	9.25	*	*
MS28 75cm KP 1/2	3.46	9.25	*	*
MS28 75cm KP 2/2	3.40	9.25	*	*
MS28 Borehole-30.5	≈0.25	9.30	9,872 ± 56	11,259 ± 49
MS28 50cm 1/2	3.45	9.50	*	*
MS28 50cm 2/2	3.25	9.50	*	*
MS28 25cm 1/2	3.13	9.75	*	*
MS28 25cm 2/2	4.18	9.75	*	*
MS28 0cm 1/2	2.60	10.00	*	*
MS28 0cm 2/2	3.24	10.00	*	*
MS28 Borehole-34.5	≈0.25	10.5	9,952 ± 104	11,391 ± 184

* = not dated

Table A.4. UPC samples and ages.

sample interval	weight (kg)	depth (m)	age (^{14}C yr BP) ± std error	age (cal yr BP) ± std error
UPC – 1	4.05	3.8 – 6.2	*	*
UPC - 2	3.10	3.8 – 6.2	*	*
UPC – A	≈0.75	3.8 – 6.2	9,885 ± 98	11,295 ± 125
UPC – B	≈0.75	3.8 – 6.2	*	*
UPC – C	≈0.75	3.8 – 6.2	*	*
UPC – D	≈0.75	3.8 – 6.2	10,011 ± 35	11,467 ± 107
UPC – E	≈0.75	3.8 – 6.2	*	*
UPC – F	≈0.75	3.8 – 6.2	9,953 ± 72	11,368 ± 134
UPC – G	≈0.75	3.8 – 6.2	*	*
UPC – H	≈0.75	3.8 – 6.2	9,849 ± 57	11,243 ± 40

* = not dated

APPENDIX B. COLEOPTERA DISTRIBUTION MAPS

Figure B.1. Distribution map of *Agonum consimile*.

Figure B.2. Distribution map of *Agonum cupripenne.*

Figure B.3. Distribution map of *Agonum lutulentum.*

Figure B.4. Distribution map of *Bembidion quadrimaculatum.*

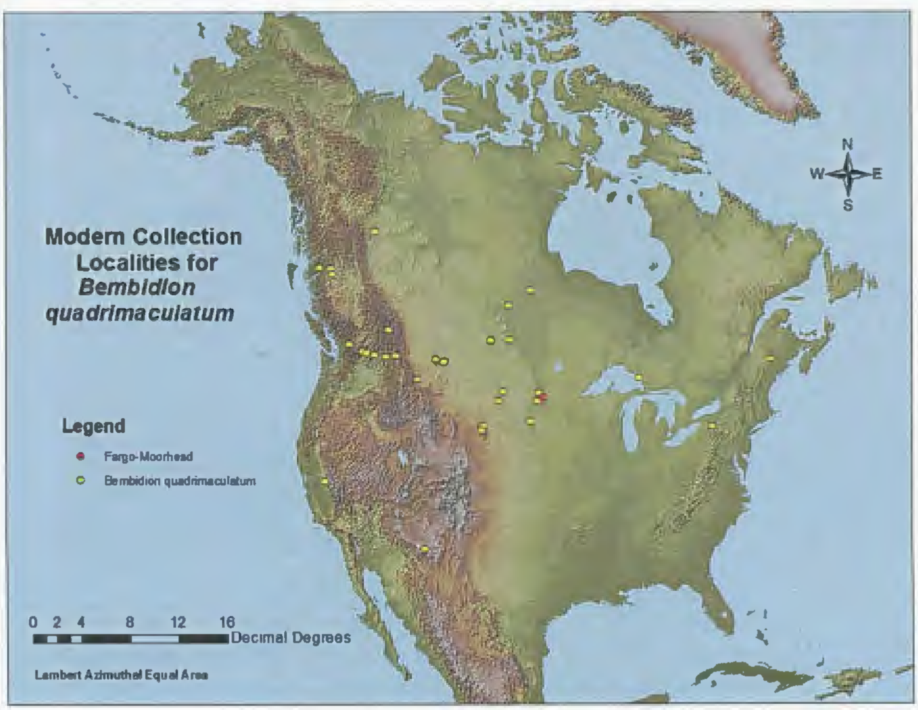


Figure B.5. Distribution map of *Bembidion transparens.*

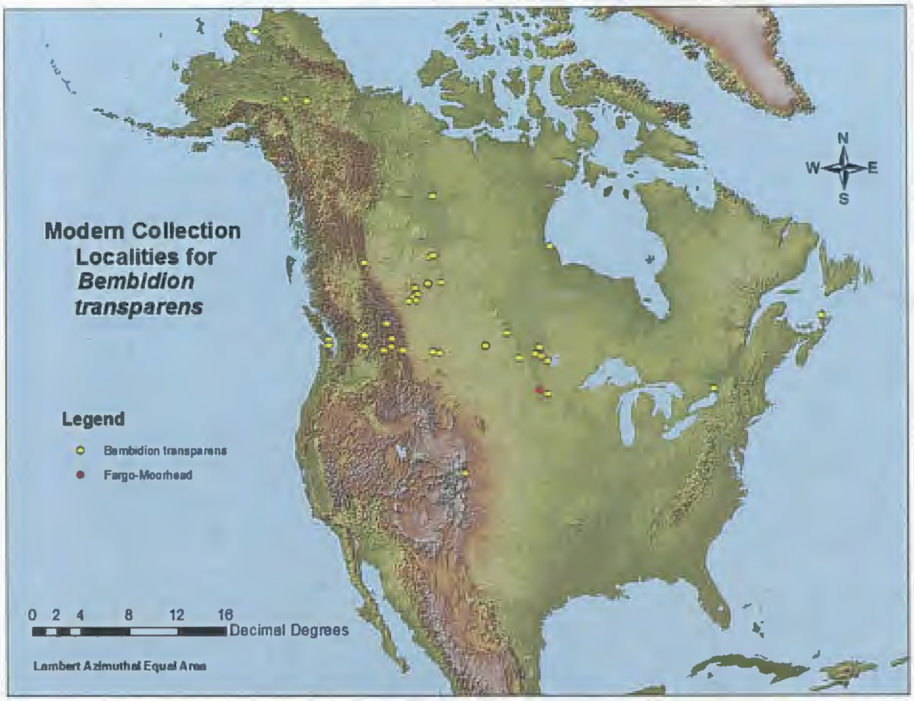


Figure B.6. Distribution map of *Bembidion versicolor.*

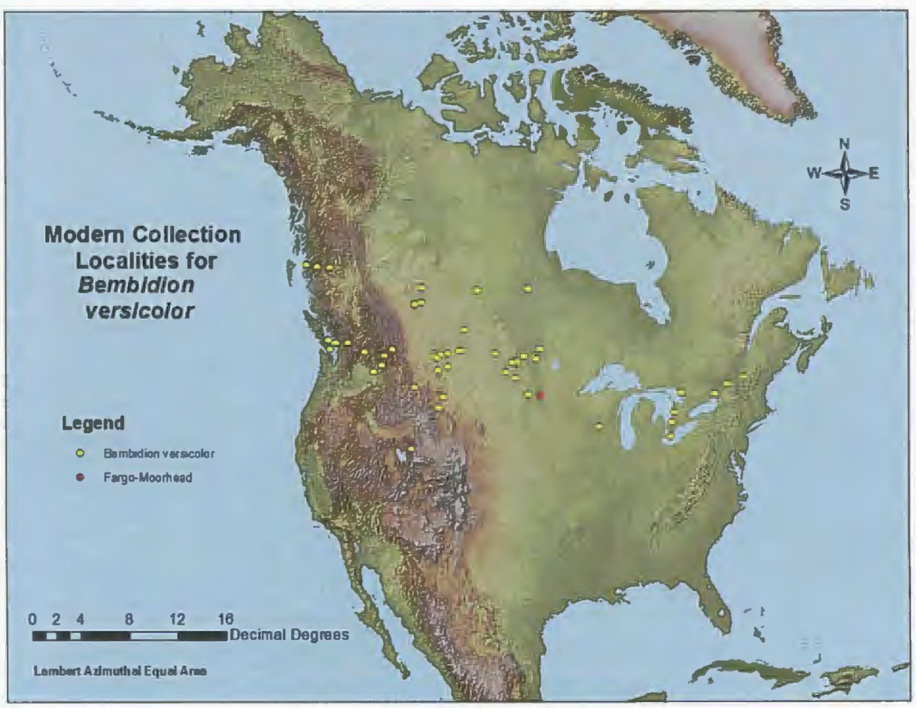


Figure B.7. Distribution map of *Blethisa multipunctata.*

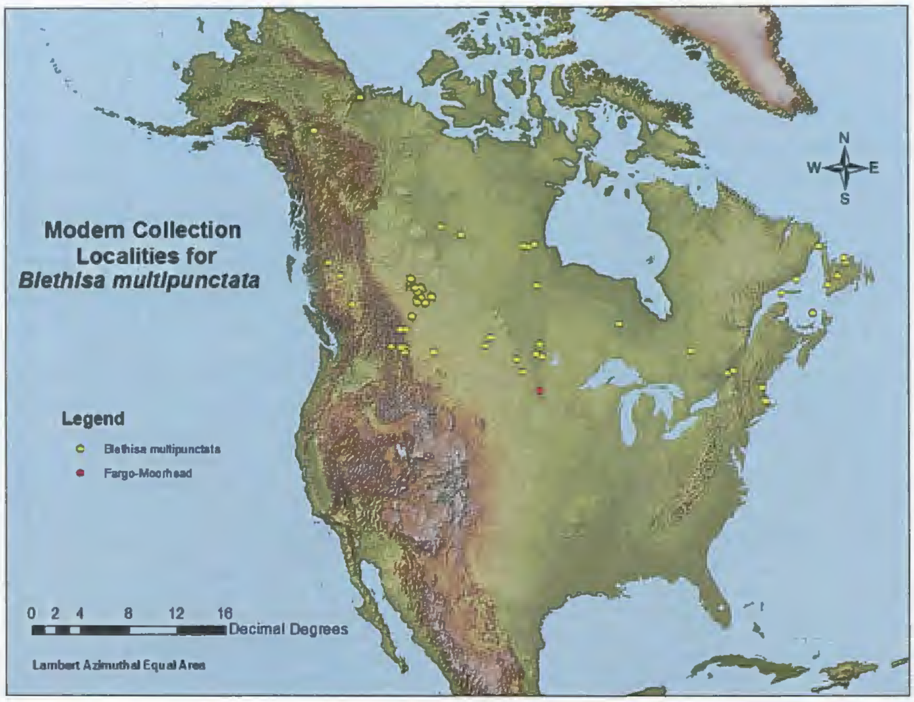


Figure B.8. Distribution map of *Elaphrus clairvillei.*

Figure B.9. Distribution map of *Olophrum consimile.*

Figure B.10. Distribution map of *Olophrum rotundicolle.*

Figure B.11. Distribution map of *Pterostichus patruelis*.

Figure B.12. Distribution map of Coleoptera species used in paleoclimatic analysis.

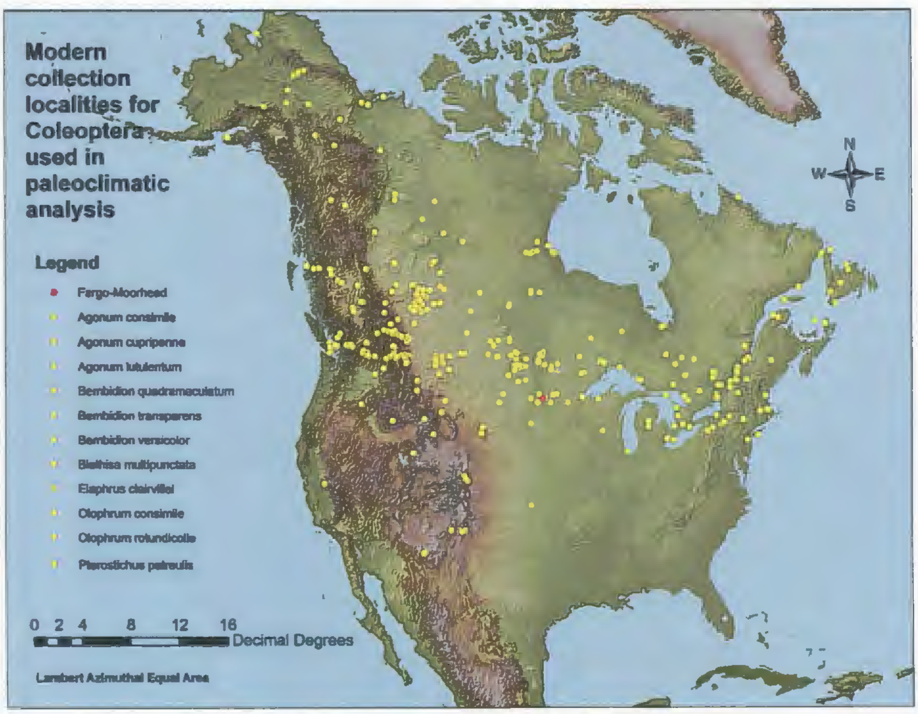


Figure B.13. Distribution map of Coleoptera within North American ecoregions.

Coleoptera distribution within North American ecoregions

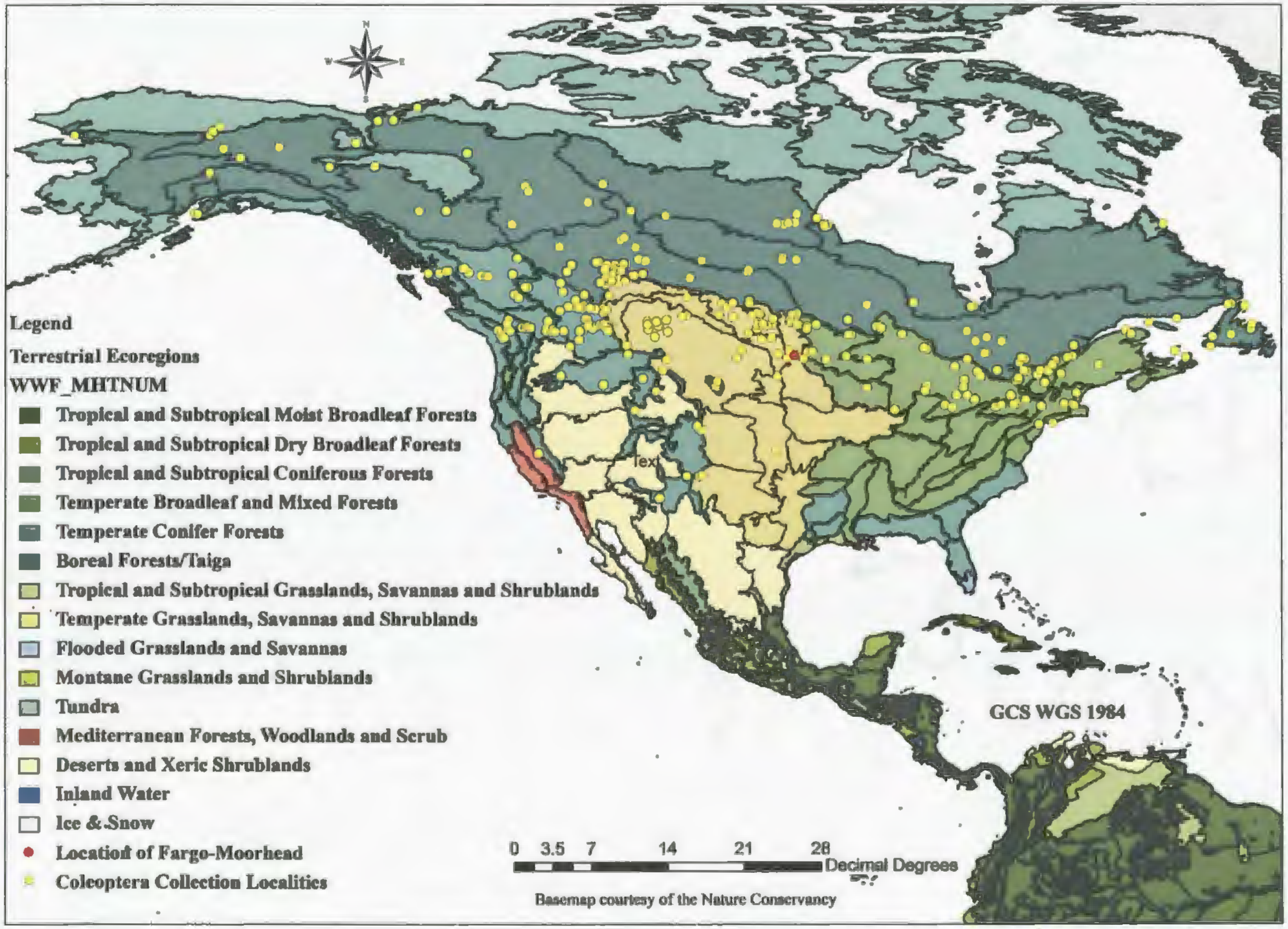
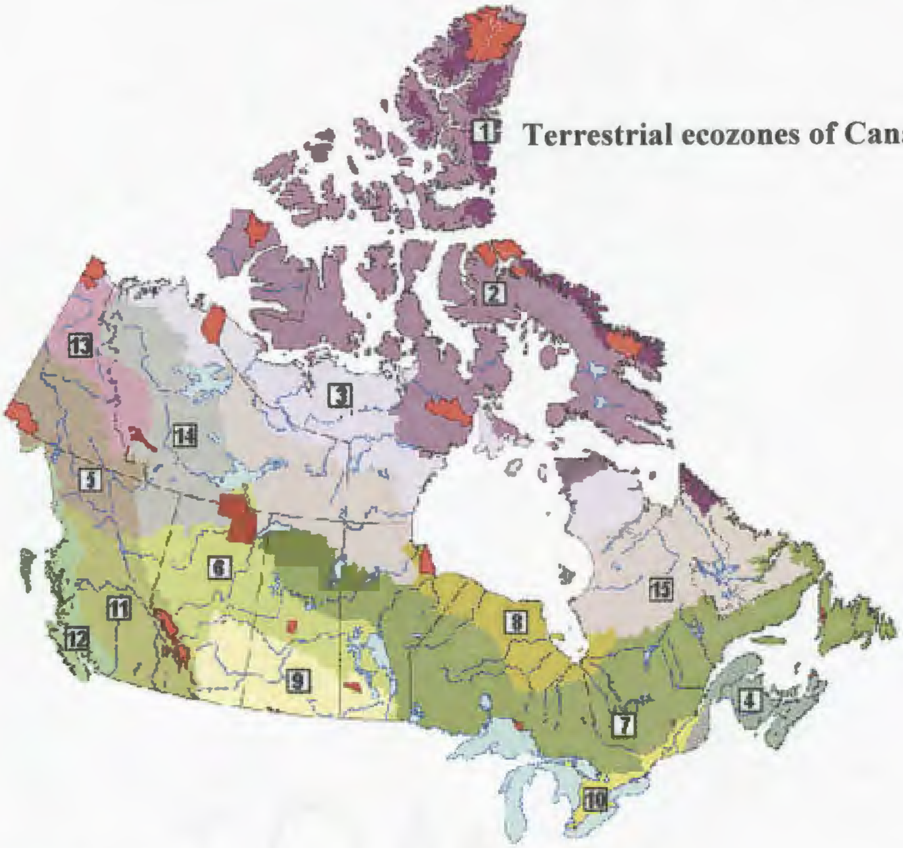


Figure B.14. Terrestrial ecozones of Canada map.



1. **Arctic Cordillera** 5 °C
2. **Northern Arctic** 5 °C to 10 °C
3. **Southern Arctic** 10 °C
4. **Atlantic Maritime** 18 °C
5. **Boreal Cordillera** 12 °C to 15 °C
6. **Boreal Plains** 12.5 °C to 17.5 °C
7. **Boreal Shield** 15 °C to 18 °C
8. **Hudson Plains** 12 °C to 16 °C
9. **Prairie** 15 °C to 17.5 °C
10. **Mixedwood Plains** 18 °C to 22 °C
11. **Montane Cordillera** 13 °C to 18 °C
12. **Pacific Maritime** 12 °C to 18 °C
13. **Taiga Cordillera** 12 °C to 15 °C
14. **Taiga Plains** 10 °C to 15 °C
15. **Taiga Shield** 7.5 °C to 17.5 °C

APPENDIX C. COLLECTION LOCALITIES AND CLIMATE DATA

Table C.1. *Agonum consimile* collection localities.

	Lat (DD)	Long (DD)	Elev (m)	Adj μ Jan Temp (°C)	Adj μ July Temp (°C)	T Range (°C)
United States: Alaska, Kotzebue	66.90	-162.58	3	-19.17	12.61	31.78
United States: Alaska, Kodiak Is, Amara Lake	57.32	-154.59	280	-10.95	11.44	22.39
United States: Alaska, Kodiak Is, S end Pinguicula Lake	57.49	-154.23	153	-10.13	12.26	22.39
United States: Alaska, Anchorage, Eagle River	61.32	-149.52	91	-9.37	14.30	23.67
United States: Alaska, 25 mi N Homer - marsh	60.00	-151.50	207	-5.95	11.11	17.06
United States: Colorado, Rocky Mnt Nat Pk, Fall River entrance 8000 ft	40.41	-105.66	2438	-4.70	17.02	21.72
Canada: British Columbia, Beaton River, Alaska Hwy mi 147	56.73	-120.80	575	-13.42	16.48	29.90
Canada: British Columbia, Fraser Lake	54.06	-124.85	698	-11.46	14.84	26.30
Canada: Saskatchewan, Cypress Hills Provincial Park	49.67	-109.46	1236	-9.76	15.14	24.90
Canada: British Columbia, 1.3 mi NW Tyco	49.25	-122.91	39	2.73	17.63	14.90
Canada: British Columbia, E Duncan	48.78	-123.70	13	2.55	16.95	14.40
Canada: British Columbia, 12 mi E Hope	49.50	-121.23	5	1.07	18.27	17.20
Canada: Goose Creek, 17 km S Churchill	58.62	-94.17	11	-26.70	12.00	38.70
Canada: Newfoundland and Labrador, L' Anse au Loup, SE Labrador	51.53	-56.83	16	-13.64	11.46	25.10
Canada: Manitoba, Akudlik (near Churchill)	58.73	-94.12	0	-26.70	12.00	38.70
Canada: Manitoba, Churchill	58.78	-94.19	0	-26.70	12.00	38.70
Canada: Manitoba, Thompson Area, Paint Lake Provincial Park	55.73	-97.90	195	-24.72	15.98	40.70

Table C.2. *Agonum cupripenne* collection localities.

	Lat (DD)	Long (DD)	Elev (m)	Adj µ Jan Temp (°C)	Adj µ July Temp (°C)	T Range (°C)
Canada: Alberta, Calahoo	53.71	-113.96	679	-13.07	16.33	29.40
Canada: Alberta, Huggett, near	53.31	-114.12	711	-13.38	16.02	29.40
Canada: Alberta, Lower Mann, 5 km ne Ashmont, Hwy 28A	54.16	-111.50	619	-15.67	16.03	31.70
Canada: British Columbia, 4 mi W Terrace	54.52	-128.69	272	-4.84	15.86	20.70
Canada: British Columbia, Duck Lake Trail	50.00	-119.40	432	-5.05	20.15	25.20
Canada: British Columbia, Exchamsiks River Park	54.34	-129.29	24	-2.41	18.29	20.70
Canada: British Columbia, Hope, 15.2 mi W of Hope	49.38	-121.77	59	0.90	18.10	17.20
Canada: British Columbia, Kimberly, Island Pond, 35 mi N Kimberly	50.19	-115.96	1445	-12.45	13.35	25.80
Canada: British Columbia, Ladner, 10 mi E Lander	49.09	-123.08	2	2.97	17.87	14.90
Canada: British Columbia, near Oliver	49.18	-119.55	308	-2.55	21.05	23.60
Canada: British Columbia, Wardner 11 mi E on Rte 3	49.43	-115.17	1740	-6.80	17.70	24.50
Canada: British Columbia, West Creston	49.10	-116.50	635	-2.95	19.05	22.00
Canada: British Columbia, Wyndell, near Creston, head of Lizard Ck	49.10	-116.50	635	-2.95	19.05	22.00
Canada: Manitoba Grand Beach	55.56	-96.63	214	-17.64	19.66	37.30
Canada: Manitoba, Brokenhead River	50.42	-96.67	217	-17.39	19.81	37.20
Canada: Manitoba, Duck Mountain Provincial Park, Loat Lake	51.83	-100.92	320	-18.02	18.18	36.20
Canada: Manitoba, Glenlea Res. Stn.	49.58	-98.86	386	-17.05	19.25	36.30
Canada: Manitoba, Grass River Provincial Park, 16 km w of Iskwasum Lake	54.63	-101.00	298	-20.26	18.64	38.90
Canada: Manitoba, N of Rapid City	50.20	-100.03	560	-18.98	17.42	36.40
Canada: Manitoba, Rt 10, 10 mi S Brandon	49.69	-99.95	431	-18.14	18.26	36.40
Canada: Manitoba, Shoal Lake	50.48	-100.69	558	-18.97	17.43	36.40
Canada: Manitoba, Whitewater Lake	49.27	-100.24	496	-17.53	18.87	36.40
Canada: Ontario 1 km WSW Chaffeys Locks	44.58	-76.33	134	-7.97	20.03	28.00
Canada: Ontario, Chesley Lake, Southhampton	44.62	-81.27	187	-6.57	18.83	25.40
Canada: Ontario, Swastika	48.14	-80.23	320	-16.90	17.60	34.50
Canada: Saskatchewan, Davis Ck	49.56	-109.32	1052	-8.56	16.34	24.90
Canada: Saskatchewan, Ekapo Lake, near Broadview	50.33	-102.56	598	-16.39	17.71	34.10
United States: Arizona, Greenlee County US Hwy 666 1.8 mi N Hennegan Meadows	33.85	-109.20	2840	-4.12	13.93	18.06
United States: Colorado, Boulder County, near Raymond Rt 7	40.16	-105.47	2451	-4.79	16.93	21.72
United States: Massachusetts, Worcester, Barre	42.42	-72.10	275	-6.04	19.74	25.78
United States: Michigan, Detroit	42.33	-83.05	179	-4.00	23.23	27.22
United States: Minnesota, Clay County, e of Glyndon	46.87	-96.57	278	-14.02	21.42	35.44
United States: Minnesota, Crow Wing County, Deerwood	46.47	-93.90	390	-14.02	19.15	33.17

Table C.2. (continued)

	Lat (DD)	Long (DD)	Elev (m)	Adj µ Jan Temp (°C)	Adj µ July Temp (°C)	T Range (°C)
United States: Minnesota, Mahnomen County 2 mi w of Tulaby Lake	47.15	-95.60	465	-14.69	20.42	35.11
United States: New Mexico, San miguel County, Sangre de Cristo Mountains, Sapello Creek, SW Rincon Monsoto	35.82	-105.51	2974	-5.45	14.38	19.83
United States: New Mexico, Sandovell County, Rte 4	35.86	-106.64	2350	-4.76	18.24	23.00
United States: New York, Allegany County, w Almond twp	42.32	-77.85	554	-6.79	19.04	25.83
United States: New York, Etna	42.49	-76.38	310	-5.34	20.28	25.61
United States: New York, Fire Island, Ocean Beach	40.65	-73.16	0	0.36	25.08	24.72
United States: New York, Green County, Hunter	42.21	-74.21	481	-4.00	23.06	27.06
United States: New York, Hinsdale	42.17	-78.40	442	-5.79	20.27	26.06
United States: South Dakota, Pennington County, Black Hills, Redbird Spring	43.98	-103.92	1706	-4.68	18.71	23.39
United States: Wyoming, Freemont County, 13 kn nw Dubois	43.60	-109.47	2206	-11.29	16.98	28.28
United States: Wyoming, Yellowstone National Pk, Norris Geyser Basin	44.73	-110.70	2281	-9.76	14.46	24.22
United States: New Mexico, Sandovell County, Rte 4	35.86	-106.64	2350	-4.76	18.24	23.00
United States: New York, Allegany County, w Almond twp	42.32	-77.85	554	-6.79	19.04	25.83
United States: New York, Etna	42.49	-76.38	310	-5.34	20.28	25.61
United States: New York, Fire Island, Ocean Beach	40.65	-73.16	0	0.36	25.08	24.72
United States: New York, Green County, Hunter	42.21	-74.21	481	-4.00	23.06	27.06
United States: New York, Hinsdale	42.17	-78.40	442	-5.79	20.27	26.06
United States: South Dakota, Pennington County, Black Hills, Redbird Spring	43.98	-103.92	1706	-4.68	18.71	23.39
United States: Wyoming, Freemont County, 13 kn nw Dubois	43.60	-109.47	2206	-11.29	16.98	28.28
United States: Wyoming, Yellowstone National Pk, Norris Geyser Basin	44.73	-110.70	2281	-9.76	14.46	24.22

Table C.3. *Agonum lutulentum* collection localities.

	Lat (DD)	Long (DD)	Elev (m)	Adj μ Jan Temp (°C)	Adj μ July Temp (°C)	T Range (°C)
Canada: BC, 16 mi N Yahk	49.31	-116.10	1761	-12.84	12.96	25.80
Canada: BC, 5.7 mi E Wardner	49.42	-114.16	1529	-11.78	12.72	24.50
Canada: BC, Cranbrook	49.51	-115.76	1021	-8.03	17.77	25.80
Canada: BC, E of Duncan	48.78	-123.70	13	2.55	16.95	14.40
Canada: BC, Hope	49.39	-121.44	43	1.07	18.27	17.20
Canada: BC, near Osoyoos	49.03	-119.06	280	-1.99	21.81	23.80
Canada: BC, Vaseux Lake	49.29	-119.53	325	-2.28	21.52	23.80
Canada: Manitoba, 5.5 mi W of Richer on Rt 1	49.66	-96.43	286	-18.73	18.87	37.60
Canada: Manitoba, Glenboro	49.56	-99.29	373	-16.61	19.19	35.80
Canada: Manitoba, Whitemouth Lake	49.23	-95.67	347	-17.52	18.58	36.10
Canada: Ontario, 27.2 mi S Parry Sound District on Rt 69	45.36	-80.02	217	-9.98	18.92	28.90
Canada: Ontario, 4 km SW Chaffeys Locks	44.58	-76.33	134	-7.97	20.03	28.00
Canada: Ontario, 8 km E. of Godfrey Westport Road, Oakdale Farm	44.55	-76.52	177	-8.25	19.75	28.00
Canada: Ontario, Clear Lake, 4.8 km NE Chaffeys Locks	44.58	-76.33	134	-7.97	20.03	28.00
Canada: Ontario, Lake Opinicon, Chaffeys Locks	44.58	-76.33	134	-7.97	20.03	28.00
Canada: Ontario, Pike Lake, S of Stanleyville	44.80	-76.32	158	-8.12	19.88	28.00
Canada: Saskatchewan, Strawberry Lake 16.1 km SW Indian Head	50.53	-103.67	585	-16.25	18.75	35.00
United States: Illinois, Chicago	41.88	-87.63	181	-5.43	23.07	28.50
United States: Kansas, Stafford County, Salt Flats Area	38.14	-98.49	536	-0.80	27.20	28.00
United States: New Jersey, Middlesex County, Lake Nelson,	40.54	-74.44	18	-0.49	25.01	25.50
United States: New York, Wayne County	43.20	-77.01	121	-3.58	22.42	26.00
Canada: Ontario, 8 km E. of Godfrey Westport Road, Oakdale Farm	44.55	-76.52	177	-8.25	19.75	28.00
Canada: Ontario, Clear Lake, 4.8 km NE Chaffeys Locks	44.58	-76.33	134	-7.97	20.03	28.00

Table C.4. *Bembidion quadrimaculatum* collection localities.

	Lat (DD)	Long (DD)	Elev (m)	Adj μ Jan Temp (°C)	Adj μ July Temp (°C)	T Range (°C)
Canada: Alberta, Cypress Hills Prov. Pk., Reservoir Lake Area	49.66	-110.28	1224	-9.68	15.22	24.90
Canada: BC, 12 mi W of Oliver	49.08	-119.55	303	-2.52	21.08	23.60
Canada: BC, 12.5 mi N Rock Creek	49.23	-119.00	1000	-7.51	15.39	22.90
Canada: BC, 4 mi N Smithers Rte 16	54.78	-126.99	752	-10.40	13.51	23.90
Canada: BC, 4 mi W Terrace Rte 16	54.50	-128.68	63	-3.30	17.40	20.70
Canada: BC, 8 mi W Rossland	49.08	-117.97	1080	-5.77	17.03	22.80
Canada: BC, Alaska Highway mi 296, Musqwa River	58.79	-122.66	309	-20.73	17.27	38.00
Canada: BC, Creston	49.10	-116.50	635	-2.95	19.05	22.00
Canada: BC, Hope	49.39	-121.44	43	1.07	18.27	17.20
Canada: BC, Moyie Lake, near Moyie	49.31	-115.33	948	-7.55	18.25	25.80
Canada: BC, near Golden	51.30	-116.97	792	-9.75	17.05	26.80
Canada: BC, near Houston, Buckley River Rte 16	54.40	-126.64	601	-9.83	14.97	24.80
Canada: BC, Spotted Lake near Osoyoos	49.03	-119.06	280	-1.99	21.81	23.80
Canada: BC, Zymoetz River NE of Terrace	54.52	-128.57	200	-4.19	16.51	20.70
Canada: Manitoba, Duck Mountain Provincial Park Loat Lake	51.60	-100.92	683	-20.38	15.82	36.20
Canada: Manitoba, Grass River Prov. Pk., Simonhouse Lake	54.48	-101.08	298	-20.26	18.64	38.90
Canada: Manitoba, Thompson Area, Paint Lake Provincial Park	55.73	-97.90	195	-24.72	15.98	40.70
Canada: Ontario, Algoma Co, Kenny Lake	47.55	-84.95	230	-14.43	15.17	29.60
Canada: Saskatchewan, 10 km W of Sheho ex.	51.58	-103.44	582	-17.14	17.56	34.70
Canada: Saskatchewan, Fairwell Ck., rubble and sand	49.55	-109.17	1081	-8.75	16.15	24.90
Canada: Saskatchewan, Frenchman River	49.51	-109.22	959	-7.96	16.94	24.90
United States: AZ Apache Cty, Apache Nat For, Escudilla Mt., 12.9 km NE Alpine	33.90	-109.10	2970	-4.97	13.09	18.06
United States: California, Groveland County, Tuolumne	37.96	-120.24	802	4.66	22.11	17.44
United States: Maine, Baxter State Park, Mt. Katahdin (5200 ft)	45.93	-68.92	1585	-19.68	10.93	30.61
United States: Montana, Teton County, Deep Cr near Choteau	47.77	-112.20	1179	-7.28	17.22	24.50
United States: New York, Allegany County, w Almond twp	42.32	-77.85	554	-6.79	19.04	25.83
United States: North Dakota, Cass County, Fargo	46.87	-96.79	274	-14.00	21.45	35.44
United States: North Dakota, Grant County, Lake Tschida	46.58	-102.09	690	-9.25	21.41	30.67
United States: North Dakota, Mercer County, Hazen	47.29	-101.63	531	-11.45	20.66	32.11
United States: North Dakota, Richland County, Mirror Pool Pond WMA	46.59	-97.49	333	-14.00	21.45	35.44
United States: North Dakota, Spink County, Fisher Gove State Park	44.88	-98.36	382	-9.83	23.05	32.89
United States: North Dakota, Trail County, 5 km S Blanchard	47.25	-97.26	299	-14.16	21.28	35.44
United States: South Dakota, Lawrence County Spearfish Creek near Spearfish	44.48	-103.85	1149	-4.37	21.80	26.17
United States: South Dakota, Pennington County	44.03	-104.02	1253	-5.32	22.96	28.28

Table C.5. *Bembidion transparens* collection localities.

	Lat (DD)	Long (DD)	Elev (m)	Adj μ Jan Temp (°C)	Adj μ July Temp (°C)	T Range (°C)
Canada: Alberta, Birch Mountains Wildland Provincial Park, Namur Lake (Lodge)	57.37	-112.76	747	-21.26	14.34	35.60
Canada: Alberta, Birch Mountains Wildland Provincial Park, Sand River	57.58	-112.44	689	-20.88	14.72	35.60
Canada: Alberta, Cypress Hills Provincial Park, Elkwater Lake	49.66	-110.28	1249	-9.84	15.06	24.90
Canada: Alberta, Cypress Hills Provincial Park, Elkwater Lake	49.66	-110.28	1249	-9.84	15.06	24.90
Canada: Alberta, Flatbush (W of Flatbush)	54.69	-114.15	610	-14.00	16.30	30.30
Canada: Alberta, George Lake	53.95	-114.10	693	-11.23	16.97	28.20
Canada: Alberta, George Lake	53.96	-114.12	684	-11.17	17.03	28.20
Canada: Alberta, Nestow (Tawatinaw Valley, near Nestow)	54.24	-113.58	637	-13.61	16.59	30.20
Canada: Alberta, Sturgeon River (near St. Albert)	53.67	-113.59	652	-13.04	16.36	29.40
Canada: Alberta, Wabamun Lake (near Sundance)	53.53	-114.60	727	-12.07	15.73	27.80
Canada: Alberta, Wandering River	55.20	-112.47	565	-6.99	16.01	23.00
Canada: Alberta, Winefred Lake	55.44	-110.52	596	-16.96	16.54	33.50
Canada: BC, 10 mi E East Pine	55.72	-122.21	544	-11.22	15.08	26.30
Canada: BC, 57 miles E Wardner	49.42	-114.16	1371	-10.76	13.74	24.50
Canada: BC, Alaskan Hwy mi 743, Swan Lake	48.46	-123.37	11	3.85	16.45	12.60
Canada: BC, Canal Flats, S end of Columbia Lake	50.15	-115.82	816	-6.69	19.11	25.80
Canada: BC, Cranbrook	49.51	-115.76	1021	-8.03	17.77	25.80
Canada: BC, Duncan,	48.78	-123.70	13	2.55	16.95	14.40
Canada: BC, Goat River, Creston	49.10	-116.45	617	-2.83	19.17	22.00
Canada: BC, near Golden	51.30	-116.97	792	-9.75	17.05	26.80
Canada: BC, near Oliver	49.08	-119.55	303	-2.52	21.08	23.60
Canada: BC, near Osoyoos	49.03	-119.06	280	-1.99	21.81	23.80
Canada: BC, West Creston	49.10	-116.50	900	-4.67	17.33	22.00
Canada: British Columbia, Duck Lake nr Wynndel	50.00	-119.40	432	-4.77	20.43	25.20
Canada: British Columbia, Vancouver Island, Wiers Beach near Metchosin	48.40	-123.53	59	2.94	17.14	14.20
Canada: British Columbia, West Creston	49.10	-116.50	635	-2.95	19.05	22.00
Canada: Manitoba, 5.5 mi W of Richer on Rt 1	49.66	-96.43	286	-18.73	18.87	37.60
Canada: Manitoba, Brokenhead River, Anola	50.42	-96.67	217	-17.39	19.81	37.20
Canada: Manitoba, Churchill	58.78	-94.19	0	-26.70	12.00	38.70
Canada: Manitoba, Duck Mountain Provincial Park	51.60	-100.92	683	-20.38	15.82	36.20
Canada: Manitoba, Glenboro	49.56	-99.29	373	-16.61	19.19	35.80
Canada: Manitoba, Sturgeon Creek	49.88	-97.27	233	-17.76	19.54	37.30
Canada: Manitoba, Whitemouth Lake	49.23	-95.67	347	-17.52	18.58	36.10
Canada: Northwest Territory, 3 km nw YellowKnife	62.47	-114.40	200	-26.76	16.84	43.60

Table C.5. (continued)

	Lat (DD)	Long (DD)	Elev (m)	Adj μ Jan Temp (°C)	Adj μ July Temp (°C)	T Range (°C)
Canada: Nova Scotia, Cheticamp	46.63	-61.01	3	-4.85	18.35	23.20
Canada: Ontario, 4.8 km NE Chaffeys Locks, Clear Lake	44.58	-76.33	134	-7.97	20.03	28.00
Canada: Saskatchewan, Cypress Hills Prov Pk	49.67	-109.46	1236	-9.76	15.14	24.90
Canada: Saskatchewan, Strawberry Lake 16.1 km SW Indian Head	50.53	-103.67	585	-16.25	18.75	35.00
United States: Alaska, Circle	65.82	-144.08	186	-23.01	14.88	37.89
United States: Alaska, Fairbanks	64.84	-147.65	135	-23.18	16.88	40.06
United States: Alaska, Kotzebue	66.90	-162.58	3	-19.17	12.61	31.78
United States: Colorado, Boulder County, Boulder	40.01	-105.28	1651	0.41	22.13	21.72
United States: Minnesota, Ottertail County, Maplewood State Park	46.53	-95.95	445	-14.56	20.55	35.11

Table C.6. *Bembidion versicolor* collection localities.

	Lat (DD)	Long (DD)	Elev (m)	Adj µ Jan Temp (°C)	Adj µ July Temp (°C)	T Range (°C)
Canada: Alberta, 28 mi N Athabaska	55.13	-113.30	681	-15.26	15.84	31.10
Canada: Alberta, Calahoo	53.71	-113.96	679	-13.21	16.19	29.40
Canada: Alberta, Redwater	53.95	-113.12	637	-12.94	16.46	29.40
Canada: Alberta-Saskatchewan border, 12.3 mi E on Rte 1	49.95	-110.27	807	-14.07	17.83	31.90
Canada: BC, Wynndel, near Creston	49.10	-116.50	635	-2.95	19.05	22.00
Canada: BC, 10 mi E of Ladner	49.09	-123.08	2	2.97	17.87	14.90
Canada: BC, 4 mi N Smithers, Rte 16	54.78	-126.99	752	-10.40	13.51	23.90
Canada: BC, 4 mi SW Terrace, Alwynn Creek	54.50	-128.68	63	-3.30	17.40	20.70
Canada: BC, Creston	49.10	-116.50	635	-2.95	19.05	22.00
Canada: BC, Creston, Goat River, 1800 feet	49.10	-116.50	635	-2.95	19.05	22.00
Canada: BC, Hope	49.39	-121.44	43	1.07	18.27	17.20
Canada: BC, Langley	49.10	-122.86	11	2.79	17.29	14.50
Canada: BC, near Osoyoos, Spotted Lake	49.03	-119.06	280	-1.99	21.81	23.80
Canada: BC, near Prince Rupert	54.32	-130.32	33	1.31	13.11	11.80
Canada: BC, near Wasa, Wasa Lake	49.76	-115.72	784	-5.55	18.85	24.40
Canada: BC, Vancouver Island, Elk Lake, 8 mi N Victoria	48.50	-123.39	83	3.38	15.98	12.60
Canada: BC, Vancouver Island, near Nanaimo, Chasm River	49.16	-123.94	17	2.77	17.97	15.20
Canada: Manitoba, 10 mi S Brandon Rt10	49.70	-99.96	445	-18.23	18.17	36.40
Canada: Manitoba, 15 mi S Aweme	49.49	-99.60	414	-18.03	18.37	36.40
Canada: Manitoba, 6.9 km N of Paint Lake P. P., Thompson Area	55.73	-97.90	195	-24.72	15.98	40.70
Canada: Manitoba, Aweme, Assiniboine River	49.69	-99.63	357	-17.66	18.74	36.40
Canada: Manitoba, Lake Winnipeg, Victoria Beach	50.70	-96.56	222	-18.31	16.89	35.20
Canada: Manitoba, Little Stony Mountain near Winnipeg	50.09	-97.22	249	-17.87	19.44	37.30
Canada: Manitoba, near Woodside	50.18	-98.76	264	-18.10	19.00	37.10
Canada: Manitoba, Winnipeg	49.88	-97.13	230	-17.74	19.56	37.30
Canada: Ontario, 27.2 mi S Parry Sound District on Rt 69	45.36	-80.02	217	-9.98	18.92	28.90
Canada: Ontario, 4 mi S Chaffeys Locks, Rte 9. –beaver pond in Potamogeton mats	44.58	-76.33	134	-7.97	20.03	28.00
Canada: Ontario, 5.5 mi E Summerstown	45.06	-74.56	47	-10.36	21.34	31.70
Canada: Ontario, Ipperwash	43.21	-81.96	179	-5.39	20.91	26.30
Canada: Ontario, London, Byron Bog (now called Sifton Bog)	43.97	-81.33	299	-6.98	19.92	26.90
Canada: Ontario, Wheatley, Museum Leiden	42.10	-82.36	179	-4.43	22.77	27.20
Canada: Quebec, 8 mi SE Knowlton	45.18	-72.43	482	-13.47	16.53	30.00
Canada: Saskatchewan, 1 mi E of Percival Rt1	50.36	-102.41	619	-18.69	17.01	35.70
Canada: Saskatchewan, 1.5 mi E of Gull Lake	50.10	-108.50	785	-12.09	18.11	30.20

Table C.6. (continued)

	Lat (DD)	Long (DD)	Elev (m)	Adj μ Jan Temp (°C)	Adj μ July Temp (°C)	T Range (°C)
Canada: Saskatchewan, 2 mi N Maple Creek	49.94	-109.47	778	-10.60	19.10	29.70
Canada: Saskatchewan, 26 km N of La Ronge	55.49	-105.30	408	-20.59	17.01	37.60
Canada: Saskatchewan, 4 mi N. Treelon, Rte 37	49.00	-108.39	1838	-11.17	18.93	30.10
Canada: Saskatchewan, Chaplin, Chaplin Lake	50.45	-106.68	666	-11.21	18.89	30.10
Canada: Saskatchewan, Cypress Hills Pk, 16 mi S on Rte 21	49.64	-100.20	1425	-10.99	13.91	24.90
Canada: Saskatchewan, Cypress Hills Pk, 5 mi N	49.73	-110.16	1162	-9.28	15.62	24.90
Canada: Saskatchewan, Cypress Hills, Fort Walsh	49.57	-109.88	1142	-9.15	15.75	24.90
Canada: Saskatchewan, near Morse, Reed Lake	50.39	-107.10	688	-11.36	18.75	30.10
Canada: Saskatchewan, Saskatoon, Saskatchewan River banks	52.13	-106.66	494	-16.38	16.02	32.40
United States: Idaho, Bonner County, Pend Oreille Lake, near Sandpoint, Rte 95	48.27	-116.55	633	-1.89	20.50	22.39
United States: Montana, 15 mi E Havre, Milk River, US2	48.56	-109.57	780	-9.62	20.22	29.83
United States: Montana, Carbon County, near Bridger, Clarks Fork	45.47	-108.84	1053	-4.80	20.87	25.67
United States: Montana, Lewis and Clark County, 4 mi S of Wolf Creek	46.95	-112.07	1427	-8.25	18.20	26.44
United States: Montana, Musselshell County, near Roundup, Musselshell River	46.44	-108.53	970	-4.13	21.53	25.67
United States: North Dakota, 11.9 mi W. York	48.31	-99.81	468	-14.53	20.64	35.17
United States: North Dakota, 20 mi E of Jamestown	46.91	-98.28	444	-12.87	21.57	34.44
United States: North Dakota, 5 mi W of Mandan, Heart River, US10	48.83	-101.00	552	-12.52	20.70	33.22
United States: Utah, Rich County, 7 mi S Garden City, Bear Lake	41.83	-111.41	2043	-7.60	16.79	24.39
United States: Washington, near Spokane	47.65	-117.41	620	-1.97	20.97	22.94
United States: Wisconson, 10 mi W of New Lisbon	43.88	-90.17	270	-10.15	20.96	31.11

Table C.7. *Blethisa multipunctata* collection localities.

	Lat (DD)	Long (DD)	Elev (m)	Adj μ Jan Temp (°C)	Adj μ July Temp (°C)	T Range (°C)
Canada: Alberta, Ashmont, 5 km w	54.14	-111.64	634	-15.82	15.88	31.70
Canada: Alberta, Athabasca, 6.4 km n	54.77	-113.31	579	-14.44	16.66	31.10
Canada: Alberta, Athabina dist., w Flatbush (Carex marsh)	54.69	-114.23	608	-13.78	16.52	30.30
Canada: Alberta, Boyle, 24.1 km w	54.62	-113.13	607	-14.27	16.83	31.10
Canada: Alberta, Bull Pond nr. Pincher Ck, 49°21'N 113°55'W	49.35	-113.92	1342	-9.65	15.45	25.10
Canada: Alberta, Chain Ponds, North Burmis Rd. 49°42'N 114°18'W	49.70	-114.29	1474	-10.51	14.59	25.10
Canada: Alberta, Crows Nest	49.61	-114.43	1296	-9.35	15.75	25.10
Canada: Alberta, Crowsnest Lake	49.63	-114.64	1373	-8.33	13.87	22.20
Canada: Alberta, Curlew Pond nr. Pincher Ck, 49°41'N 113°52'W	49.68	-113.87	1298	-9.36	15.74	25.10
Canada: Alberta, Edmonton	53.54	-113.49	664	-13.12	16.28	29.40
Canada: Alberta, Elkwater Lake	49.66	-110.28	1229	-13.53	16.17	29.70
Canada: Alberta, Flatbush (and near)	54.69	-114.15	610	-13.80	16.50	30.30
Canada: Alberta, Frith Pond	49.27	-113.78	1280	-9.25	15.86	25.10
Canada: Alberta, Lost Road Pond nr Pincher Ck., 49°17'N 113°57'W	49.28	-113.95	1469	-10.47	14.63	25.10
Canada: Alberta, Lynch Lakes nr Pincher Ck., 49°23'N 113°57'W	49.38	-113.95	1344	-9.66	15.44	25.10
Canada: Alberta, Meadow Pond Lynch Lakes, nr Pincher Ck., 49°23'N 113°57'W	49.38	-113.95	1344	-9.66	15.44	25.10
Canada: Alberta, Mundare	53.60	-112.34	685	-15.04	16.07	31.10
Canada: Alberta, Nestow	54.33	-113.59	647	-12.76	16.64	29.40
Canada: Alberta, Ninemile Point Lesser Slave Lake	55.36	-114.98	577	-14.47	15.63	30.10
Canada: Alberta, Pecten Pond nr Pincher Ck., 49°18'N 113°58'W	49.30	-113.97	1411	-10.10	15.00	25.10
Canada: Alberta, Peigan Indian Reserve	49.61	-113.63	1011	-7.70	17.40	25.10
Canada: Alberta, Pincher Creek, 20 km north Porcupine Hills	49.67	-114.05	1337	-9.62	15.48	25.10
Canada: Alberta, Pothole Pond nr. Pincher Ck, 49°40'N 113°52'W	49.67	-113.87	1274	-9.21	15.89	25.10
Canada: Alberta, Red Deer, ca. 4.8 km n	52.32	-113.82	879	-11.91	15.99	27.90
Canada: Alberta, Redwater River nr. Redwater	53.97	-113.10	612	-12.41	16.99	29.40
Canada: Alberta, Rock Pond nr. Pincher Ck, 49°21'N 113°53'W	49.35	-113.88	1320	-9.51	15.60	25.10
Canada: Alberta, St. Albert, east Athabasca U. campus	53.66	-113.59	625	-12.54	16.86	29.40
Canada: Alberta, Tp. 24 Rge. 8 W. 5	51.04	-115.02	1385	-10.86	14.24	25.10
Canada: Alberta, Tp. 25 Rge. 3 W. 5 Rt 28A	51.15	-114.37	1126	-9.31	15.79	25.10
Canada: British Columbia, Cranbrook	49.51	-115.76	1021	-8.29	17.51	25.80
Canada: British Columbia, Cranbrook	49.51	-115.76	1021	-8.29	17.51	25.80
Canada: British Columbia, Fraser Lake	54.06	-124.85	698	-11.46	14.84	26.30
Canada: British Columbia, North end Williams Lake	52.13	-122.13	596	-6.31	17.89	24.20

Table C.7. (continued)

	Lat (DD)	Long (DD)	Elev (m)	Adj μ Jan Temp (°C)	Adj μ July Temp (°C)	T Range (°C)
Canada: British Columbia, Smithers 7 mi N Rte 16	54.78	-127.16	498	-8.74	15.16	23.90
Canada: Manitoba, Arlington	49.88	-97.13	230	-17.74	19.56	37.30
Canada: Manitoba, Aweme	49.49	-99.60	414	-18.03	18.37	36.40
Canada: Manitoba, Brokenhead River crossing hwy 15, 20 km S Anola	50.42	-96.67	217	-17.29	19.91	37.20
Canada: Manitoba, Grand Beach	55.56	-96.63	214	-17.56	19.75	37.30
Canada: Manitoba, Lake Winnipeg, Victoria Beach	50.70	-96.56	222	-18.22	16.98	35.20
Canada: Manitoba, Richer Rte 1	49.66	-96.43	286	-18.84	18.76	37.60
Canada: Manitoba, Seal River, St. Croix Island area	58.95	-96.75	172	-24.40	16.30	40.70
Canada: Manitoba, Shethanei Lake	58.78	-97.78	237	-24.72	15.98	40.70
Canada: Manitoba, Stony Lake	58.87	-98.45	236	-24.98	15.72	40.70
Canada: Manitoba, Winnipeg	49.88	-97.13	230	-17.74	19.56	37.30
Canada: New Foundland, Harmon Field	48.56	-58.54	20	-6.17	16.13	22.30
Canada: New Foundland, L' Anse-au-Moadau	51.53	-56.83	16	-13.64	11.46	25.10
Canada: New Foundland, Lewisporte	49.24	-55.05	1	-6.43	16.98	23.40
Canada: New Foundland, Red Indian Lake C.	48.74	-56.84	157	-9.78	15.22	25.00
Canada: New Foundland, Twillinggate	49.64	-54.96	0	-6.42	16.98	23.40
Canada: Northwest Territories, Aklavik	68.22	-135.02	1	-27.16	14.64	41.80
Canada: Northwest Territories, Fort Smith	68.22	-135.02	1	-27.16	14.64	41.80
Canada: Northwest Territories, Norman Wells	60.00	-111.87	180	-23.95	14.45	38.40
Canada: Ontario, Ogoki	51.63	-85.95	163	-21.70	17.80	39.50
Canada: Quebec, Havre - Aubert	47.22	-61.97	63	-16.02	18.38	34.40
Canada: Quebec, Montreal	45.54	-73.64	42	-11.84	19.76	31.60
Canada: Quebec, Natashguen	50.18	-61.81	0	-13.43	14.57	28.00
Canada: Quebec, Port - Menier	49.82	-64.35	1	-10.61	17.99	28.60
Canada: Quebec, Rigaud	45.48	-74.30	37	-11.81	19.79	31.60
Canada: Quebec, Ste-Mathilde	45.48	-74.30	37	-11.57	20.03	31.60
Canada: Quebec, Sullivan	48.12	-77.83	298	-16.90	17.60	34.50
Canada: Saskatchewan, Strawberry Lake 16.1 km W Indian Head	50.53	-103.67	585	-16.28	18.72	35.00
Canada: Saskatchewan, Uranium City	59.57	-108.62	286	2.23	11.63	9.40
Canada: Saskatchewan; Jedburgh	51.24	-103.00	575	-18.65	17.05	35.70
Canada: Yukon Territories, Dawson	64.04	-139.42	359	-26.63	15.67	42.30
United States: Massachusetts, Middlesex county, Wayland	42.36	-71.36	36	-1.79	22.98	24.78
United States: Massachusetts, W. Roxbury	42.28	-71.19	40	-1.70	23.08	24.78
United States: Massachusetts, Wayland	42.36	-71.36	36	-1.69	23.08	24.78
United States: New Hampshire, Milten	43.41	-70.99	139	-2.95	21.60	24.56

Table C.8. *Elaphrus clairvillei* collection localities.

	Lat (DD)	Long (DD)	Elev (m)	Adj µ Jan Temp (°C)	Adj µ July Temp (°C)	T Range (°C)
United States: North Dakota, Ramsey county, Starkweather	48.45	-98.88	455	-14.47	20.69	35.17
Canada: Alberta, Athabasca (6.4km N of)	54.77	-113.31	579	-14.59	16.51	31.10
Canada: Alberta, Boyle (24.1 km west)	54.62	-113.13	586	-14.14	16.96	31.10
Canada: Alberta, Conklin	55.63	-111.09	577	-21.45	14.15	35.60
Canada: Alberta, Cypress Hills Provincial Park, Elkwater Lake	49.66	-110.28	1224	-9.68	15.22	24.90
Canada: Alberta, Elkwater	49.66	-110.28	1224	-13.50	16.20	29.70
Canada: Alberta, Fawcett (near)	54.53	-114.09	619	-11.04	16.76	27.80
Canada: Alberta, Fawcett (W of, Athabina dist.)	54.54	-114.15	606	-10.96	16.84	27.80
Canada: Alberta, Flatbush	54.69	-114.15	606	-13.98	16.32	30.30
Canada: Alberta, Flatbush (W of, Athabina dist.)	54.66	-114.24	611	-14.01	16.29	30.30
Canada: Alberta, George Lake	53.96	-114.12	690	-11.21	16.99	28.20
Canada: Alberta, Lesser Slave Lake (8.1km N of the east end of Lesser Slave Lake)	55.38	-114.77	597	-14.60	15.50	30.10
Canada: Alberta, Lynch Lakes	49.38	-113.95	1344	-9.66	15.44	25.10
Canada: Alberta, Millarville	50.76	-114.32	1192	-8.22	15.18	23.40
Canada: Alberta, Ministik Lake	53.35	-113.06	773	-14.51	15.49	30.00
Canada: Alberta, Nestow (near)	54.24	-113.59	637	-17.51	12.69	30.20
Canada: Alberta, Nestow (Tawatinaw Valley, near Nestow)	54.24	-113.58	623	-17.42	12.78	30.20
Canada: Alberta, Ninemile Point	55.36	-114.98	578	-14.48	15.62	30.10
Canada: Alberta, Nordegg	52.40	-116.08	1180	-10.39	13.41	23.80
Canada: Alberta, Peace River (90km NW, EMEND)	56.77	-118.37	723	-20.48	14.22	34.70
Canada: Alberta, Pembina River (west)	54.54	-114.15	606	-14.77	16.33	31.10
Canada: Alberta, Pincher Creek (17.6 km s.)	49.33	-113.93	1387	-9.94	15.16	25.10
Canada: Alberta, Pincher Creek (Chain Ponds, North Burmis Road)	49.70	-114.29	1487	-10.59	14.51	25.10
Canada: Alberta, Pincher Creek (Lost Road Pond, near Pincher Creek)	49.28	-113.95	1469	-10.47	14.63	25.10
Canada: Alberta, Pincher Creek (near, Bull Pond)	49.35	-113.92	1351	-9.71	15.39	25.10
Canada: Alberta, Pincher Creek (Rock Pond, near Pincher Creek)	49.35	-113.88	1321	-9.51	15.59	25.10
Canada: Alberta, Red Deer (ca. 4.8 km n)	52.32	-113.82	879	-11.81	16.09	27.90
Canada: Alberta, Rock Lake	53.47	-118.25	1406	-11.52	12.38	23.90
Canada: Alberta, Skeleton Lake	54.60	-112.70	623	-14.88	16.22	31.10
Canada: Alberta, Smith	55.13	-114.02	956	-19.53	13.47	33.00
Canada: Alberta, Spring Creek Basin	54.50	-117.68	788	-12.97	15.93	28.90
Canada: Alberta, St. Albert (east)	53.66	-113.59	658	-13.08	16.32	29.40
Canada: Alberta, Upper Mann Lake (5km NE of Ashmont)	54.15	-111.51	617	-15.70	16.00	31.70

Table C.8. (continued)

	Lat (DD)	Long (DD)	Elev (m)	Adj μ Jan Temp (°C)	Adj μ July Temp (°C)	T Range (°C)
Canada: Alberta, Wabamun Lake	53.53	-114.60	724	-12.05	15.75	27.80
Canada: Alberta, Wagner Natural Area	53.56	-113.82	643	-10.90	17.30	28.20
Canada: Alberta, Winefred Lake	55.48	-110.43	593	-16.94	16.56	33.50
Canada: British Columbia 10 mi E East Pine	55.72	-122.21	544	-11.22	15.08	26.30
Canada: British Columbia, Alaska Highway Beaton Road mi 147	48.46	-123.45	20	-9.81	20.09	29.90
Canada: British Columbia, Copper River Valley	54.54	-128.52	73	-3.36	17.34	20.70
Canada: British Columbia, Cranbrook	49.51	-115.76	1021	-8.03	17.77	25.80
Canada: British Columbia, Duncan E of Duncan	48.78	-123.70	13	2.55	16.95	14.40
Canada: British Columbia, Endako 20 mi W Endako	54.13	-125.50	787	-11.04	13.76	24.80
Canada: British Columbia, Fraser Lake 7 mi W Fraser Lake	54.05	-125.03	849	-12.44	13.86	26.30
Canada: British Columbia, Fraser Lake	54.06	-124.85	698	-11.46	14.84	26.30
Canada: British Columbia, Marguerite	52.41	-122.43	493	-8.26	17.04	25.30
Canada: British Columbia, Osoyoos 12 mi E of	49.03	-119.06	280	-1.99	21.81	23.80
Canada: British Columbia, Smithers 7 mi E Smithers, Route 16	54.78	-126.99	752	-10.40	13.51	23.90
Canada: British Columbia, Swan Lake mi 743 Alaskan Highway	48.46	-123.37	11	3.70	16.30	12.60
Canada: British Columbia, Terrace 4 mi W Terrace Route 16	54.50	-128.68	63	-3.30	17.40	20.70
Canada: British Columbia, Vancouver Island, Wiers Beach near Metchosin	48.40	-123.53	59	2.94	17.14	14.20
Canada: British Columbia, Wardner 11 mi E on Rte 3	49.42	-114.16	888	-7.62	16.88	24.50
Canada: British Columbia, Williams Lake N end of lake	52.12	-122.07	594	-6.26	17.94	24.20
Canada: Manitoba Hubbard Point	59.35	-94.77	0	-26.52	12.18	38.70
Canada: Manitoba, Braintree Highway 308, 8 km S East Braintree	49.49	-95.61	328	-17.39	18.71	36.10
Canada: Manitoba, Brokenhead River, Anola 20 mi. E of Anola	50.42	-96.67	217	-17.39	19.81	37.20
Canada: Manitoba, Churchill, Akudlik, 5 kn S of Churchill	58.73	-94.12	7	-26.56	12.14	38.70
Canada: Manitoba, Churchill, Bird Cove area	58.75	-93.87	7	-26.56	12.14	38.70
Canada: Manitoba, Duck Mountain Provincial Park	51.60	-100.92	683	-19.11	17.09	36.20
Canada: Manitoba, Grand Beach	50.56	-96.63	216	-17.65	19.65	37.30
Canada: Manitoba, Grassy River Provincial Park 16 km w of Iskwasum Lake	54.63	-101.00	298	-20.26	18.64	38.90
Canada: Manitoba, Northern Studies Center area	58.72	-93.78	17	-26.63	12.07	38.70
Canada: Manitoba, Round Sand Lake	59.73	-96.62	177	-26.63	12.07	38.70
Canada: Manitoba, Seal River, near Wolverine	58.92	-97.37	222	-24.89	15.81	40.70
Canada: Manitoba, Thompson Area 13.6 km s of Thompson	55.55	-97.93	212	-24.83	15.87	40.70
Canada: Ontario 2 km SE Lakeside	43.19	-80.99	366	-6.87	19.93	26.80
Canada: Ontario, S Stanleyville, N Burgess Rd 6	44.80	-76.32	158	-8.12	19.88	28.00

Table C.8. (continued)

	Lat (DD)	Long (DD)	Elev (m)	Adj μ Jan Temp (°C)	Adj μ July Temp (°C)	T Range (°C)
Canada: Ontario, Beaver Walking Trail, Beaver Pond 2 km NE Chaffey's Locks	44.58	-76.33	134	-7.97	20.03	28.00
Canada: Ontario, Byron Bog (now called Sifton Bog)	43.97	-81.33	299	-6.98	19.92	26.90
Canada: Ontario, Godfrey 8 km E. of Godfrey Westport Road, Oakdale Farm	44.55	-76.52	177	-8.25	19.75	28.00
Canada: Ontario, Lake Opinicon, Chaffey's Locks	44.58	-76.33	134	-7.97	20.03	28.00
Canada: Ontario, Little Current 16 mi SW Little Current	45.80	-82.13	217	-10.15	18.95	29.10
Canada: Ontario, Long Point regional Authority Forest 2 km S jct Rts 59 and 3	42.84	-80.30	230	-5.69	20.91	26.60
Canada: Ontario, Owens Sound, Townline Lake	44.03	-84.72	308	-10.57	18.33	28.90
Canada: Ontario, Perry Sound 27.2 mi S Perry Sound Route 69	44.93	-79.77	192	-9.82	19.09	28.90
Canada: Ontario, Pike Lake S Stanleyville	44.79	-76.33	147	-8.05	19.95	28.00
Canada: Ontario, Route 9 4 km SW Chaffey's Locks	44.58	-76.33	134	-7.97	20.03	28.00
Canada: Quebec, Gatineau Pk, McKenzie King Est. Larriault Trail	45.48	-75.85	239	-11.61	20.09	31.70
Canada: Saskatchewan, Cypress Hills Park 16 mi S Cypress Hills Park, Route 21	49.22	-110.21	957	-7.95	16.95	24.90
Canada: Saskatchewan, Cypress Hills Park, Rte 221, 27.4 km E Ft. Walsh	49.93	-109.45	768	-6.72	18.18	24.90
Canada: Saskatchewan, Cypress Hills Park, Cypress Hills	49.66	-110.28	1249	-9.84	15.06	24.90
Canada: Saskatchewan, Davis Davis Ck. Near ck.	49.56	-109.32	1052	-8.56	16.34	24.90
Canada: Saskatchewan, Strawberry Lake 16.1 km SW Indian Head	50.53	-103.67	585	-16.25	18.75	35.00
United States: Alaska, Circle	65.82	-144.08	186	-23.01	14.88	37.89
United States: Alaska, Fairbanks	64.83	-147.65	135	-23.18	16.88	40.06
United States: Colorado, Rocky Mountain National Park near Fall River Entrance	40.41	-105.66	2438	-4.70	17.02	21.72
United States: Idaho, Butte county US 93, 40 miles N Arco	44.20	-114.31	1824	-10.15	14.57	24.72
United States: Minnesota, Clearwater County, Itasca State Park	47.19	-95.15	475	-14.91	19.53	34.44
United States: Minnesota, Ottertail County, Maplewood State Park	46.53	-95.95	445	-14.56	20.55	35.11
United States: New Mexico, La Cueva Route 4 near La Cueva	35.94	-105.25	2139	-0.02	19.81	19.83
United States: New York, Lebanon N Lebanon	42.79	-75.64	467	-6.40	19.43	25.83
United States: New York, Tompkins co, Ithaca	42.44	-76.50	122	-4.11	21.50	25.61
United States: Oregon, Baker county, Anthony Lake 16 mi W North Powder	45.00	-118.23	2109	-5.16	16.34	21.50
United States: South Dakota, Pennington County, Black Hills Nat. For., Bear Spring	44.03	-104.02	1253	-5.32	22.96	28.28

Table C.9. *Olophrum consimile* collection localities.

	Lat (DD)	Long (DD)	Elev (m)	Adj μ Jan Temp (°C)	Adj μ July Temp (°C)	T Range (°C)
Canada: Alberta, Banff National Park, Consolation Lake, 6400 – 7000 ft	51.44	-116.17	2042	-13.58	10.32	23.90
Canada: Alberta, Jasper National Park, Mt. Edith Cavell 6000 ft	52.67	-118.05	1829	-14.79	10.01	24.80
Canada: Alberta, Kananaskis For. Exp Sta. Lusk Creek	51.09	-115.09	1321	-8.48	13.32	21.80
Canada: Alberta, Moose Lake Provincial Park near Moose Lake 2 mi N Bonnyville	54.30	-110.73	552	-16.68	16.82	33.50
Canada: Alberta, Valleyview	55.12	-117.27	687	-12.31	16.59	28.90
Canada: Alberta, Waterton Lakes National Park	49.11	-113.85	1283	-5.20	15.20	20.40
Canada: Alberta, Waterton Park	49.05	-113.91	1380	-5.84	14.56	20.40
Canada: British Colombia, Kooteney Park, Kindsley Pass 7000'	55.73	-115.99	2134	-14.18	9.73	23.90
Canada: British Columbia, 10 mi E Barkerville, Slide Mountain 6000 ft	53.08	-121.26	1829	-6.14	19.16	25.30
Canada: British Columbia, 12 mi E Hope	49.50	-121.23	5	1.32	18.52	17.20
Canada: British Columbia, 4 mi W Midway	49.01	-118.77	581	-3.95	19.85	23.80
Canada: British Columbia, Alta Lake 2100 ft	50.12	-122.98	640	-2.88	16.02	18.90
Canada: British Columbia, Barkerville, Round Top Mountain 6200 ft	53.08	-121.51	1890	-17.34	7.96	25.30
Canada: British Columbia, Garibaldi Prov Pk, Black Tusk Trail 5000 ft	49.74	-123.13	1524	0.41	17.91	17.50
Canada: British Columbia, Glacier National Park 10 mi E Rogers Pass	51.30	-117.56	1401	-11.48	12.02	23.50
Canada: British Columbia, Kootenay National Park, Sinclair Creek, 6000 ft	51.18	-116.26	1829	-3.05	20.85	23.90
Canada: British Columbia, Mile 392 Alaska Highway, Summit Lake, 4200 ft	54.25	-122.62	1280	-13.43	11.67	25.10
Canada: British Columbia, Mt. Begbie 6200 – 7000 ft	50.94	-118.31	2012	-15.45	8.05	23.50
Canada: British Columbia, Yoho Nat. Pk, Lake McArthur 7000 ft	51.34	-116.34	2134	-16.55	8.65	25.20
Canada: Manitoba Fort Churchill	58.77	-94.08	27	-26.69	12.01	38.70
Canada: Manitoba, 1 km N Onanole	50.62	-99.97	638	-19.65	13.75	33.40
Canada: Manitoba, Churchill	58.78	-94.19	0	-26.52	12.18	38.70
Canada: Manitoba, Husavick	50.56	-96.99	220	-18.30	16.90	35.20
Canada: Manitoba, Husavick	50.56	-96.99	42	-17.64	19.66	37.30
Canada: Manitoba, Riding Mountain Nat. Pk., Lake Audy S end	50.70	-100.22	594	-19.39	14.01	33.40
Canada: Manitoba, Riding Mountain Nat. Pk., Wasagaming	50.65	-99.97	617	-19.54	13.87	33.40
Canada: Northwest Territories, 32 mi NW Ft Simpson, Trail River	62.29	-121.52	264	-26.02	16.58	42.60
Canada: Northwest Territories, Aklavik	68.22	-135.02	1	-27.16	14.64	41.80
Canada: Northwest Territories, Fort Smith	60.00	-111.87	208	-24.12	16.48	40.60
Canada: Northwest Territories, Hay River	60.82	-115.78	161	-23.07	15.93	39.00
Canada: Ontario, 12 mi NE Moosonee	51.33	-80.38	0	-20.64	15.47	36.10
Canada: Ontario, 12 mi NE Moosonee	51.38	-80.32	0	-20.64	15.47	36.10
Canada: Ontario, 13 mi S Sioux Lookout, Butterfly Lake	50.11	-91.91	383	-18.60	18.60	37.20
Canada: Ontario, 36 mi S Pickle Lake	51.48	-90.17	358	-20.29	17.91	38.20

Table C.9. (continued)

	Lat (DD)	Long (DD)	Elev (m)	Adj μ Jan Temp (°C)	Adj μ July Temp (°C)	T Range (°C)
Canada: Ontario, Atikokm	48.76	-91.62	383	-18.02	17.78	35.80
Canada: Ontario, Cochrane	49.06	-81.02	278	-17.39	17.51	34.90
Canada: Ontario, Cochrane	49.07	-81.03	278	-18.42	16.78	35.20
Canada: Ontario, Hwy 11, W Atikokan, edge McCauley Creek	48.73	-91.89	381	-18.01	17.79	35.80
Canada: Ontario, Lake Superior Prov Pk. Sand River	47.44	-84.71	294	-14.83	14.77	29.60
Canada: Ontario, Mar	46.20	-76.21	208	-13.41	18.59	32.00
Canada: Ontario, Mer Bleue	45.40	-75.50	70	-10.55	21.15	31.70
Canada: Ontario, Moosonee	51.28	-80.64	10	-20.70	15.40	36.10
Canada: Ontario, Ottawa	45.42	-75.70	76	-10.51	21.19	31.70
Canada: Ontario, Sudbury	46.49	-80.99	262	-13.04	19.56	32.60
Canada: Ontario, Sudbury	46.49	-80.99	259	-13.02	19.58	32.60
Canada: Quebec Duparquet	48.50	-79.22	287	-16.86	18.04	34.90
Canada: Quebec, 12 mi W Mont Laurier	46.53	-75.74	287	-14.02	17.88	31.90
Canada: Quebec, 3 mi S St. Paulin	46.37	-72.95	177	-13.27	19.24	32.50
Canada: Quebec, 6 bmi S Grand Remous	46.62	-76.01	287	-14.02	17.88	31.90
Canada: Quebec, Berthierville, Berthier Co	46.08	-73.19	8	-11.97	20.33	32.30
Canada: Quebec, Cap Rouge	46.76	-71.36	27	-12.49	19.51	32.00
Canada: Quebec, Gatinneau Pk, Ramsey Lake area	45.48	-75.85	239	-11.61	20.09	31.70
Canada: Quebec, Laniel	47.05	-79.27	280	-16.59	17.91	34.50
Canada: Quebec, Laniel	47.04	-79.43	290	-12.81	18.59	31.40
Canada: Quebec, Parc des Laurentides, Mare-du-Sault 2700 ft	47.75	-71.25	823	-16.99	13.51	30.50
Canada: Quebec, Ste. Catherine	45.40	-73.58	19	-9.38	21.12	30.50
Canada: Quebec, Thundar River	46.65	-71.85	24	-12.66	19.34	32.00
Canada: Saskatchewan, 49° 42' 30" N 94° 48' 45"	49.68	-94.79	354	-17.66	19.14	36.80
Canada: Saskatchewan, 9 mi SW Keno, Hansen Lake	64.10	-135.28	972	-28.74	12.96	41.70
Canada: Saskatchewan, Canora	51.64	-102.43	487	-17.83	17.87	35.70
Canada: Saskatchewan, Canora	64.10	-135.28	487	-25.59	16.11	41.70
Canada: Saskatchewan, mi 259 Demster Hwy Richardson Mountains 1900 ft	66.17	-137.00	579	-27.15	7.75	34.90
Canada: Saskatchewan, Otter Lake 4000 ft	55.57	-104.58	1219	-23.03	13.81	36.83
Canada: Yukon Territories, mi 724 Alaska Hwy, Swift River	60.00	-131.19	888	-20.39	12.71	33.10
Canada: Yukon Territory 15 mi SW Keno, McQuesten Lk	64.10	-135.28	972	-28.74	12.96	41.70
United States: Alaska, 2.5 mi E Mi 181, Geoge Parks Hwy, Alaska Range, 3500 ft	63.15	-149.26	1067	-14.99	10.01	25.00
United States: Alaska, Alaska Range, Antimony Creek, 2.5 mi E Mi 181,Hwy 3	63.10	-149.48	1067	-14.99	10.01	25.00

Table C.9. (continued)

	Lat (DD)	Long (DD)	Elev (m)	Adj μ Jan Temp (°C)	Adj μ July Temp (°C)	T Range (°C)
United States: Alaska, Antimony Creek, Alaska Range 3500'	63.11	-149.47	1067	-20.56	9.94	30.50
United States: Alaska, Dalton Hwy, 66°58', -150°23' 395 m	66.97	-150.38	395	-15.41	12.04	27.44
United States: Alaska, Denali Hwy, mi 110, Seattle Creek	63.56	-149.80	946	-18.71	11.06	29.78
United States: Alaska, Denali St Pk, Byers Creek at Hwy 1	62.72	-150.19	257	-9.73	15.27	25.00
United States: Alaska, Denali St Pk, Byers Lake Campground	62.72	-150.19	257	-9.73	15.27	25.00
United States: Alaska, Denali St Pk, Mtn above Byers Lake, 2500 ft	62.72	-150.19	762	-13.01	11.99	25.00
United States: Alaska, Kenai Mts., 16 mi N Seward, 500-600 ft	60.34	-149.35	168	-4.16	12.61	16.78
United States: Alaska, Kenai Mts., 22 mi N Seward, 600-800 ft	60.41	-149.27	213	-4.46	12.32	16.78
United States: Alaska, Kenai Mts., 8 mi W Cooper Landing, 500 ft	60.50	-150.12	152	-4.06	12.71	16.78
United States: Alaska, Kenai Mts., creek above Tern Lake Campground, 850 ft	60.54	-149.55	259	-4.76	12.02	16.78
United States: Alaska, Kenai Peninsula, 8 mi SE Kasilof	60.26	-151.06	50	-10.49	12.62	23.11
United States: Alaska, Kenai Peninsula, Anchor Campground, 12 mi N Homer, 450 ft	59.64	-151.63	137	-5.54	12.40	17.94
United States: Alaska, Kenai Peninsula, Anchor River at Hwy 1, 450 ft	59.80	-151.27	137	-5.54	12.40	17.94
United States: Alaska, Kenai Peninsula, Kalifonsky Beach, nr Kenai	60.46	-151.28	10	-10.23	12.88	23.11
United States: Alaska, mile 1249 Alaska Highway, Deadman Lake	62.70	-141.15	602	-27.35	14.70	42.06
United States: Alaska, mile 24 Wales Hwy, 149° 10', 65° 40', 600 ft	65.67	-149.17	183	-23.49	16.56	40.06
United States: Alaska, mile 32 Taylor Hwy, Mt Fairplay, 3600 ft	63.67	-142.22	1097	-29.42	11.30	40.72
United States: Alaska, Prudhoe Bay Road, .5 mi N Yukon R., 149° 45', 65° 52', 400 ft	65.85	-149.73	122	-13.63	13.81	27.44
United States: Alaska, St. George Is	56.56	-159.58	0	-3.46	8.21	11.67
United States: Alaska, St. Paul Is	57.17	-170.26	50	-3.78	7.89	11.67
United States: Alaska, Talkeetna Mts, Hatcher Pass	61.77	-149.31	1212	-17.38	7.07	24.44
United States: Alaska, Unalaska Island, Mt Makushin	53.88	-166.92	400	-2.85	7.92	10.78
United States: Arizona, 10 mi SW Ward, Rainbow Lakes, 11,000 ft	34.19	-110.00	3353	-7.37	13.80	21.17
United States: Arizona, 16 mi W Teds Place, West Fork Sheep Creek, 10,000 ft	33.94	-111.60	3048	-5.69	16.25	21.94
United States: Arizona, San Francisco Mountains, Mt Agassiz, Coconino Co, 3200 m	35.34	-111.69	3200	-10.57	9.87	20.44
United States: Idaho, Sagle, Bonner Co	48.20	-116.55	202	-0.64	21.58	22.22
United States: Idaho, Waha Lake	46.21	-116.84	1062	-3.11	19.00	22.11
United States: Michigan, 3 mi E Engadine, Mackinac Co, Hiawatha Club, West Suter	46.12	-85.52	58	-7.58	20.97	28.56
United States: Minnesota, Ottertail County, Maplewood State Park	46.53	-95.95	445	-14.56	20.55	35.11
United States: Montana, Park Co, 7 mi NE Cooke City, nr Mud Lake, 9,000 ft	45.02	-109.93	2743	-13.66	9.89	23.56
United States: Montana, Park Co, Beartooth Prim. Area, Goose Lake, 10,500 ft	45.12	-109.92	3200	-16.63	6.92	23.56
United States: Oregon, Eagles Cap Prim Area, Wallawa Co, .5 mi NE Mirror Lake	45.20	-117.30	2347	-11.32	10.24	21.56
United States: Oregon, Gearhard Mt, Klamath Co, 6500-7200 ft	42.46	-120.88	2088	-7.19	12.53	19.72
United States: Oregon, Government Camp, 3800'	45.30	-121.75	1158	-0.81	14.19	15.00

Table C.9. (continued)

	Lat (DD)	Long (DD)	Elev (m)	Adj µ Jan Temp (°C)	Adj µ July Temp (°C)	T Range (°C)
United States: Oregon, Grant Co, Malheur National Forest, trail above Strawberry Falls, 7600 ft	44.26	-118.69	2316	-9.43	10.79	20.22
United States: Oregon, Grant Co, S side Strawberry Mt, 8200 ft	44.32	-118.72	2499	-10.62	9.60	20.22
United States: Oregon, Kimball State Park, Wood River Spring, Klamath Co	42.74	-121.98	1286	1.19	16.47	15.28
United States: Oregon, Mt Hood, Government Camp, 3800 ft	45.30	-121.75	1158	-0.81	14.19	15.00
United States: Oregon, Three Sisters Primitive Area, Skyline Trail, Wickup Plains, N. Linton Meadows, 5500-6000 ft	45.57	-118.12	1753	-6.97	12.70	19.67
United States: Oregon, Wallawa Co. Wallawa Mtns	45.20	-117.32	3280	-3.00	18.11	21.11
United States: South Dakota, 16 mi SSW Spearfish, Little Spearfish Creek, Lawrence Co, 6000 ft	44.48	-103.85	1149	-4.37	21.80	26.17
United States: Utah, Manti Lasal Nat For, Geyser Pass, Grand Co	38.49	-109.23	3358	-12.39	9.00	21.39
United States: Utah, Manti Lasal Nat For, Warner Campground, 9200 ft	38.50	-109.30	2804	-8.79	12.60	21.39
United States: Utah, Whiskey Creek, mi 39 Hwy 150, Sulphur Campground, Summit Co, 9000 ft	40.78	-110.89	2743	-11.37	12.63	24.00
United States: Washington, 23 mi E Glacier, Austin Pass, Whatcom Co, 4600 ft	48.85	-121.69	1402	-5.15	8.18	13.33
United States: Wyoming, 1 mi SW Beartooth Pass, Shoshone Nat For, Park Co, 10,500 ft	44.96	-109.48	3200	-15.74	8.48	24.22

Table C.10. *Olophrum rotundicolle* collection localities.

	Lat (DD)	Long (DD)	Elev (m)	Adj µ Jan Temp (°C)	Adj µ July Temp (°C)	T Range (°C)
Canada: Alberta Banff	51.17	-115.57	1385.32	-9.31	14.59	23.90
Canada: Alberta Banff National Park, Upper Waterfowl Lk	51.89	-116.87	1640.00	-10.96	12.94	23.90
Canada: Alberta Calgary	51.03	-114.05	1045.46	-8.65	16.45	25.10
Canada: Alberta McMurray	56.72	-111.37	251.76	-18.04	17.56	35.60
Canada: British Columbia Manning Prov. Pk, 20 mi E Hope	49.37	-121.00	1670.91	-3.15	14.05	17.20
Canada: British Columbia Mile 743 Alaska Hwy, Swan Lk	48.46	-123.37	11.00	1.55	14.15	12.60
Canada: Manitoba Churchill	58.77	-94.17	7.62	-26.57	12.13	38.70
Canada: Manitoba Fort Churchill	58.77	-94.08	27.00	-26.69	12.01	38.70
Canada: Manitoba Lake Audy, Riding Mt. Nat. Pk.	50.70	-100.22	594.36	-19.39	14.01	33.40
Canada: Manitoba Warkworth Creek	58.60	-94.07	9.00	-26.58	12.12	38.70
Canada: Manitoba Winnipeg	49.88	-97.13	230.43	-17.74	19.56	37.30
Canada: Newfoundland 2 mi W Rose Blanche	47.62	-58.73	93.57	-5.55	13.35	18.90
Canada: Newfoundland Blow Me Down Mt.	58.79	-63.06	192.00	-8.31	14.59	22.90
Canada: Newfoundland near St. Anthony	51.35	-55.60	0.00	-11.52	12.48	24.00
Canada: Northwest Territories 32 mi NW Ft. Simpson Trail R	58.82	-122.71	456.00	-21.68	16.32	38.00
Canada: Northwest Territories 40 mi E. Tuktoyaktuk	69.43	-131.38	32.92	-26.06	10.74	36.80
Canada: Northwest Territories 5 mi SE Ft. Simpson, Hwy 3	61.81	-121.23	158.00	-25.33	17.27	42.60
Canada: Northwest Territories Aklavik	68.22	-135.02	0.91	-27.16	14.64	41.80
Canada: Northwest Territories Fort Smith	60.00	-111.87	180.44	-23.95	14.45	38.40
Canada: Northwest Territories Inuvik, Shell Lake	68.30	-133.57	24.69	-27.32	14.48	41.80
Canada: Northwest Territories Norman Wells	65.27	-126.80	17.98	-26.14	17.36	43.50
Canada: Ontario 52 mi S Armstrong	49.52	-89.05	324.00	-20.03	15.97	36.00
Canada: Ontario 54 mi S Armstrong	49.50	-89.30	323.70	-20.02	15.98	36.00
Canada: Ontario 6 mi E Terrace Bay on Hwy 17, Thunder Bay	48.78	-86.96	282.00	-14.65	14.55	29.20
Canada: Ontario Black Sturgeon Lake, 42 mi N Hurkett	49.35	-88.87	274.02	-19.70	16.30	36.00
Canada: Ontario Lake Superior Prov. Pk., Gargantua	47.55	-84.95	230.12	-14.43	15.17	29.60
Canada: Ontario Whitney, Hwy 127, 9.5 mi S Hwy 60, Nipissing District	45.48	-78.23	431.00	-14.86	17.14	32.00
Canada: Quebec Blanc Sablon	51.47	-57.13	22.56	-13.21	11.89	25.10
Canada: Quebec Duparquet	48.50	-79.22	287.43	-16.86	18.04	34.90
Canada: Quebec Lanoraie, Berthierville	45.95	-73.22	9.14	-11.92	20.38	32.30
Canada: Quebec Mt. Albert	49.13	-66.46	147.00	-12.34	15.56	27.90
Canada: Quebec Mt. Jacques Cartier	48.75	-66.00	345.00	-13.63	14.27	27.90
Canada: Quebec Mt. Lyall	48.79	-65.97	598.00	-15.27	12.63	27.90
Canada: Quebec Parc des Laurentides, Mare du Sault	47.75	-71.25	885.00	-17.39	13.11	30.50

Table C.10. (continued)

	Lat (DD)	Long (DD)	Elev (m)	Adj µ Jan Temp (°C)	Adj µ July Temp (°C)	T Range (°C)
Canada: Saskatchewan Canora	51.63	-102.42	487.98	-17.83	17.87	35.70
Canada: Saskatchewan Prince Albert Nt. Pk.	53.93	-106.38	630.94	-20.42	16.18	36.60
Canada: Yukon Territory 15 mi SW Keno, McQuesten Lk	64.10	-135.28	972.00	-28.74	12.96	41.70
Canada: Yukon Territory Mile 724 Alaska Hwy, Swift River	60.00	-131.18	895.50	-20.44	12.66	33.10
Canada: Yukon Territory Watson Lake	60.05	-128.70	701.65	-24.30	15.00	39.30
United States: Alaska, Kenai Peninsula, 1 mi N Anchor Point	59.78	-151.78	53.95	-4.95	12.10	17.06
United States: Alaska, Kenai Peninsula, 5 mi N Homer	59.72	-151.53	369.72	-7.00	10.05	17.06
United States: Alaska, Mile 24 Wales Hwy, Hess Creek	65.67	-149.17	144.00	-23.24	16.82	40.06
United States: Alaska, Mt. McKinley Nat. Pk.	53.46	-150.49	1285.00	-17.15	12.62	29.78
United States: Alaska, Prudhoe Bay Rd, 2 mi S Grayling Lk	66.92	-150.42	423.00	-25.48	14.19	39.67
United States: Alaska, Prudhoe Bay Rd, 25 mi N Dietrich Camp	67.67	-149.58	615.00	-26.73	12.94	39.67
United States: Alaska, Prudhoe Bay Rd, 8 mi N South Fork Koyukuk R	67.22	-150.12	654.00	-26.98	12.69	39.67
United States: Alaska, Prudhoe Bay Rd, Coldfoot, nr. Clara Creek	67.27	-150.17	317.00	-24.79	14.88	39.67
United States: Colorado, Leadville	39.25	106.29	3090.00	-8.40	13.44	21.83
United States: Minnesota, Duluth	46.78	-92.08	262.13	-12.50	18.28	30.78
United States: New York, Ithaca	42.44	76.50	120.00	-5.34	20.28	25.61
United States: New York, Mt. Whiteface	44.36	-73.90	548.03	-9.95	17.83	27.78

Table C.11. *Pterostichus patruelis* collection localities.

	Lat (DD)	Long (DD)	Elev (m)	Adj μ Jan Temp (°C)	Adj μ July Temp (°C)	T Range (°C)
Canada: Alberta, Cypress Hills Provincial Park, Elkwater Lake	49.66	-110.28	1251	-9.86	15.04	24.90
Canada: Alberta, Cypress Hills, Reservoir Lake	50.99	-114.12	1087	-8.92	16.18	25.10
Canada: Alberta, George Lake	53.96	-114.12	685	-11.17	17.03	28.20
Canada: Alberta, Lesser Slave Lake, Ninemile Point	55.36	-114.98	578	-14.48	15.62	30.10
Canada: Alberta, Pembina River (w Flatbush)	54.70	-114.23	595	-14.70	16.40	31.10
Canada: Alberta, Skeleton Lake (near)	54.60	-112.70	626	-14.90	16.20	31.10
Canada: Alberta, Sturgeon River (near St. Albert)	53.67	-113.59	652	-13.04	16.36	29.40
Canada: Alberta, Wabamun Lake (near Sundance)	53.53	-114.60	725	-12.05	15.75	27.80
Canada: British Columbia Yoho Nat Pk Wapta Falls Rd at hwy1	51.22	-116.59	1097	-8.83	15.07	23.90
Canada: Manitoba, 3 mi W Aweme	49.71	-99.67	349	-17.61	18.79	36.40
Canada: Manitoba, 5.5 mi W of Richer on Rte 1	49.66	-96.57	268	-18.61	18.99	37.60
Canada: Manitoba, Shoal Lake, near Woodlands	50.48	-100.69	558	-18.97	17.43	36.40
Canada: Manitoba, Whitemouth Lake	49.26	-95.66	348	-17.52	18.58	36.10
Canada: Ontario, Byron Bog (now called Sifton Bog)	43.97	-81.33	299	-6.98	19.92	26.90
Canada: Ontario, Lake Opinicon, Chaffey's Locks (Typha marsh)	44.58	-76.33	130	-7.94	20.06	28.00
Canada: Ontario, Long Point Regional Authority Forest	42.82	-80.29	207	-5.54	21.06	26.60
Canada: Ontario, Stanleyville, N Burgess Rd 6, Mackler's Swamp	44.80	-76.32	154	-8.10	19.90	28.00
Canada: Saskatchewan, Cypress Hills Park	49.93	-109.45	768	-6.72	18.18	24.90
United States: Michigan, Iron County, Ottawa National Forest	46.47	-90.14	462	-14.23	18.50	32.73
United States: Michigan, Isabella	43.60	-84.86	244	-7.07	21.44	28.51
United States: Minnesota, Clearwater County, Itasca State Park	47.19	-95.15	475	-16.73	19.53	36.26
United States: Minnesota, Ottertail County, Maplewood State Park	46.53	-95.95	445	-16.36	20.55	36.91
United States: New York, Ithaca	42.44	-76.50	120	-4.75	21.51	26.26
United States: New York, Schuyler County, Cayuta Lake	42.37	-76.74	416	-6.68	19.59	26.26

APPENDIX D. IDENTIFIED PLANT MACROFOSSILS

Table D.1. Plant macrofossils from the Fargo UPC site.

TAXA Latin name (common name)	**ABUNDANCE samples A (top) to H (bottom): counts** [seeds unless otherwise noted]	**Bulk # 1 Sample Counts**	**HABITAT OF TAXA** (study area = found in the Fargo, ND area today)
NON-VASCULAR PLANTS			
Drepanocladus sp. (sickle-leaf moss)	G: 2 (pieces)	1	a fen moss, found in shallow calcareous waters
TREES and SHRUBS			
Larix sp. (tamarack)	G: 1 seed,	2 seeds + 1 wing fragment	
Picea sp. (spruce)		1 charred seed and 1 charred needle fragment	
Viburnum cf. *V. opulus* L. var. *americanum* Ait. (highbush cranberry)	C: 1,		swampy woods; moist, wooded hillsides or low woodlands; in study area (just in eastern NN, MN, SD, and Canada
Rubus cf. *R. idaeus*(red raspberry)	C: 1,	1	open wooded hillsides, ravines, stream banks, and in rocky places; common in study area

Table D.1. (continued)

TAXA Latin name (common name)	**ABUNDANCE samples A (top) to H (bottom): counts** [seeds unless otherwise noted]	**Bulk # 1 Sample Counts**	**HABITAT OF TAXA** (study area = found in the Fargo, ND area today)
MUDFLAT HERBS (Shoreline)			
Lycopus americanus Muhl. ex Bart (water hoarhound; American bugleweed)	A: 2.5, B: 4, C: 14.5, D: 2, E: 7.5, F: 26, G: 31, H: 17, (nutlets)	10	common in moist or wet soils along stream banks, lakeshores, edges of ponds (sloughs), ditches and in low places in fields; either partial shade or open, usually exposed; common in study area
Mentha arvensis L. (wild mint)	A: 2, B: 1, C:2, E: 1, F: 6, G: 3, H: 1,	11	common in moist soils, either open or shaded, found along stream banks, lakeshores, springs, marshes and ditches; may be found in a shunted form in drying soil; common in study area
Potentilla spp. (cinquefoil)	A: 1, B: 2, F: 2, G: 6, H; 1,	10 (three species)	wet meadows; fens; lakeshores; moist or dry soil; numerous species in study area
Bidens sp. (beggarticks)	C: 4, D: 1; E: 1, F; 2, G: 2,		in the Asteraceae family (several species of *Bidens*); frequent along stream banks and ponds, in prairie and wooded areas; in damp soils mainly, can tolerate drying soil; common in study area
Asteraceae (aster family)	B: 1,		100+ species, prairie or wooded, range of soil moisture conditions; in study area
Brassicaceae (mustard family)	D: 1,	5	wide variety of habitats
cf. *Viola* sp. (violet)	B: 1, C: 1, D: 1,	1	several species in study area
Chenopodium sp. (goosefoot)	F: 2,		disturbed open habitats, dry to moist soils; common in study area (many species)

Table D.1. (continued)

TAXA Latin name (common name)	**ABUNDANCE samples A (top) to H (bottom): counts** [seeds unless otherwise noted]	**Bulk # 1 Sample Counts**	**HABITAT OF TAXA** (study area = found in the Fargo, ND area today)
EMERGENTS (Aquatic-Emergents)			
Carex cf. C. sychnocephala Carey	A: 5, B: 17, C: 5, F: 2, G: 7,	18	common in old lake beds and sandy river beds and along shores; common in study area
Carex cf. *C. atherodes* Spreng. (slough sedge)	A: 1, C:1, D: 1, H; 3,	3	marshes, wet meadows, prairie swales, pond margins; usually in shallow water where may form dense stands; in study area
Carex cf. *C rostrata* Stokes ex Willd. (beaked sedge)	C: 1, F: 1, H: 1,	2	sloughs, bogs and shores; in study area
Carex sp. (4th species type = small)	C: 2, E: 1, F: 1, G: 1,	6	see above (100+ species of *Carex*)
Polygonum lapathifolium L. (pale smartweed)	none	3	common species in wet places, such as in marshes, wet meadows; can form dense growths up to 2 m high along pond and stream banks; in study area
Sagittaria latifolia Willd. (broad-leaved arrowhead)	C: 9, D: 2.5, H: 1,	9	muddy shores and ditches; in study area; plants have slender rhizomes bearing tubers which are eaten by ducks
Scirpus cf. S. *validus* Vahl. (common bulrush)	C: 5, D: 1, F: 2, G: 1, H: 5, one of F with bristles	6 (1with bristles attached)	emergent in shallow water and marshy ground; along lake edges, sloughs, marshes, roadside ditches; can be in drying soil; through study area and Great Plains
Scirpus cf. *S. microcarpus* Presl.		1	a swamp plant; marshy places, along streams, wet low areas, meadows; in study area today
Scirpus sp. (3rd species)		2	
Eleocharis sp. (spike-rush)	A: 1, B: 4, C: 26, D: 1, F: 6, G: 8, H: 10,	32	shallow water of marshes, wet meadows; muddy shores, stream banks, swamps; in study area
Typha latifolia broad-leaved cattail)	F: 1,	4	abundant and widespread in nonsaline wet habitats, along the edges of ponds, ditches, etc. throughout Great Plains
Juncus sp. (rush)		1	moist soils in a variety of habitats; common (numerous species)

Table D.1. (continued)

TAXA Latin name (common name)	**ABUNDANCE samples A (top) to H (bottom): counts** [seeds unless otherwise noted]	**Bulk # 1 Sample Counts**	**HABITAT OF TAXA** (study area = found in the Fargo, ND area today)
SUBMERGED AQUATICS			
Hippuris vulgaris L. (marestail)	A: 1, C: 10.5, D: 3.5, E: 13, F: 24, G: 29, H: 23,	31	rooted in mud of quiet water of lakes, ponds, sloughs and ditches; wet places, protruding above shallow water or from dried up ponds; common in study area
Potamogeton sp. (pondweed)	A: 0.25		shallow water (up to 1 m); in study area
Potamogeton pusillus L. (baby pondweed)	C: 1,	1	common in shallow, fresh to brackish water of lakes, ponds, marshes, ditches and sluggish streams; in study area; formerly known as *P. berchtoldii Fieb.* L. (small pondweed)
Zannichellia palustris L. (horned pondweed)		1	in quiet or running water; can tolerate brackish water; common in study area
UNKNOWN TERRESTRIAL SEEDS	A: 2, G: 1, H: 7	9	
Plant taxonomy and habitat based on: *Great Plains Flora Association. 1986. Flora of the Great Plains. University of Kansas Press: Lawrence.* *Stevens, O.A. 1963. Handbook of North Dakota Plants. North Dakota Institute for Regional Studies, Fargo.*			
AQUATIC CRUSTACEAN			
Daphnia sp.		1 ephippium	

APPENDIX E. FOSSIL INSECT DATA

Table E.1. MS28 fossil insect data.

MS28 Interval	#	Family	Genera	Species	H	P	L	R
0 cm 1/2, 1/1	1	Hydraenidae	Ochthebius					1
0 cm 1/2, 1/1	2	Pselaphidae						1
0 cm 1/2, 1/1	3	Hydrophilidae					1	
0 cm 1/2, 1/1	4	Staphylinidae	Aleocharinae			f		
0 cm 1/2, 1/1	5	Staphylinidae	Olophrum				1	
0 cm 1/2, 1/1	6	Hydraenidae	Ochthebius				f	
0 cm 1/2, 1/1	7	Staphylinidae	Olophrum					1
0 cm 1/2, 1/1	8	Staphylinidae					1	
0 cm 1/2, 1/1	9	Staphylinidae	Olophrum			1		
0 cm 1/2, 1/1	10	Scirtidae					1	
0 cm 1/2, 1/1	11	Scirtidae						1
0 cm 1/2, 1/1	12	Staphylinidae	Aleocharinae				1	
0 cm 1/2, 1/1	14	Scirtidae				1		
0 cm 1/2, 1/1	18	Scirtidae				f		
0 cm 1/2, 1/1	21	Staphylinidae	Aleocharinae			1		
0 cm 1/2, 1/1	23	Staphylinidae	Aleocharinae				1	
0 cm 1/2, 1/1	26	Micropeplinae	Micropeplus	tesserula				1
0 cm 1/2, 1/1	27	Hydraenidae	Ochthebius					1
0 cm 1/2, 1/1	28	Staphylinidae	Aleocharinae					1
0 cm 1/2, 1/1	30	Staphylinidae	Aleocharinae			1		
0 cm 1/2, 1/1	32	Scirtidae				f		
0 cm 1/2, 1/1	36	Staphylinidae						1
0 cm 1/2, 1/1	38	Curculionidae					1	
0 cm 1/2, 1/1	39	Latridiidae					1	
0 cm 1/2, 1/1	40	Staphylinidae	Aleocharinae				1	
0 cm 1/2, 1/1	42	Carabidae	Elaphrus				f	
0 cm 1/2, 1/1	45	Staphylinidae						1
0 cm 1/2, 1/1	47	Hydrophilidae					1	
0 cm 1/2, 1/1	48	Staphylinidae	Aleocharinae			1		
0 cm 2/2, 1/1	2	Pselaphidae						1
0 cm 2/2, 1/1	3	Hydrophilidae						1
0 cm 2/2, 1/1	4	Pselaphidae					1	
0 cm 2/2, 1/1	5	Staphylinidae	Stenus				1	
0 cm 2/2, 1/1	7	Hydraenidae	Ochthebius				1	
0 cm 2/2, 1/1	8	Staphylinidae	Aleocharinae					1
0 cm 2/2, 1/1	10	Scolytidae					1	
0 cm 2/2, 1/1	11	Coccinellidae					1	
0 cm 2/2, 1/1	12	Staphylinidae	Stenus					1
0 cm 2/2, 1/1	13	Staphylinidae			1			
0 cm 2/2, 1/1	14	Hydraenidae					1	
0 cm 2/2, 1/1	15	Scirtidae				f		
0 cm 2/2, 1/1	16	Chrysomelidae	Donacia	pubescens			f	
0 cm 2/2, 1/1	18	Scirtidae				f		
0 cm 2/2, 1/1	19	Staphylinidae	Stenus				1	
0 cm 2/2, 1/1	20	Carabidae	Bembidion				1	

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
0 cm 2/2, 1/1	21	Latridiidae	Corticaria				1	1
0 cm 2/2, 1/1	22	Staphylinidae	Aleocharinae				1	
0 cm 2/2, 1/1	23	Staphylinidae	Aleocharinae					1
0 cm 2/2, 1/1	24	Scirtidae						1
0 cm 2/2, 1/1	25	Scirtidae						1
0 cm 2/2, 1/1	26	Scirtidae						1
0 cm 2/2, 1/1	27	Scirtidae						f
0 cm 2/2, 1/1	28	Curculionidae	Ceutorhynchnus					1
0 cm 2/2, 1/1	30	Curculionidae						1
0 cm 2/2, 1/1	31	Hydraenidae						1
0 cm 2/2, 1/1	32	Hydrophilidae						f
0 cm 2/2, 1/1	33	Hydrophilidae						1
0 cm 2/2, 1/1	34	Staphylinidae	Aleocharinae			1		
0 cm 2/2, 1/1	36	Staphylinidae	Philonthus					1
0 cm 2/2, 1/1	37	Staphylinidae	Philonthus					1
0 cm 2/2, 1/1	38	Pselaphidae						1
0 cm 2/2, 1/1	39	Carabidae	Bembidion			1		
0 cm 2/2, 1/1	40	Scirtidae						1
0 cm 2/2, 1/1	43	Staphylinidae					1	
0 cm 2/2, 1/1	45	Staphylinidae	Aleocharinae					1
0 cm 2/2, 1/1	48	Scirtidae				f		
0 cm 2/2, 1/1	49	Staphylinidae	Stenus					1
0 cm 2/2, 1/1	50	Hydraenidae	Ochthebius				1	
0 cm 2/2, 1/1	51	Staphylinidae	Aleocharinae			1		
0 cm 2/2, 1/1	52	Staphylinidae	Aleocharinae				1	
0 cm 2/2, 1/1	53	Latridiidae					1	
0 cm 2/2, 1/1	54	Staphylinidae				f		
0 cm 2/2, 1/1	56	Staphylinidae	Aleocharinae				1	
0 cm 2/2, 1/1	59	Carabidae	Bembidion		1			
0 cm 2/2, 1/1	60	Staphylinidae	Stenus				1	
25 cm 1/2, 1/1	1	Staphylinidae	Aleocharinae					1
25 cm 1/2, 1/1	2	Carabidae	Bembidion				f	
25 cm 1/2, 1/1	3	Hydrophilidae						1
25 cm 1/2, 1/1	4	Carabidae	Bembidion	transparens		1		
25 cm 1/2, 1/1	5	Carabidae	Bembidion	transparens		1		
25 cm 1/2, 1/1	6	Staphylinidae					1	
25 cm 1/2, 1/1	7	Hydraenidae	Ochthebius					1
25 cm 1/2, 1/1	9	Staphylinidae	Stenus				1	
25 cm 1/2, 1/1	11	Scirtidae				1		
25 cm 1/2, 1/1	12	Carabidae	Dyschirius					1
25 cm 2/2, 1/1	1	Hydraenidae	Ochthebius					1
25 cm 2/2, 1/1	2	Hydraenidae	Ochthebius					1
25 cm 2/2, 1/1	4	Hydraenidae	Ochthebius				1	
25 cm 2/2, 1/1	6	Staphylinidae	Stenus				1	
25 cm 2/2, 1/1	7	Latridiidae					1	
25 cm 2/2, 1/1	8	Scirtidae						1
25 cm 2/2, 1/1	10	Hydraenidae	Ochthebius					1

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
25 cm 2/2, 1/1	11	Staphylinidae	Aleocharinae			1		
25 cm 2/2, 1/1	12	Staphylinidae	Stenus				1	
25 cm 2/2, 1/1	13	Staphylinidae	Omaliinae				1	
25 cm 2/2, 1/1	14	Latridiidae						1
25 cm 2/2, 1/1	15	Carabidae	Bembidion	transparens		1		
25 cm 2/2, 1/1	17	Hydrophilidae			f			
25 cm 2/2, 1/1	19	Scirtidae				f		
25 cm 2/2, 1/1	21	Carabidae	Bembidion	transparens		f		
25 cm 2/2, 1/1	22	Staphylinidae	Stenus			1		
25 cm 2/2, 1/1	23	Staphylinidae	Euaesthetus			1		
25 cm 2/2, 1/1	24	Scirtidae				f		
25 cm 2/2, 1/1	25	Pselaphidae						1
25 cm 2/2, 1/1	27	Hydrophilidae				f		
25 cm 2/2, 1/1	28	Carabidae	Bembidion				1	
25 cm 2/2, 1/1	29	Hydrophilidae	Cercyon				1	
25 cm 2/2, 1/1	30	Staphylinidae	Aleocharinae					1
25 cm 2/2, 1/1	31	Staphylinidae	Euaesthetus			1		
25 cm 2/2, 1/1	32	Scirtidae				1		
25 cm 2/2, 1/1	33	Latridiidae					1	
25 cm 2/2, 1/1	34	Staphylinidae						1
25 cm 2/2, 1/1	36	Scirtidae				1		
25 cm 2/2, 1/1	37	Carabidae	Bembidion	transparens		f		
25 cm 2/2, 1/1	38	Scirtidae				f		
25 cm 2/2, 1/1	40	Staphylinidae	Olophrum				1	
25 cm 2/2, 1/1	42	Scolytidae						1
25 cm 2/2, 1/1	43	Scirtidae				1		
25 cm 2/2, 1/1	44	Staphylinidae	Aleocharinae				1	
25 cm 2/2, 1/1	46	Staphylinidae	Stenus					f
25 cm 2/2, 1/1	47	Staphylinidae					1	
25 cm 2/2, 1/1	49	Staphylinidae	Olophrum				1	
25 cm 2/2, 1/1	50	Carabidae	Bembidion	transparens	f			
25 cm 2/2, 1/1	53	Hydrophilidae	Cercyon					1
25 cm 2/2, 1/1	54	Carabidae			1			
25 cm 2/2, 1/1	59	Noctuidae	Bellura		m			
50 cm 1/2, 1/1	9	Staphylinidae	Stenus				1	
50 cm 1/2, 1/1	10	Hydrophilidae	Hydrophilus				f	
50 cm 1/2, 1/1	11	Staphylinidae	Stenus				1	
50 cm 1/2, 1/1	13	Latridiidae					1	
50 cm 1/2, 1/1	18	Hydraenidae	Ochthebius				1	
50 cm 1/2, 1/1	19	Staphylinidae						1
50 cm 1/2, 1/1	22	Hydraenidae						1
50 cm 1/2, 1/1	23	Hydraenidae	Ochthebius					1
50 cm 1/2, 1/1	26	Staphylinidae	Philonthus					
50 cm, 2/2, 1/1	1	Scirtidae				f		
50 cm, 2/2, 1/1	2	Hydraenidae	Ochthebius					1
50 cm, 2/2, 1/1	5	Staphylinidae	Aleocharinae				1	
50 cm, 2/2, 1/1	6	Staphylinidae	Olophrum					1

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
50 cm, 2/2, 1/1	7	Hydraenidae	Ochthebius				1	
50 cm, 2/2, 1/1	8	Staphylinidae	Aleocharinae				1	
50 cm, 2/2, 1/1	10	Staphylinidae	Aleocharinae					1
50 cm, 2/2, 1/1	11	Scirtidae						1
50 cm, 2/2, 1/1	12	Staphylinidae	Aleocharinae			1		
50 cm, 2/2, 1/1	14	Staphylinidae	Aleocharinae					1
50 cm, 2/2, 1/1	15	Hydraenidae	Ochthebius					1
50 cm, 2/2, 1/1	17	Scirtidae				1		
50 cm, 2/2, 1/1	18	Hydraenidae	Ochthebius				1	
50 cm, 2/2, 1/1	19	Hydraenidae						1
50 cm, 2/2, 1/1	23	Scirtidae						f
50 cm, 2/2, 1/1	27	Staphylinidae	Aleocharinae				1	
50 cm, 2/2, 1/1	28	Staphylinidae	Aleocharinae					1
50 cm, 2/2, 1/1	29	Pselaphidae					1	
50 cm, 2/2, 1/1	31	Carabidae	Elaphrus	clairvillei			f	
50 cm, 2/2, 1/1	32	Staphylinidae	Aleocharinae					1
50 cm, 2/2, 1/1	33	Staphylinidae	Aleocharinae				1	
50 cm, 2/2, 1/1	34	Staphylinidae	Olophrum			f		
50 cm, 2/2, 1/1	35	Staphylinidae	Aleocharinae					1
50 cm, 2/2, 1/1	40	Ptiliidae					1	
50 cm, 2/2, 1/1	41	Hydrophilidae					f	
50 cm, 2/2, 1/1	42	Hemiptera				1		
60-80 cm, 1/1, 1/2	1	Staphylinidae	Olophrum					1
60-80 cm, 1/1, 1/2	3	Scirtidae						1
60-80 cm, 1/1, 1/2	7	Heteroceridae						1
60-80 cm, 1/1, 1/2	8	Staphylinidae	Stenus				1	
60-80 cm, 1/1, 1/2	9	Scolytidae					1	
60-80 cm, 1/1, 1/2	11	Staphylinidae	Olophrum	consimile		1		
60-80 cm, 1/1, 1/2	15	Staphylinidae					1	
60-80 cm, 1/1, 1/2	16	Curculionidae	Ceutorhynchnus				1	
60-80 cm, 1/1, 1/2	17	Scirtidae					1	
60-80 cm, 1/1, 1/2	18	Hydraenidae	Ochthebius				1	
60-80 cm, 1/1, 1/2	19	Hydraenidae	Ochthebius					1
60-80 cm, 1/1, 1/2	20	Latridiidae						1
60-80 cm, 1/1, 1/2	21	Staphylinidae	Stenus					
60-80 cm, 1/1, 1/2	22	Hydraenidae	Ochthebius					1
60-80 cm, 1/1, 1/2	24	Leiodidae	Cathops				1	
60-80 cm, 1/1, 1/2	25	Carabidae	Bembidion	transparens		1		
60-80 cm, 1/1, 1/2	26	Staphylinidae	Aleocharinae				1	
60-80 cm, 1/1, 1/2	27	Heteroceridae					1	
60-80 cm, 1/1, 1/2	28	Hydrophilidae						1
60-80 cm, 1/1, 1/2	29	Staphylinidae	Omaliinae				1	
60-80 cm, 1/1, 1/2	39	Staphylinidae	Aleocharinae					1
60-80 cm, 1/1, 1/2	41	Hydrophilidae	Helophorus			1		
60-80 cm, 1/1, 1/2	44	Staphylinidae	Stenus					1
60-80 cm, 1/1, 1/2	45	Scirtidae						
60-80 cm, 1/1, 1/2	48	Staphylinidae	Stenus				1	

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
60-80 cm, 1/1, 1/2	49	Chrysomelidae	Donacia	pubescens			1	
60-80 cm, 1/1, 1/2	54	Scirtidae					1	
60-80 cm, 1/1, 1/2	56	Latridiidae						1
60-80 cm, 1/1, 1/2	58	Staphylinidae	Aleocharinae				1	
60-80 cm, 1/1, 1/2	59	Hydrophilidae	Helophorus					1
60-80 cm, 1/1, 2/2	1	Hydraenidae	Ochthebius				1	
60-80 cm, 1/1, 2/2	2	Scirtidae				f		
60-80 cm, 1/1, 2/2	3	Scydmaenidae					1	
60-80 cm, 1/1, 2/2	4	Staphylinidae	Aleocharinae					1
60-80 cm, 1/1, 2/2	6	Scirtidae					f	
60-80 cm, 1/1, 2/2	10	Noctuidae	Bellura		m			
60-80 cm, 1/1, 2/2	11	Noctuidae	Bellura		m			
75 cm 1/2, 1/1	1	Chrysomelidae	Donacia	pubescens			1	
75 cm 1/2, 1/1	2	Coccinellidae					1	
75 cm 1/2, 1/1	7	Staphylinidae	Aleocharinae				1	
75 cm 1/2, 1/1	9	Staphylinidae	Stenus					1
75 cm 1/2, 1/1	14	Micropeplinae	Micropeplus	tesserula		1		
75 cm 1/2, 1/1	17	Staphylinidae	Aleocharinae					1
75 cm 1/2, 1/1	19	Staphylinidae					1	
75 cm 1/2, 1/1	25	Dytiscidae				f		
75 cm 1/2, 1/1	30	Carabidae	Bembidion			1		
75 cm 1/2, 1/1	34	Odonata						
75 cm 1/2, 1/1	36	Dytiscidae	Colymbetes				f	
75 cm 1/2, 1/1	38	Hydraenidae						1
75 cm 1/2, 1/1	39	Hydraenidae					1	
75 cm 1/2, 1/1	40	Hydraenidae						1
75 cm 1/2, 1/1	41	Hydraenidae						1
75 cm 1/2, 1/1	42	Noctuidae	Bellura		m			
75 cm 1/2, 1/1	43	Latridiidae	Corticaria				1	
75 cm 1/2, 1/1	45	Staphylinidae					1	
75 cm 1/2, 1/1	48	Dytiscidae	Colymbetes				f	
75 cm 1/2, 1/1	49	Hydraenidae	Ochthebius		1			
75 cm 1/2, 1/1	51	Staphylinidae	Arpedium			1		
75 cm 1/2, 1/1	55	Staphylinidae	Olophrum			f		
75 cm 1/2, 1/1	60	Scolytidae						1
75 cm 2/2, 1/3	1	Staphylinidae	Aleocharinae			1		
75 cm 2/2, 1/3	2	Chrysomelidae	Plateumaris					f
75 cm 2/2, 1/3	3	Curculionidae					1	
75 cm 2/2, 1/3	4	Micropeplinae	Micropeplus	tesserula			1	
75 cm 2/2, 1/3	5	Latridiidae	Corticaria			1		
75 cm 2/2, 1/3	6	Staphylinidae	Stenus					1
75 cm 2/2, 1/3	7	Staphylinidae	Stenus				1	
75 cm 2/2, 1/3	8	Staphylinidae			1			
75 cm 2/2, 1/3	9	Staphylinidae	Aleocharinae					1
75 cm 2/2, 1/3	10	Scirtidae				1		
75 cm 2/2, 1/3	11	Curculionidae			1			
75 cm 2/2, 1/3	13	Carabidae	Bembidion				1	

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
75 cm 2/2, 1/3	15	Hydraenidae	Ochthebius			1		
75 cm 2/2, 1/3	16	Pselaphidae						1
75 cm 2/2, 1/3	17	Staphylinidae	Olophrum				f	
75 cm 2/2, 1/3	19	Staphylinidae	Aleocharinae				1	
75 cm 2/2, 1/3	22	Pselaphidae						1
75 cm 2/2, 1/3	23	Pselaphidae					1	
75 cm 2/2, 1/3	27	Staphylinidae	Stenus					1
75 cm 2/2, 1/3	28	Staphylinidae	Stenus					1
75 cm 2/2, 1/3	29	Staphylinidae	Aleocharinae				1	
75 cm 2/2, 1/3	32	Staphylinidae	Stenus				1	
75 cm 2/2, 1/3	33	Carabidae				f		
75 cm 2/2, 1/3	36	Staphylinidae	Stenus					1
75 cm 2/2, 1/3	39	Hydraenidae	Ochthebius				1	
75 cm 2/2, 1/3	40	Staphylinidae	Aleocharinae			1		
75 cm 2/2, 1/3	41	Staphylinidae	Aleocharinae			1		
75 cm 2/2, 1/3	43	Staphylinidae	Aleocharinae				1	
75 cm 2/2, 1/3	44	Staphylinidae	Stenus				1	
75 cm 2/2, 1/3	45	Pselaphidae					1	
75 cm 2/2, 1/3	46	Carabidae				1		
75 cm 2/2, 1/3	47	Scolytidae	Phloeotribus	piceae			1	
75 cm 2/2, 1/3	48	Dytiscidae	Ilybius					1
75 cm 2/2, 1/3	49	Chrysomelidae			1	1		
75 cm 2/2, 1/3	50	Staphylinidae	Aleocharinae			1		
75 cm 2/2, 1/3	52	Curculionidae			1			
75 cm 2/2, 1/3	54	Coccinellidae			1			
75 cm 2/2, 1/3	55	Carabidae	Bembidion					1
75 cm 2/2, 1/3	56	Curculionidae			1			
75 cm 2/2, 1/3	57	Georissidae					1	
75 cm 2/2, 1/3	58	Hydrophilidae				1		
75 cm 2/2, 1/3	59	Scirtidae				1		
75 cm 2/2, 2/3	6	Staphylinidae	Olophrum				1	
75 cm 2/2, 2/3	7	Scirtidae				1		
75 cm 2/2, 2/3	8	Hydraenidae	Ochthebius			1		
75 cm 2/2, 2/3	9	Hydrophilidae				f		
75 cm 2/2, 2/3	10	Carabidae	Bembidion			1		
75 cm 2/2, 2/3	11	Pselaphidae					1	
75 cm 2/2, 2/3	12	Carabidae	Bembidion					1
75 cm 2/2, 2/3	13	Staphylinidae	Stenus					1
75 cm 2/2, 2/3	14	Staphylinidae	Stenus		1			
75 cm 2/2, 2/3	15	Hydrophilidae					1	
75 cm 2/2, 2/3	19	Staphylinidae	Stenus				1	
75 cm 2/2, 2/3	20	Staphylinidae	Olophrum				1	
75 cm 2/2, 2/3	21	Hydrophilidae						1
75 cm 2/2, 2/3	25	Carabidae			1			
75 cm 2/2, 2/3	27	Staphylinidae	Stenus					1
75 cm 2/2, 2/3	28	Staphylinidae	Olophrum			1		
75 cm 2/2, 2/3	29	Micropeplinae	Micropeplus	sculptus			1	

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
75 cm 2/2, 2/3	31	Staphylinidae	Stenus					1
75 cm 2/2, 2/3	33	Curculionidae			1			
75 cm 2/2, 2/3	40	Dytiscidae	Rhantus					1
75 cm 2/2, 2/3	44	Staphylinidae	Stenus				1	
75 cm 2/2, 2/3	45	Staphylinidae	Stenus					1
75 cm 2/2, 2/3	46	Staphylinidae	Stenus					1
75 cm 2/2, 2/3	48	Staphylinidae	Stenus					1
75 cm 2/2, 2/3	49	Dytiscidae	Colymbetes				f	
75 cm 2/2, 2/3	50	Hydrophilidae	Hydrochus					1
75 cm 2/2, 2/3	51	Curculionidae						1
75 cm 2/2, 2/3	54	Hydrophilidae						1
75 cm 2/2, 2/3	55	Hydrophilidae						1
75 cm 2/2, 2/3	58	Staphylinidae	Stenus					1
75 cm 2/2, 3/3	4	Staphylinidae	Aleocharinae				1	
75 cm 2/2, 3/3	5	Staphylinidae	Stenus					1
75 cm 2/2, 3/3	6	Staphylinidae	Stenus				1	
75 cm 2/2, 3/3	8	Staphylinidae	Stenus					1
75 cm 2/2, 3/3	11	Staphylinidae	Aleocharinae					1
75 cm 2/2, 3/3	12	Scirtidae				1		
75 cm 2/2, 3/3	15	Curculionidae			1			
75 cm 2/2, 3/3	17	Staphylinidae	Stenus				1	
75 cm 2/2, 3/3	19	Hydrophilidae	Hydrochus					f
75 cm 2/2, 3/3	20	Staphylinidae	Aleocharinae				1	
75 cm 2/2, 3/3	24	Carabidae			1			
75 cm 2/2, 3/3	27	Scirtidae				1		
75 cm 2/2, 3/3	29	Hydrophilidae						
75 cm 2/2, 3/3	30	Noctuidae	Bellura		m			
75 cm 2/2, 3/3	31	Staphylinidae	Olophrum			f		
75 cm 2/2, 3/3	34	Staphylinidae	Olophrum			1		
75 cm 2/2, 3/3	46	Carabidae	Bembidion				1	
KP 75 cm, 1/2, 1/2	3	Chrysomelidae	Donacia	pubescens				1
KP 75 cm, 1/2, 1/2	7	Carabidae	Elaphrus	clairvillei			f	
KP 75 cm, 1/2, 1/2	8	Staphylinidae	Olophrum			f		
KP 75 cm, 1/2, 1/2	9	Hydraenidae	Ochthebius				1	
KP 75 cm, 1/2, 1/2	13	Hydraenidae	Ochthebius				f	
KP 75 cm, 1/2, 1/2	15	Staphylinidae			1			
KP 75 cm, 1/2, 1/2	16	Scirtidae					1	
KP 75 cm, 1/2, 1/2	17	Hydraenidae	Ochthebius				1	
KP 75 cm, 1/2, 1/2	20	Hydraenidae	Ochthebius					1
KP 75 cm, 1/2, 1/2	24	Hydraenidae	Ochthebius					1
KP 75 cm, 1/2, 1/2	27	Carabidae					f	
KP 75 cm, 1/2, 1/2	28	Hydrophilidae					1	
KP 75 cm, 1/2, 1/2	29	Carabidae	Bembidion				f	
KP 75 cm, 1/2, 1/2	30	Staphylinidae	Stenus					
KP 75 cm, 1/2, 1/2	31	Hydraenidae	Ochthebius					1
KP 75 cm, 1/2, 1/2	32	Staphylinidae						1
KP 75 cm, 1/2, 1/2	33	Staphylinidae	Aleocharinae					1

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
KP 75 cm, 1/2, 1/2	34	Scirtidae			1			
KP 75 cm, 1/2, 1/2	35	Staphylinidae	Stenus				1	
KP 75 cm, 1/2, 1/2	36	Latridiidae						1
KP 75 cm, 1/2, 1/2	37	Scolytidae						1
KP 75 cm, 1/2, 1/2	38	Micropeplinae	Micropeplus	tesserula				
KP 75 cm, 1/2, 1/2	39	Staphylinidae	Stenus				1	
KP 75 cm, 1/2, 1/2	40	Hydraenidae	Ochthebius				f	
KP 75 cm, 1/2, 1/2	41	Latridiidae						1
KP 75 cm, 1/2, 1/2	44	Hydraenidae	Ochthebius			1		
KP 75 cm, 1/2, 1/2	45	Staphylinidae	Olophrum	consimile		f		
KP 75 cm, 1/2, 1/2	46	Staphylinidae	Stenus				1	
KP 75 cm, 1/2, 1/2	47	Staphylinidae	Stenus					1
KP 75 cm, 1/2, 1/2	48	Staphylinidae	Stenus				1	
KP 75 cm, 1/2, 1/2	49	Staphylinidae	Tachininae					1
KP 75 cm, 1/2, 1/2	50	Staphylinidae	Aleocharinae				1	
KP 75 cm, 1/2, 1/2	51	Chrysomelidae			1			
KP 75 cm, 1/2, 1/2	53	Latridiidae					f	
KP 75 cm, 1/2, 1/2	54	Hydrophilidae					1	
KP 75 cm, 1/2, 1/2	55	Hydraenidae	Ochthebius					f
KP 75 cm, 1/2, 1/2	56	Staphylinidae	Philonthus				1	
KP 75 cm, 1/2, 1/2	57	Scirtidae					1	
KP 75 cm, 1/2, 1/2	58	Staphylinidae	Aleocharinae			1		
KP 75 cm, 1/2, 1/2	59	Hydraenidae	Ochthebius					1
KP 75 cm, 1/2, 1/2	60	Latridiidae					1	
KP 75 cm, 1/2, 2/2	3	Staphylinidae	Stenus				1	
KP 75 cm, 1/2, 2/2	4	Staphylinidae						1
KP 75 cm, 1/2, 2/2	6	Latridiidae				1		
KP 75 cm, 1/2, 2/2	7	Scirtidae				1		
KP 75 cm, 1/2, 2/2	10	Carabidae						f
KP 75 cm, 1/2, 2/2	11	Latridiidae			1			
KP 75 cm, 1/2, 2/2	12	Staphylinidae	Aleocharinae			1		
KP 75 cm, 1/2, 2/2	13	Staphylinidae	Stenus					1
KP 75 cm, 1/2, 2/2	14	Pselaphidae					1	
KP 75 cm, 1/2, 2/2	15	Staphylinidae	Stenus					1
KP 75 cm, 1/2, 2/2	16	Staphylinidae	Stenus				1	
KP 75 cm, 1/2, 2/2	17	Latridiidae				1		
KP 75 cm, 1/2, 2/2	18	Staphylinidae	Stenus					1
KP 75 cm, 1/2, 2/2	19	Carabidae	Elaphrus	clairvillei			f	
KP 75 cm, 1/2, 2/2	21	Pselaphidae					1	
KP 75 cm, 1/2, 2/2	22	Staphylinidae	Aleocharinae			1		
KP 75 cm, 1/2, 2/2	24	Staphylinidae	Aleocharinae			1		
KP 75 cm, 1/2, 2/2	25	Staphylinidae	Aleocharinae					1
KP 75 cm, 1/2, 2/2	26	Staphylinidae	Aleocharinae				1	
KP 75 cm, 1/2, 2/2	27	Staphylinidae	Aleocharinae					1
KP 75 cm, 1/2, 2/2	28	Scirtidae				1		
KP 75 cm, 1/2, 2/2	31	Staphylinidae	Aleocharinae			2		
KP 75 cm, 1/2, 2/2	32	Staphylinidae	Stenus					1

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
KP 75 cm, 1/2, 2/2	33	Staphylinidae	Aleocharinae					1
KP 75 cm, 1/2, 2/2	34	Staphylinidae	Aleocharinae				1	
KP 75 cm, 1/2, 2/2	36	Scirtidae				1		
KP 75 cm, 1/2, 2/2	43	Curculionidae						f
KP 75 cm, 1/2, 2/2	44	Scolytidae				1		
KP 75 cm, 1/2, 2/2	46	Pselaphidae					1	
KP 75 cm, 1/2, 2/2	47	Staphylinidae	Stenus				1	
KP 75 cm, 1/2, 2/2	50	Staphylinidae	Stenus				1	
KP 75 cm, 1/2, 2/2	52	Staphylinidae	Aleocharinae					1
KP 75 cm, 1/2, 2/2	53	Staphylinidae	Aleocharinae				1	
KP 75 cm, 1/2, 2/2	54	Staphylinidae	Aleocharinae					1
KP 75 cm, 1/2, 2/2	55	Staphylinidae	Stenus				1	
KP 75 cm, 1/2, 2/2	56	Staphylinidae	Stenus				1	
KP 75 cm, 1/2, 2/2	57	Carabidae	Bradycellinini					1
KP 75 cm, 1/2, 2/2	59	Curculionidae						1
KP 75 cm, 1/2, 2/2	60	Carabidae			1			
KP 75 cm, 2/2, 1/2	1	Carabidae	Elaphrus	clairvillei			f	
KP 75 cm, 2/2, 1/2	2	Carabidae					1	
KP 75 cm, 2/2, 1/2	3	Carabidae					1	
KP 75 cm, 2/2, 1/2	4	Scirtidae						1
KP 75 cm, 2/2, 1/2	5	Staphylinidae					1	
KP 75 cm, 2/2, 1/2	6	Byrrhidae	Cytilus					f
KP 75 cm, 2/2, 1/2	7	Hydrophilidae			f	f		
KP 75 cm, 2/2, 1/2	8	Scirtidae					f	
KP 75 cm, 2/2, 1/2	9	Staphylinidae	Omaliinae					1
KP 75 cm, 2/2, 1/2	11	Latridiidae					1	
KP 75 cm, 2/2, 1/2	14	Curculionidae						1
KP 75 cm, 2/2, 1/2	15	Carabidae	Bembidion	transparens		1		
KP 75 cm, 2/2, 1/2	16	Carabidae	Bembidion	transparens		1		
KP 75 cm, 2/2, 1/2	17	Carabidae	Bembidion	transparens		1		
KP 75 cm, 2/2, 1/2	18	Carabidae	Carabus				1	
KP 75 cm, 2/2, 1/2	19	Hydraenidae						1
KP 75 cm, 2/2, 1/2	20	Scirtidae					1	
KP 75 cm, 2/2, 1/2	21	Carabidae	Bembidion	transparens				1
KP 75 cm, 2/2, 1/2	24	Latridiidae						1
KP 75 cm, 2/2, 1/2	25	Carabidae	Bembidion	transparens			1	
KP 75 cm, 2/2, 1/2	26	Carabidae					1	
KP 75 cm, 2/2, 1/2	27	Curculionidae	Ceutorhynchnus				1	
KP 75 cm, 2/2, 1/2	28	Scirtidae					f	
KP 75 cm, 2/2, 1/2	30	Scirtidae					1	
KP 75 cm, 2/2, 1/2	31	Hydraenidae	Ochthebius					1
KP 75 cm, 2/2, 1/2	32	Staphylinidae				1		
KP 75 cm, 2/2, 1/2	34	Latridiidae					1	
KP 75 cm, 2/2, 1/2	36	Hydraenidae	Ochthebius				1	
KP 75 cm, 2/2, 1/2	37	Scirtidae						1
KP 75 cm, 2/2, 1/2	38	Staphylinidae	Aleocharinae			1		
KP 75 cm, 2/2, 1/2	40	Latridiidae						1

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
KP 75 cm, 2/2, 1/2	42	Staphylinidae	Olophrum				1	
KP 75 cm, 2/2, 1/2	47	Gyrinidae	Gyrinus					1
KP 75 cm, 2/2, 1/2	48	Curculionidae				1		
KP 75 cm, 2/2, 1/2	49	Staphylinidae	Omaliinae		1			
KP 75 cm, 2/2, 1/2	51	Latridiidae					1	
KP 75 cm, 2/2, 1/2	52	Latridiidae					1	
KP 75 cm, 2/2, 1/2	53	Staphylinidae	Euaesthetus			1		
KP 75 cm, 2/2, 1/2	54	Scirtidae				1		
KP 75 cm, 2/2, 1/2	58	Staphylinidae					1	
KP 75 cm, 2/2, 1/2	59	Staphylinidae	Euaesthetus				1	
KP 75 cm, 2/2, 2/2	1	Staphylinidae	Stenus					1
KP 75 cm, 2/2, 2/2	2	Staphylinidae	Aleocharinae			1		
KP 75 cm, 2/2, 2/2	4	Oribatid mite						
KP 75 cm, 2/2, 2/2	7	Staphylinidae	Aleocharinae			1		
KP 75 cm, 2/2, 2/2	8	Oribatida						
KP 75 cm, 2/2, 2/2	9	Staphylinidae	Omaliinae			1		
KP 75 cm, 2/2, 2/2	10	Scirtidae					1	
KP 75 cm, 2/2, 2/2	11	Scirtidae						1
KP 75 cm, 2/2, 2/2	14	Staphylinidae	Stenus				1	
KP 75 cm, 2/2, 2/2	18	Staphylinidae	Stenus				1	
KP 75 cm, 2/2, 2/2	20	Scirtidae				f		
KP 75 cm, 2/2, 2/2	22	Staphylinidae	Aleocharinae					1
KP 75 cm, 2/2, 2/2	23	Hydraenidae	Ochthebius				1	
KP 75 cm, 2/2, 2/2	25	Staphylinidae	Stenus				1	
KP 75 cm, 2/2, 2/2	27	Staphylinidae	Aleocharinae				f	
KP 75 cm, 2/2, 2/2	31	Staphylinidae						1
KP 75 cm, 2/2, 2/2	32	Scirtidae				1		
KP 75 cm, 2/2, 2/2	33	Pselaphidae						1
KP 75 cm, 2/2, 2/2	34	Scirtidae				1		
KP 75 cm, 2/2, 2/2	35	Staphylinidae	Aleocharinae					1
KP 75 cm, 2/2, 2/2	36	Hydrophilidae	Helophorus			f		
KP 75 cm, 2/2, 2/2	37	Staphylinidae					1	
KP 75 cm, 2/2, 2/2	41	Oribatid mite						
KP 75 cm, 2/2, 2/2	42	Staphylinidae	Aleocharinae				1	
KP 75 cm, 2/2, 2/2	43	Staphylinidae	Aleocharinae				1	
KP 75 cm, 2/2, 2/2	44	Scirtidae				f		
KP 75 cm, 2/2, 2/2	46	Staphylinidae	Stenus					1
KP 75 cm, 2/2, 2/2	49	Staphylinidae	Aleocharinae			1		
KP 75 cm, 2/2, 2/2	50	Staphylinidae	Stenus				1	
KP 75 cm, 2/2, 2/2	52	Staphylinidae	Aleocharinae				1	
KP 75 cm, 2/2, 2/2	53	Staphylinidae	Aleocharinae			1		
KP 75 cm, 2/2, 2/2	54	Scirtidae				1		
KP 75 cm, 2/2, 2/2	55	Staphylinidae	Aleocharinae			1		
KP 75 cm, 2/2, 2/2	57	Oribatid mite						
KP 75 cm, 2/2, 2/2	59	Staphylinidae	Aleocharinae			1		
KP 75 cm, 2/2, 2/2	60	Staphylinidae	Aleocharinae			1		
Peat 75 cm, 1/2, 1/4	1	Curculionidae	Notaris	aethiops				1

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
Peat 75 cm, 1/2, 1/4	2	Pselaphidae					1	
Peat 75 cm, 1/2, 1/4	4	Scirtidae					1	
Peat 75 cm, 1/2, 1/4	5	Scirtidae						1
Peat 75 cm, 1/2, 1/4	6	Staphylinidae	Aleocharinae			1		
Peat 75 cm, 1/2, 1/4	7	Staphylinidae	Stenus					1
Peat 75 cm, 1/2, 1/4	8	Curculionidae						1
Peat 75 cm, 1/2, 1/4	9	Hydraenidae	Ochthebius					1
Peat 75 cm, 1/2, 1/4	10	Hydraenidae	Ochthebius				1	
Peat 75 cm, 1/2, 1/4	11	Latridiidae						1
Peat 75 cm, 1/2, 1/4	12	Hydraenidae	Ochthebius					1
Peat 75 cm, 1/2, 1/4	13	Latridiidae						1
Peat 75 cm, 1/2, 1/4	14	Hydraenidae	Ochthebius				1	
Peat 75 cm, 1/2, 1/4	15	Hydraenidae	Ochthebius				1	
Peat 75 cm, 1/2, 1/4	17	Georissidae						1
Peat 75 cm, 1/2, 1/4	18	Staphylinidae	Stenus					1
Peat 75 cm, 1/2, 1/4	19	Scarabaeidae	Micraegialia	pusilla			1	
Peat 75 cm, 1/2, 1/4	20	Staphylinidae				1		
Peat 75 cm, 1/2, 1/4	21	Hydrophilidae					1	
Peat 75 cm, 1/2, 1/4	22	Latridiidae					1	
Peat 75 cm, 1/2, 1/4	24	Coccinellidae	Scymnus					1
Peat 75 cm, 1/2, 1/4	26	Pselaphidae					1	
Peat 75 cm, 1/2, 1/4	27	Staphylinidae	Olophrum				1	
Peat 75 cm, 1/2, 1/4	28	Staphylinidae	Aleocharinae				1	
Peat 75 cm, 1/2, 1/4	29	Staphylinidae	Omaliinae				1	
Peat 75 cm, 1/2, 1/4	31	Staphylinidae	Aleocharinae				1	
Peat 75 cm, 1/2, 1/4	32	Staphylinidae	Aleocharinae					1
Peat 75 cm, 1/2, 1/4	33	Staphylinidae	Aleocharinae			1		
Peat 75 cm, 1/2, 1/4	34	Staphylinidae	Aleocharinae			1		
Peat 75 cm, 1/2, 1/4	35	Staphylinidae	Stenus					1
Peat 75 cm, 1/2, 1/4	37	Staphylinidae	Aleocharinae					1
Peat 75 cm, 1/2, 1/4	38	Staphylinidae	Aleocharinae				1	
Peat 75 cm, 1/2, 1/4	39	Hydraenidae	Ochthebius				1	
Peat 75 cm, 1/2, 1/4	40	Staphylinidae	Aleocharinae			1		
Peat 75 cm, 1/2, 1/4	41	Staphylinidae	Stenus				1	
Peat 75 cm, 1/2, 1/4	44	Hydrophilidae						f
Peat 75 cm, 1/2, 1/4	45	Brentidae	Apion				1	
Peat 75 cm, 1/2, 1/4	46	Staphylinidae	Olophrum	consimile		1		
Peat 75 cm, 1/2, 1/4	47	Carabidae	Amara	obesa		1		
Peat 75 cm, 1/2, 1/4	48	Carabidae						1
Peat 75 cm, 1/2, 1/4	49	Carabidae	Pterostichus	patruelis		1		
Peat 75 cm, 1/2, 1/4	50	Carabidae	Elaphrus	clairvillei		1		
Peat 75 cm, 1/2, 1/4	51	Hydrophilidae						1
Peat 75 cm, 1/2, 1/4	52	Carabidae	Bembidion	quadrimaculatum		1		
Peat 75 cm, 1/2, 1/4	53	Carabidae	Bembidion	transparens		1		
Peat 75 cm, 1/2, 1/4	55	Staphylinidae	Omaliinae				1	
Peat 75 cm, 1/2, 1/4	56	Staphylinidae	Stenus					1
Peat 75 cm, 1/2, 1/4	57	Staphylinidae	Aleocharinae					1

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
Peat 75 cm, 1/2, 1/4	58	Carabidae	Bembidion	quadrimaculatum		1		
Peat 75 cm, 1/2, 1/4	59	Staphylinidae	Aleocharinae					1
Peat 75 cm, 1/2, 1/4	60	Carabidae				f		
Peat 75 cm, 1/2, 2/4	1	Hydrophilidae					1	
Peat 75 cm, 1/2, 2/4	2	Staphylinidae	Olophrum				1	
Peat 75 cm, 1/2, 2/4	3	Staphylinidae	Olophrum					1
Peat 75 cm, 1/2, 2/4	4	Staphylinidae	Tachininae					1
Peat 75 cm, 1/2, 2/4	5	Staphylinidae	Stenus				1	
Peat 75 cm, 1/2, 2/4	6	Scirtidae				1		
Peat 75 cm, 1/2, 2/4	7	Carabidae	Agonum			f		
Peat 75 cm, 1/2, 2/4	8	Staphylinidae	Stenus			1		
Peat 75 cm, 1/2, 2/4	9	Staphylinidae	Stenus				1	
Peat 75 cm, 1/2, 2/4	11	Staphylinidae	Stenus					1
Peat 75 cm, 1/2, 2/4	12	Staphylinidae					1	
Peat 75 cm, 1/2, 2/4	13	Carabidae						f
Peat 75 cm, 1/2, 2/4	14	Scirtidae				f		
Peat 75 cm, 1/2, 2/4	16	Curculionidae			1			
Peat 75 cm, 1/2, 2/4	18	Latridiidae					f	
Peat 75 cm, 1/2, 2/4	19	Staphylinidae	Stenus				1	
Peat 75 cm, 1/2, 2/4	20	Staphylinidae	Stenus				1	
Peat 75 cm, 1/2, 2/4	22	Scirtidae				1		
Peat 75 cm, 1/2, 2/4	23	Staphylinidae	Aleocharinae			1		
Peat 75 cm, 1/2, 2/4	25	Staphylinidae	Olophrum	consimile		1		
Peat 75 cm, 1/2, 2/4	26	Hydraenidae	Ochthebius					1
Peat 75 cm, 1/2, 2/4	27	Staphylinidae	Stenus				1	
Peat 75 cm, 1/2, 2/4	29	Scirtidae				1		
Peat 75 cm, 1/2, 2/4	30	Scirtidae				1		
Peat 75 cm, 1/2, 2/4	35	Staphylinidae	Stenus					1
Peat 75 cm, 1/2, 2/4	37	Staphylinidae	Olophrum		1			
Peat 75 cm, 1/2, 2/4	38	Staphylinidae	Aleocharinae					1
Peat 75 cm, 1/2, 2/4	39	Staphylinidae	Aleocharinae				1	
Peat 75 cm, 1/2, 2/4	40	Staphylinidae				1		
Peat 75 cm, 1/2, 2/4	41	Latridiidae					1	
Peat 75 cm, 1/2, 2/4	43	Staphylinidae	Stenus			1		
Peat 75 cm, 1/2, 2/4	45	Staphylinidae	Aleocharinae			1		
Peat 75 cm, 1/2, 2/4	46	Staphylinidae	Arpedium					1
Peat 75 cm, 1/2, 2/4	47	Pselaphidae						1
Peat 75 cm, 1/2, 2/4	48	Pselaphidae					1	
Peat 75 cm, 1/2, 2/4	49	Staphylinidae	Aleocharinae				1	
Peat 75 cm, 1/2, 2/4	50	Scirtidae				1		
Peat 75 cm, 1/2, 2/4	51	Staphylinidae	Stenus				1	
Peat 75 cm, 1/2, 2/4	52	Staphylinidae	Aleocharinae					1
Peat 75 cm, 1/2, 2/4	53	Staphylinidae	Aleocharinae			1		
Peat 75 cm, 1/2, 2/4	54	Staphylinidae	Stenus					1
Peat 75 cm, 1/2, 2/4	55	Staphylinidae	Aleocharinae					1
Peat 75 cm, 1/2, 2/4	56	Ptiliidae					1	
Peat 75 cm, 1/2, 2/4	57	Curculionidae	Notaris		1			

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
Peat 75 cm, 1/2, 2/4	58	Carabidae				f		
Peat 75 cm, 1/2, 2/4	60	Byrrhidae					f	
Peat 75 cm, 1/2, 3/4	4	Curculionidae			1			
Peat 75 cm, 1/2, 3/4	5	Staphylinidae	Stenus					1
Peat 75 cm, 1/2, 3/4	6	Scirtidae				1		
Peat 75 cm, 1/2, 3/4	7	Scirtidae				1		
Peat 75 cm, 1/2, 3/4	8	Staphylinidae	Stenus				1	
Peat 75 cm, 1/2, 3/4	9	Staphylinidae				1		
Peat 75 cm, 1/2, 3/4	10	Carabidae					1	
Peat 75 cm, 1/2, 3/4	11	Hydraenidae	Ochthebius					1
Peat 75 cm, 1/2, 3/4	12	Staphylinidae	Stenus					1
Peat 75 cm, 1/2, 3/4	13	Hydraenidae	Ochthebius					1
Peat 75 cm, 1/2, 3/4	14	Staphylinidae	Aleocharinae			1		
Peat 75 cm, 1/2, 3/4	15	Carabidae	Bembidion					1
Peat 75 cm, 1/2, 3/4	16	Latridiidae						1
Peat 75 cm, 1/2, 3/4	17	Staphylinidae					1	
Peat 75 cm, 1/2, 3/4	18	Staphylinidae					1	
Peat 75 cm, 1/2, 3/4	19	Staphylinidae	Stenus				1	
Peat 75 cm, 1/2, 3/4	20	Staphylinidae	Olophrum				1	
Peat 75 cm, 1/2, 3/4	22	Curculionidae				1		
Peat 75 cm, 1/2, 3/4	23	Staphylinidae	Olophrum	consimile		1		
Peat 75 cm, 1/2, 3/4	25	Dytiscidae					f	
Peat 75 cm, 1/2, 3/4	27	Staphylinidae	Stenus					1
Peat 75 cm, 1/2, 3/4	28	Staphylinidae	Aleocharinae					1
Peat 75 cm, 1/2, 3/4	29	Pselaphidae						1
Peat 75 cm, 1/2, 3/4	30	Carabidae					f	
Peat 75 cm, 1/2, 3/4	31	Staphylinidae	Stenus			1		
Peat 75 cm, 1/2, 3/4	32	Hydraenidae	Ochthebius					1
Peat 75 cm, 1/2, 3/4	33	Pselaphidae						1
Peat 75 cm, 1/2, 3/4	34	Staphylinidae	Aleocharinae			1		
Peat 75 cm, 1/2, 3/4	36	Staphylinidae	Aleocharinae				1	
Peat 75 cm, 1/2, 3/4	37	Hydraenidae	Ochthebius					1
Peat 75 cm, 1/2, 3/4	38	Staphylinidae	Aleocharinae					1
Peat 75 cm, 1/2, 3/4	39	Hydraenidae	Ochthebius				1	
Peat 75 cm, 1/2, 3/4	40	Pselaphidae					1	
Peat 75 cm, 1/2, 3/4	41	Staphylinidae	Stenus				1	
Peat 75 cm, 1/2, 3/4	44	Hydraenidae	Ochthebius					1
Peat 75 cm, 1/2, 3/4	45	Scirtidae				1		
Peat 75 cm, 1/2, 3/4	46	Staphylinidae	Stenus		1			
Peat 75 cm, 1/2, 3/4	47	Latridiidae					1	
Peat 75 cm, 1/2, 3/4	48	Staphylinidae	Olophrum	consimile		1		
Peat 75 cm, 1/2, 3/4	49	Scirtidae			1			
Peat 75 cm, 1/2, 3/4	50	Scirtidae			1			
Peat 75 cm, 1/2, 3/4	51	Latridiidae						1
Peat 75 cm, 1/2, 3/4	52	Carabidae	Bembidion	transparens		1		
Peat 75 cm, 1/2, 3/4	53	Staphylinidae	Aleocharinae				1	
Peat 75 cm, 1/2, 3/4	54	Hydraenidae	Ochthebius					1

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
Peat 75 cm, 1/2, 3/4	55	Hydrophilidae			1			
Peat 75 cm, 1/2, 3/4	56	Latridiidae	Corticaria			1		
Peat 75 cm, 1/2, 3/4	57	Elmidae	Dubiraphia				1	
Peat 75 cm, 1/2, 3/4	59	Haliplidae					1	
Peat 75 cm, 1/2, 3/4	60	Staphylinidae	Aleocharinae					1
Peat 75 cm, 1/2, 4/4	1	Hydrophilidae						1
Peat 75 cm, 1/2, 4/4	3	Scirtidae				f		
Peat 75 cm, 1/2, 4/4	5	Staphylinidae	Aleocharinae				1	
Peat 75 cm, 1/2, 4/4	8	Hydraenidae						
Peat 75 cm, 1/2, 4/4	11	Staphylinidae	Stenus					1
Peat 75 cm, 1/2, 4/4	12	Pselaphidae					1	
Peat 75 cm, 1/2, 4/4	16	Carabidae	Bembidion			f		
Peat 75 cm, 1/2, 4/4	18	Staphylinidae	Aleocharinae					1
Peat 75 cm, 1/2, 4/4	19	Staphylinidae	Aleocharinae				1	
Peat 75 cm, 1/2, 4/4	22	Hydrophilidae			1			
Peat 75 cm, 1/2, 4/4	24	Carabidae						f
Peat 75 cm, 1/2, 4/4	28	Staphylinidae	Aleocharinae			1		
Peat 75 cm, 1/2, 4/4	30	Hydrophilidae						1
Peat 75 cm, 1/2, 4/4	31	Scirtidae				f		
Peat 75 cm, 1/2, 4/4	32	Hydrophilidae				1		
Peat 75 cm, 1/2, 4/4	33	Hydrophilidae						1
Peat 75 cm, 1/2, 4/4	37	Hydrophilidae				f		
Peat 75 cm, 1/2, 4/4	38	Staphylinidae	Stenus		1			
Peat 75 cm, 1/2, 4/4	40	Staphylinidae	Aleocharinae		1			
Peat 75 cm, 1/2, 4/4	43	Curculionidae	Ceutorhynchnus					f
Peat 75 cm, 1/2, 4/4	44	Scirtidae				f		
Peat 75 cm, 1/2, 4/4	45	Scirtidae			1			
Peat 75 cm, 1/2, 4/4	50	Scirtidae				f		
Peat 75 cm, 2/2, 1/2	1	Micropeplinae	Micropeplus	tesserula				1
Peat 75 cm, 2/2, 1/2	2	Staphylinidae	Olophrum					1
Peat 75 cm, 2/2, 1/2	5	Staphylinidae	Olophrum			f		
Peat 75 cm, 2/2, 1/2	7	Staphylinidae	Aleocharinae			1		
Peat 75 cm, 2/2, 1/2	8	Staphylinidae	Olophrum			f		
Peat 75 cm, 2/2, 1/2	9	Carabidae	Bembidion	versicolor				1
Peat 75 cm, 2/2, 1/2	14	Hydrophilidae	Hydrochus				1	
Peat 75 cm, 2/2, 1/2	17	Curculionidae	Ceutorhynchnus				f	
Peat 75 cm, 2/2, 1/2	20	Carabidae						f
Peat 75 cm, 2/2, 1/2	21	Carabidae	Agonum					1
Peat 75 cm, 2/2, 1/2	23	Staphylinidae	Olophrum			f		
Peat 75 cm, 2/2, 1/2	33	Staphylinidae			1			
Peat 75 cm, 2/2, 1/2	37	Staphylinidae	Stenus					1
Peat 75 cm, 2/2, 1/2	39	Heteroceridae						f
Peat 75 cm, 2/2, 1/2	45	Hydrophilidae					f	
Peat 75 cm, 2/2, 1/2	46	Hydraenidae	Ochthebius					1
Peat 75 cm, 2/2, 1/2	47	Staphylinidae	Aleocharinae				1	
Peat 75 cm, 2/2, 2/2	1	Staphylinidae	Aleocharinae				1	
Peat 75 cm, 2/2, 2/2	2	Staphylinidae						1

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
Peat 75 cm, 2/2, 2/2	3	Staphylinidae	Stenus					1
Peat 75 cm, 2/2, 2/2	5	Staphylinidae	Aleocharinae					1
Peat 75 cm, 2/2, 2/2	15	Staphylinidae	Stenus				1	
Peat 75 cm, 2/2, 2/2	16	Staphylinidae	Aleocharinae					1
Peat 75 cm, 2/2, 2/2	17	Scirtidae				1		
Peat 75 cm, 2/2, 2/2	19	Scirtidae				1		
Workers 75 cm 1/3, 1/3	1	Carabidae			1		f	
Workers 75 cm 1/3, 1/3	2	Scirtidae						1
Workers 75 cm 1/3, 1/3	3	Carabidae	Agonum	cupripenne		1		
Workers 75 cm 1/3, 1/3	4	Hydrophilidae						f
Workers 75 cm 1/3, 1/3	5	Staphylinidae	Philonthus					1
Workers 75 cm 1/3, 1/3	6	Chrysomelidae	Donacia	pubescens			1	
Workers 75 cm 1/3, 1/3	7	Carabidae					1	
Workers 75 cm 1/3, 1/3	8	Carabidae					1	
Workers 75 cm 1/3, 1/3	14	Staphylinidae	Stenus				1	
Workers 75 cm 1/3, 1/3	16	Scirtidae					1	
Workers 75 cm 1/3, 1/3	17	Scirtidae				1		
Workers 75 cm 1/3, 1/3	19	Scirtidae						1
Workers 75 cm 1/3, 1/3	20	Chrysomelidae	Donacia	pubescens				1
Workers 75 cm 1/3, 1/3	22	Scirtidae				1		
Workers 75 cm 1/3, 1/3	26	Staphylinidae	Aleocharinae				1	
Workers 75 cm 1/3, 1/3	28	Curculionidae	Ceutorhynchnus				1	
Workers 75 cm 1/3, 1/3	29	Hydraenidae	Ochthebius					1
Workers 75 cm 1/3, 1/3	30	Scirtidae				1		
Workers 75 cm 1/3, 1/3	32	Chrysomelidae	Donacia	pubescens	1			
Workers 75 cm 1/3, 1/3	33	Staphylinidae	Stenus					1
Workers 75 cm 1/3, 1/3	34	Scirtidae				1		
Workers 75 cm 1/3, 1/3	36	Hydraenidae	Ochthebius				1	
Workers 75 cm 1/3, 1/3	39	Hydraenidae	Ochthebius				1	
Workers 75 cm 1/3, 1/3	40	Staphylinidae	Olophrum	consimile		1		
Workers 75 cm 1/3, 1/3	41	Staphylinidae	Stenus					1
Workers 75 cm 1/3, 1/3	42	Staphylinidae	Omaliinae				1	
Workers 75 cm 1/3, 1/3	43	Hydrophilidae	Cercyon			1		
Workers 75 cm 1/3, 1/3	46	Hydraenidae	Ochthebius					1
Workers 75 cm 1/3, 1/3	48	Hydrophilidae	Hydrochus	squamifer		1		
Workers 75 cm 1/3, 1/3	49	Scirtidae				1		
Workers 75 cm 1/3, 1/3	50	Staphylinidae	Philonthus			1		
Workers 75 cm 1/3, 1/3	51	Curculionidae	Ceutorhynchnus					1
Workers 75 cm 1/3, 1/3	53	Scirtidae				1		
Workers 75 cm 1/3, 1/3	54	Scirtidae				1		
Workers 75 cm 1/3, 1/3	55	Hydraenidae	Ochthebius				1	
Workers 75 cm 1/3, 1/3	56	Staphylinidae	Stenus					1
Workers 75 cm 1/3, 1/3	57	Hydraenidae	Ochthebius				1	
Workers 75 cm 1/3, 1/3	58	Scirtidae				1		
Workers 75 cm 1/3, 1/3	59	Nitidulidae						1
Workers 75 cm 1/3, 2/3	2	Staphylinidae					1	

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
Workers 75 cm 1/3, 2/3	3	Latridiidae					1	
Workers 75 cm 1/3, 2/3	4	Staphylinidae	Omaliinae					1
Workers 75 cm 1/3, 2/3	5	Staphylinidae	Stenus					1
Workers 75 cm 1/3, 2/3	6	Staphylinidae	Omaliinae				1	
Workers 75 cm 1/3, 2/3	7	Scirtidae				1		
Workers 75 cm 1/3, 2/3	8	Staphylinidae	Stenus					
Workers 75 cm 1/3, 2/3	9	Staphylinidae	Stenus					1
Workers 75 cm 1/3, 2/3	10	Pselaphidae					1	
Workers 75 cm 1/3, 2/3	11	Hydraenidae	Ochthebius				1	
Workers 75 cm 1/3, 2/3	13	Staphylinidae	Stenus					
Workers 75 cm 1/3, 2/3	14	Carabidae	Dyschirius					1
Workers 75 cm 1/3, 2/3	15	Hydraenidae	Ochthebius				f	
Workers 75 cm 1/3, 2/3	18	Scirtidae				1		
Workers 75 cm 1/3, 2/3	19	Scirtidae				1		
Workers 75 cm 1/3, 2/3	21	Scirtidae					1	
Workers 75 cm 1/3, 2/3	23	Staphylinidae	Stenus					1
Workers 75 cm 1/3, 2/3	24	Staphylinidae	Arpedium			1		
Workers 75 cm 1/3, 2/3	25	Pselaphidae					1	
Workers 75 cm 1/3, 2/3	26	Scirtidae				1		
Workers 75 cm 1/3, 2/3	27	Staphylinidae	Arpedium				1	
Workers 75 cm 1/3, 2/3	30	Latridiidae					1	
Workers 75 cm 1/3, 2/3	31	Staphylinidae	Aleocharinae					1
Workers 75 cm 1/3, 2/3	32	Staphylinidae	Stenus					1
Workers 75 cm 1/3, 2/3	34	Carabidae	Agonum	consimile		1		
Workers 75 cm 1/3, 2/3	35	Staphylinidae	Omaliinae				1	
Workers 75 cm 1/3, 2/3	36	Staphylinidae	Aleocharinae			1		
Workers 75 cm 1/3, 2/3	38	Staphylinidae	Aleocharinae			1		
Workers 75 cm 1/3, 2/3	39	Staphylinidae	Aleocharinae					1
Workers 75 cm 1/3, 2/3	40	Latridiidae					1	
Workers 75 cm 1/3, 2/3	41	Staphylinidae	Stenus			1		
Workers 75 cm 1/3, 2/3	44	Hydraenidae	Ochthebius			1		
Workers 75 cm 1/3, 2/3	45	Hydraenidae	Ochthebius					1
Workers 75 cm 1/3, 2/3	46	Staphylinidae	Aleocharinae					1
Workers 75 cm 1/3, 2/3	47	Staphylinidae	Aleocharinae				1	
Workers 75 cm 1/3, 2/3	48	Hydraenidae					1	
Workers 75 cm 1/3, 2/3	50	Staphylinidae	Arpedium			f		
Workers 75 cm 1/3, 2/3	51	Staphylinidae	Stenus					1
Workers 75 cm 1/3, 2/3	53	Staphylinidae	Aleocharinae			1		
Workers 75 cm 1/3, 2/3	55	Pselaphidae				1		
Workers 75 cm 1/3, 2/3	57	Staphylinidae	Aleocharinae			1		
Workers 75 cm 1/3, 2/3	58	Hydraenidae						1
Workers 75 cm 1/3, 2/3	59	Staphylinidae	Aleocharinae				1	
Workers 75 cm 1/3, 2/3	60	Hydraenidae						1
Workers 75 cm 1/3, 3/3	1	Staphylinidae	Aleocharinae					1
Workers 75 cm 1/3, 3/3	2	Latridiidae						
Workers 75 cm 1/3, 3/3	3	Carabidae					f	

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
Workers 75 cm 1/3, 3/3	5	Staphylinidae	Stenus			1		
Workers 75 cm 1/3, 3/3	6	Staphylinidae	Stenus					
Workers 75 cm 1/3, 3/3	8	Staphylinidae	Aleocharinae				1	
Workers 75 cm 1/3, 3/3	9	Staphylinidae	Stenus				1	
Workers 75 cm 1/3, 3/3	11	Staphylinidae	Aleocharinae		1			
Workers 75 cm 1/3, 3/3	12	Hydraenidae	Hydraena			1		
Workers 75 cm 1/3, 3/3	13	Hydraenidae					1	
Workers 75 cm 1/3, 3/3	14	Hydraenidae					1	
Workers 75 cm 1/3, 3/3	15	Hydraenidae				1		
Workers 75 cm 1/3, 3/3	16	Hydraenidae	Hydraena			1		
Workers 75 cm 1/3, 3/3	17	Scydmaenidae						1
Workers 75 cm 1/3, 3/3	18	Hydraenidae					1	
Workers 75 cm 1/3, 3/3	21	Hydraenidae	Ochthebius			1		
Workers 75 cm 1/3, 3/3	23	Staphylinidae	Aleocharinae			1		
Workers 75 cm 1/3, 3/3	26	Dytiscidae					1	
Workers 75 cm 1/3, 3/3	27	Staphylinidae	Stenus				1	
Workers 75 cm 2/3, 1/3	1	Hydrophilidae				1		
Workers 75 cm 2/3, 1/3	2	Staphylinidae	Olophrum				1	
Workers 75 cm 2/3, 1/3	4	Latridiidae					1	
Workers 75 cm 2/3, 1/3	5	Staphylinidae	Olophrum					1
Workers 75 cm 2/3, 1/3	6	Latridiidae						1
Workers 75 cm 2/3, 1/3	11	Carabidae	Bembidion	transparens		1		
Workers 75 cm 2/3, 1/3	12	Hydraenidae	Ochthebius					1
Workers 75 cm 2/3, 1/3	14	Staphylinidae	Omaliinae				1	
Workers 75 cm 2/3, 1/3	16	Curculionidae	Ceutorhynchnus					1
Workers 75 cm 2/3, 1/3	17	Hydraenidae	Ochthebius				1	
Workers 75 cm 2/3, 1/3	20	Curculionidae	Notaris	aethiops			1	
Workers 75 cm 2/3, 1/3	25	Hydraenidae	Ochthebius					1
Workers 75 cm 2/3, 1/3	26	Curculionidae	Ceutorhynchnus					1
Workers 75 cm 2/3, 1/3	28	Staphylinidae	Omaliinae					1
Workers 75 cm 2/3, 1/3	30	Hydraenidae						1
Workers 75 cm 2/3, 1/3	32	Hydraenidae	Ochthebius					1
Workers 75 cm 2/3, 1/3	33	Scirtidae				1		
Workers 75 cm 2/3, 1/3	37	Hydraenidae	Ochthebius					1
Workers 75 cm 2/3, 1/3	42	Oribatida						
Workers 75 cm 2/3, 1/3	43	Hydraenidae	Ochthebius					1
Workers 75 cm 2/3, 1/3	48	Hydraenidae	Ochthebius				1	
Workers 75 cm 2/3, 1/3	50	Staphylinidae					1	
Workers 75 cm 2/3, 1/3	54	Hydraenidae	Ochthebius					1
Workers 75 cm 2/3, 1/3	56	Hydraenidae	Ochthebius				1	
Workers 75 cm 2/3, 1/3	57	Staphylinidae						1
Workers 75 cm 2/3, 2/3	5	Hydraenidae					1	
Workers 75 cm 2/3, 2/3	7	Corixidae						
Workers 75 cm 2/3, 2/3	14	Carabidae	Dyschirius				1	
Workers 75 cm 2/3, 2/3	22	Staphylinidae	Olophrum					1
Workers 75 cm 2/3, 2/3	23	Scirtidae						1
Workers 75 cm 2/3, 2/3	24	Hydraenidae	Ochthebius					1

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
Workers 75 cm 2/3, 2/3	26	Staphylinidae	Omaliinae				1	
Workers 75 cm 2/3, 2/3	27	Staphylinidae						1
Workers 75 cm 2/3, 2/3	29	Staphylinidae	Olophrum	rotundicolle		1		
Workers 75 cm 2/3, 2/3	33	Hydrophilidae	Hydrochus				1	
Workers 75 cm 2/3, 2/3	34	Hydraenidae	Ochthebius				1	
Workers 75 cm 2/3, 2/3	37	Hydraenidae	Ochthebius					1
Workers 75 cm 2/3, 2/3	38	Hydraenidae	Ochthebius					1
Workers 75 cm 2/3, 2/3	39	Scirtidae				1		
Workers 75 cm 2/3, 2/3	44	Staphylinidae						1
Workers 75 cm 2/3, 2/3	45	Staphylinidae					1	
Workers 75 cm 2/3, 2/3	46	Staphylinidae	Aleocharinae				1	
Workers 75 cm 2/3, 2/3	48	Scirtidae				1		
Workers 75 cm 2/3, 2/3	49	Staphylinidae	Stenus				1	
Workers 75 cm 2/3, 2/3	51	Hydraenidae	Ochthebius					1
Workers 75 cm 2/3, 2/3	53	Carabidae	Dyschirius					1
Workers 75 cm 2/3, 2/3	56	Chrysomelidae	Donacia	pubescens			f	
Workers 75 cm 2/3, 2/3	58	Hydraenidae					f	
Workers 75 cm 2/3, 2/3	59	Hydraenidae						1
Workers 75 cm 2/3, 2/3	60	Hydraenidae						1
Workers 75 cm 2/3, 3/3	1	Oribatida						
Workers 75 cm 2/3, 3/3	2	Oribatida						
Workers 75 cm 2/3, 3/3	3	Oribatida						
Workers 75 cm 2/3, 3/3	9	Hydraenidae						1
Workers 75 cm 2/3, 3/3	10	Scirtidae				1		
Workers 75 cm 2/3, 3/3	13	Scirtidae				1		
Workers 75 cm 2/3, 3/3	14	Hydraenidae						1
Workers 75 cm 2/3, 3/3	15	Scirtidae				1		
Workers 75 cm 2/3, 3/3	16	Lygaeoidea					1	
Workers 75 cm 2/3, 3/3	17	Curculionidae	Ceutorhynchnus				1	
Workers 75 cm 2/3, 3/3	21	Latridiidae						1
Workers 75 cm 2/3, 3/3	22	Staphylinidae					1	
Workers 75 cm 2/3, 3/3	23	Hydraenidae					1	
Workers 75 cm 2/3, 3/3	24	Staphylinidae	Aleocharinae					1
Workers 75 cm 3/3, 1/3	1	Latridiidae					1	
Workers 75 cm 3/3, 1/3	2	Scirtidae				1		
Workers 75 cm 3/3, 1/3	3	Hydraenidae					1	
Workers 75 cm 3/3, 1/3	4	Staphylinidae						1
Workers 75 cm 3/3, 1/3	5	Curculionidae	Ceutorhynchnus			1		
Workers 75 cm 3/3, 1/3	6	Scirtidae				1		
Workers 75 cm 3/3, 1/3	7	Scirtidae				1		
Workers 75 cm 3/3, 1/3	8	Scirtidae					1	
Workers 75 cm 3/3, 1/3	9	Staphylinidae	Aleocharinae					1
Workers 75 cm 3/3, 1/3	10	Staphylinidae	Aleocharinae			1		
Workers 75 cm 3/3, 1/3	11	Staphylinidae	Stenus				1	
Workers 75 cm 3/3, 1/3	12	Staphylinidae	Aleocharinae				1	
Workers 75 cm 3/3, 1/3	13	Staphylinidae	Stenus				1	
Workers 75 cm 3/3, 1/3	14	Staphylinidae					1	

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
Workers 75 cm 3/3, 1/3	15	Scirtidae					1	
Workers 75 cm 3/3, 1/3	16	Hydraenidae						1
Workers 75 cm 3/3, 1/3	17	Hydraenidae						1
Workers 75 cm 3/3, 1/3	18	Staphylinidae	Aleocharinae				1	
Workers 75 cm 3/3, 1/3	20	Staphylinidae	Aleocharinae				1	
Workers 75 cm 3/3, 1/3	22	Latridiidae					1	
Workers 75 cm 3/3, 1/3	23	Staphylinidae	Aleocharinae					1
Workers 75 cm 3/3, 1/3	25	Staphylinidae	Aleocharinae					1
Workers 75 cm 3/3, 1/3	27	Staphylinidae	Aleocharinae					1
Workers 75 cm 3/3, 1/3	28	Staphylinidae	Stenus					1
Workers 75 cm 3/3, 1/3	29	Staphylinidae	Stenus				1	
Workers 75 cm 3/3, 1/3	31	Hydraenidae					1	
Workers 75 cm 3/3, 1/3	32	Latridiidae						1
Workers 75 cm 3/3, 1/3	34	Hydraenidae	Ochthebius					1
Workers 75 cm 3/3, 1/3	35	Staphylinidae	Aleocharinae				1	
Workers 75 cm 3/3, 1/3	36	Curculionidae					1	
Workers 75 cm 3/3, 1/3	42	Staphylinidae	Aleocharinae					1
Workers 75 cm 3/3, 1/3	43	Staphylinidae					1	
Workers 75 cm 3/3, 1/3	45	Staphylinidae						1
Workers 75 cm 3/3, 1/3	46	Scirtidae					f	
Workers 75 cm 3/3, 1/3	47	Hydraenidae	Ochthebius				1	
Workers 75 cm 3/3, 1/3	48	Scirtidae				1		
Workers 75 cm 3/3, 1/3	49	Staphylinidae	Aleocharinae			1		
Workers 75 cm 3/3, 1/3	50	Staphylinidae	Aleocharinae					1
Workers 75 cm 3/3, 1/3	51	Staphylinidae	Stenus					1
Workers 75 cm 3/3, 1/3	52	Staphylinidae	Aleocharinae				1	
Workers 75 cm 3/3, 1/3	53	Staphylinidae	Aleocharinae				1	
Workers 75 cm 3/3, 1/3	54	Scolytidae						1
Workers 75 cm 3/3, 1/3	55	Staphylinidae	Aleocharinae					1
Workers 75 cm 3/3, 1/3	56	Staphylinidae						1
Workers 75 cm 3/3, 1/3	57	Staphylinidae						1
Workers 75 cm 3/3, 1/3	58	Hydraenidae	Ochthebius				1	
Workers 75 cm 3/3, 1/3	59	Hydraenidae					1	
Workers 75 cm 3/3, 2/3	1	Hydraenidae	Ochthebius					1
Workers 75 cm 3/3, 2/3	2	Hydraenidae	Ochthebius				1	
Workers 75 cm 3/3, 2/3	3	Staphylinidae						1
Workers 75 cm 3/3, 2/3	4	Hydraenidae	Ochthebius					1
Workers 75 cm 3/3, 2/3	5	Staphylinidae	Aleocharinae					1
Workers 75 cm 3/3, 2/3	6	Staphylinidae						1
Workers 75 cm 3/3, 2/3	7	Pselaphidae					1	
Workers 75 cm 3/3, 2/3	8	Scirtidae				1		
Workers 75 cm 3/3, 2/3	11	Hydraenidae					1	
Workers 75 cm 3/3, 2/3	12	Staphylinidae					1	
Workers 75 cm 3/3, 2/3	13	Staphylinidae	Stenus				1	
Workers 75 cm 3/3, 2/3	14	Micropeplinae	Micropeplus	tesserula				1
Workers 75 cm 3/3, 2/3	16	Staphylinidae	Stenus				1	
Workers 75 cm 3/3, 2/3	17	Staphylinidae	Aleocharinae			1		

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
Workers 75 cm 3/3, 2/3	18	Staphylinidae	Olophrum	consimile		1		
Workers 75 cm 3/3, 2/3	19	Staphylinidae	Aleocharinae				1	
Workers 75 cm 3/3, 2/3	20	Pselaphidae						1
Workers 75 cm 3/3, 2/3	22	Staphylinidae	Aleocharinae				1	
Workers 75 cm 3/3, 2/3	23	Staphylinidae	Aleocharinae					1
Workers 75 cm 3/3, 2/3	24	Staphylinidae	Aleocharinae					1
Workers 75 cm 3/3, 2/3	29	Hydraenidae	Ochthebius					1
Workers 75 cm 3/3, 2/3	30	Scirtidae					1	
Workers 75 cm 3/3, 2/3	31	Staphylinidae	Stenus					1
Workers 75 cm 3/3, 2/3	32	Staphylinidae	Stenus					1
Workers 75 cm 3/3, 2/3	33	Scirtidae					1	
Workers 75 cm 3/3, 2/3	37	Hydraenidae	Ochthebius					1
Workers 75 cm 3/3, 2/3	38	Latridiidae						1
Workers 75 cm 3/3, 2/3	41	Staphylinidae	Aleocharinae					1
Workers 75 cm 3/3, 2/3	44	Latridiidae						1
Workers 75 cm 3/3, 2/3	45	Staphylinidae					1	
Workers 75 cm 3/3, 2/3	47	Staphylinidae	Aleocharinae				1	
Workers 75 cm 3/3, 2/3	49	Scirtidae				f		
Workers 75 cm 3/3, 2/3	50	Staphylinidae	Aleocharinae				1	
Workers 75 cm 3/3, 2/3	52	Staphylinidae	Aleocharinae			1		
Workers 75 cm 3/3, 2/3	53	Staphylinidae						1
Workers 75 cm 3/3, 2/3	54	Staphylinidae	Aleocharinae					1
Workers 75 cm 3/3, 2/3	55	Staphylinidae	Aleocharinae				1	
Workers 75 cm 3/3, 2/3	58	Staphylinidae	Aleocharinae			1		
Workers 75 cm 3/3, 2/3	59	Curculionidae	Ceutorhynchnus				1	
Workers 75 cm 3/3, 3/3	1	Scolytidae			1	1		
Workers 75 cm 3/3, 3/3	2	Staphylinidae	Aleocharinae				1	
Workers 75 cm 3/3, 3/3	3	Staphylinidae	Stenus					
Workers 75 cm 3/3, 3/3	4	Hydrophilidae	Helophorus			1		
Workers 75 cm 3/3, 3/3	5	Staphylinidae	Stenus					1
Workers 75 cm 3/3, 3/3	6	Staphylinidae	Stenus					1
Workers 75 cm 3/3, 3/3	7	Staphylinidae	Aleocharinae					1
Workers 75 cm 3/3, 3/3	8	Curculionidae				1		
Workers 75 cm 3/3, 3/3	10	Staphylinidae	Aleocharinae				1	
Workers 75 cm 3/3, 3/3	11	Staphylinidae	Aleocharinae				1	
Workers 75 cm 3/3, 3/3	12	Staphylinidae	Aleocharinae			1		
Workers 75 cm 3/3, 3/3	16	Hydraenidae	Ochthebius				1	
Workers 75 cm 3/3, 3/3	19	Staphylinidae	Aleocharinae				1	
Workers 75 cm 3/3, 3/3	23	Staphylinidae	Stenus					1
Workers 75 cm 3/3, 3/3	26	Pselaphidae						1
Workers 75 cm 3/3, 3/3	29	Staphylinidae	Aleocharinae				1	
100 cm, 1/2, 1/1	1	Scirtidae					1	
100 cm, 1/2, 1/1	2	Chrysomelidae	Donacia		1			
100 cm, 1/2, 1/1	5	Chrysomelidae	Donacia				1	
100 cm, 1/2, 1/1	6	Carabidae	Bembidion			1		
100 cm, 1/2, 1/1	12	Staphylinidae	Stenus				f	
100 cm, 1/2, 1/1	13	Scirtidae						1

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
100 cm, 1/2, 1/1	16	Carabidae	Elaphrus				f	
100 cm, 1/2, 1/1	17	Scirtidae						
100 cm, 1/2, 1/1	20	Pselaphidae					1	
100 cm, 1/2, 1/1	22	Staphylinidae	Stenus			1		
100 cm, 1/2, 1/1	26	Carabidae						1
100 cm, 1/2, 1/1	27	Hydrophilidae						1
100 cm, 1/2, 1/1	28	Noctuidae	Bellura		m			
100 cm, 1/2, 1/1	29	Noctuidae	Bellura		m			
100 cm, 1/2, 1/1	30	Staphylinidae	Aleocharinae					
100 cm, 2/2, 1/2	3	Curculionidae				1		
100 cm, 2/2, 1/2	6	Chrysomelidae	Donacia	pubescens			1	
100 cm, 2/2, 1/2	8	Chrysomelidae						f
100 cm, 2/2, 1/2	9	Carabidae					1	
100 cm, 2/2, 1/2	10	Hydraenidae	Ochthebius				f	
100 cm, 2/2, 1/2	12	Blephariceridae	(Diptera)				1	
100 cm, 2/2, 1/2	13	Scirtidae						1
100 cm, 2/2, 1/2	14	Scirtidae				1		
100 cm, 2/2, 1/2	16	Scydmaenidae	Euconnus	clavipes			1	
100 cm, 2/2, 1/2	20	Pselaphidae					1	
100 cm, 2/2, 1/2	24	Staphylinidae	Olophrum					f
100 cm, 2/2, 1/2	29	Carabidae	Bembidion				1	
100 cm, 2/2, 1/2	31	Scirtidae				f		
100 cm, 2/2, 1/2	35	Hydrophilidae			1			
100 cm, 2/2, 1/2	38	Staphylinidae	Olophrum					1
100 cm, 2/2, 1/2	41	Latridiidae					1	
100 cm, 2/2, 1/2	45	Hydrophilidae			f			
100 cm, 2/2, 1/2	50	Hydrophilidae			1			
100 cm, 2/2, 1/2	53	Staphylinidae	Aleocharinae					1
100 cm, 2/2, 1/2	57	Staphylinidae	Stenus				1	
100 cm, 2/2, 1/2	58	Staphylinidae	Stenus					1
100 cm, 2/2, 1/2	60	Staphylinidae	Stenus					1
100 cm, 2/2, 2/2	2	Scirtidae				1		
100 cm, 2/2, 2/2	4	Staphylinidae	Stenus				1	
100 cm, 2/2, 2/2	6	Staphylinidae	Aleocharinae					1
100 cm, 2/2, 2/2	7	Scirtidae				1		
100 cm, 2/2, 2/2	8	Staphylinidae					1	
100 cm, 2/2, 2/2	13	Chrysomelidae	Plateumaris				f	
100 cm, 2/2, 2/2	19	Hydraenidae	Ochthebius				1	
100 cm, 2/2, 2/2	21	Byrrhidae					f	
100 cm, 2/2, 2/2	23	Staphylinidae	Aleocharinae			1		
100 cm, 2/2, 2/2	26	Staphylinidae	Omaliinae				1	
100 cm, 2/2, 2/2	28	Scirtidae						1
100 cm, 2/2, 2/2	29	Scirtidae				1		
100 cm, 2/2, 2/2	33	Staphylinidae	Aleocharinae			1		
101 cm, 2/2, 1/2	54	Hydraenidae	Ochthebius					1
125 cm, 1/2, 1/2	1	Chrysomelidae	Donacia				1	
125 cm, 1/2, 1/2	2	Hydrophilidae					1	

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
125 cm, 1/2, 1/2	3	Scirtidae						f
125 cm, 1/2, 1/2	4	Scirtidae						f
125 cm, 1/2, 1/2	5	Hydraenidae	Ochthebius					1
125 cm, 1/2, 1/2	6	Carabidae						f
125 cm, 1/2, 1/2	8	Carabidae	Bembidion		1			
125 cm, 1/2, 1/2	9	Limnichidae					1	
125 cm, 1/2, 1/2	10	Byrrhidae						f
125 cm, 1/2, 1/2	11	Latridiidae						1
125 cm, 1/2, 1/2	12	Scirtidae						1
125 cm, 1/2, 1/2	16	Carabidae	Bembidion				1	
125 cm, 1/2, 1/2	17	Scirtidae				1		
125 cm, 1/2, 1/2	18	Staphylinidae	Stenus					1
125 cm, 1/2, 1/2	20	Carabidae				1		
125 cm, 1/2, 1/2	24	Latridiidae						1
125 cm, 1/2, 1/2	25	Leiodidae						1
125 cm, 1/2, 1/2	26	Staphylinidae	Olophrum				1	
125 cm, 1/2, 1/2	27	Hydrophilidae	Cercyon					1
125 cm, 1/2, 1/2	28	Carabidae					f	
125 cm, 1/2, 1/2	30	Hydraenidae	Ochthebius					1
125 cm, 1/2, 1/2	32	Hydraenidae	Ochthebius					1
125 cm, 1/2, 1/2	33	Hydraenidae	Ochthebius					1
125 cm, 1/2, 1/2	34	Staphylinidae					1	
125 cm, 1/2, 1/2	35	Hydraenidae	Ochthebius					1
125 cm, 1/2, 1/2	36	Scirtidae					1	
125 cm, 1/2, 1/2	37	Hydraenidae	Ochthebius				1	
125 cm, 1/2, 1/2	38	Hydraenidae	Ochthebius					1
125 cm, 1/2, 1/2	41	Staphylinidae						1
125 cm, 1/2, 1/2	43	Scirtidae					1	
125 cm, 1/2, 1/2	44	Latridiidae					1	
125 cm, 1/2, 1/2	45	Scirtidae					1	
125 cm, 1/2, 1/2	46	Staphylinidae						1
125 cm, 1/2, 1/2	48	Hydrophilidae			1			
125 cm, 1/2, 1/2	49	Scirtidae						1
125 cm, 1/2, 1/2	50	Staphylinidae	Stenus					1
125 cm, 1/2, 1/2	51	Scirtidae				1		
125 cm, 1/2, 1/2	53	Staphylinidae						1
125 cm, 1/2, 1/2	55	Scirtidae					f	
125 cm, 1/2, 1/2	57	Scirtidae					f	
125 cm, 1/2, 1/2	58	Hydraenidae	Ochthebius					1
125 cm, 1/2, 1/2	59	Curculionidae				1		
125 cm, 1/2, 1/2	60	Staphylinidae						1
125 cm, 1/2, 2/2	2	Hydraenidae	Ochthebius				1	
125 cm, 1/2, 2/2	4	Staphylinidae	Stenus			1		
125 cm, 1/2, 2/2	6	Staphylinidae	Stenus					1
125 cm, 1/2, 2/2	8	Staphylinidae	Aleocharinae					1
125 cm, 1/2, 2/2	12	Oribatida						
125 cm, 1/2, 2/2	14	Carabidae					f	

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
125 cm, 1/2, 2/2	16	Staphylinidae					1	
125 cm, 1/2, 2/2	22	Carabidae	Bembidion					1
125 cm, 1/2, 2/2	23	Carabidae						1
125 cm, 1/2, 2/2	27	Staphylinidae	Stenus				1	
125 cm, 1/2, 2/2	31	Staphylinidae	Aleocharinae				1	
125 cm, 2/2, 1/2	1	Carabidae	Diplous				1	
125 cm, 2/2, 1/2	2	Scirtidae					1	
125 cm, 2/2, 1/2	3	Chrysomelidae	Donacia					
125 cm, 2/2, 1/2	4	Scirtidae					1	
125 cm, 2/2, 1/2	5	Carabidae	Bembidion				1	
125 cm, 2/2, 1/2	6	Scirtidae						1
125 cm, 2/2, 1/2	7	Hydraenidae						1
125 cm, 2/2, 1/2	8	Scirtidae					1	
125 cm, 2/2, 1/2	9	Hydrophilidae	Hydrochus					1
125 cm, 2/2, 1/2	10	Hydraenidae	Ochthebius					1
125 cm, 2/2, 1/2	11	Hydraenidae	Ochthebius					1
125 cm, 2/2, 1/2	12	Hydraenidae	Ochthebius					1
125 cm, 2/2, 1/2	14	Hydraenidae	Ochthebius				1	
125 cm, 2/2, 1/2	15	Hydraenidae	Ochthebius					1
125 cm, 2/2, 1/2	16	Staphylinidae	Olophrum					1
125 cm, 2/2, 1/2	18	Scydmaenidae					1	
125 cm, 2/2, 1/2	19	Hydraenidae	Ochthebius				1	
125 cm, 2/2, 1/2	20	Hydraenidae	Ochthebius					1
125 cm, 2/2, 1/2	21	Carabidae	Bembidion					1
125 cm, 2/2, 1/2	22	Scirtidae					1	
125 cm, 2/2, 1/2	23	Hydraenidae	Ochthebius				1	
125 cm, 2/2, 1/2	24	Hydraenidae	Ochthebius				1	
125 cm, 2/2, 1/2	25	Hydrophilidae	Georissus					1
125 cm, 2/2, 1/2	26	Staphylinidae				1		
125 cm, 2/2, 1/2	27	Scirtidae					1	
125 cm, 2/2, 1/2	28	Scirtidae					1	
125 cm, 2/2, 1/2	29	Hydraenidae	Ochthebius					1
125 cm, 2/2, 1/2	30	Hydraenidae	Ochthebius					1
125 cm, 2/2, 1/2	31	Hydrophilidae			1			
125 cm, 2/2, 1/2	32	Staphylinidae	Stenus				1	
125 cm, 2/2, 1/2	33	Hydrophilidae						1
125 cm, 2/2, 1/2	34	Hydraenidae	Ochthebius				1	
125 cm, 2/2, 1/2	35	Hydraenidae	Ochthebius				1	
125 cm, 2/2, 1/2	36	Hydraenidae	Ochthebius					1
125 cm, 2/2, 1/2	37	Hydraenidae	Ochthebius					1
125 cm, 2/2, 1/2	38	Staphylinidae						1
125 cm, 2/2, 1/2	39	Staphylinidae	Stenus				1	
125 cm, 2/2, 1/2	41	Staphylinidae					1	
125 cm, 2/2, 1/2	42	Staphylinidae	Aleocharinae			1		
125 cm, 2/2, 1/2	43	Coccinellidae	Brachiacantha	ursina				1
125 cm, 2/2, 1/2	44	Coccinellidae	Brachiacantha	ursina	1			
125 cm, 2/2, 1/2	45	Scirtidae					1	

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
125 cm, 2/2, 1/2	46	Staphylinidae	Stenus					1
125 cm, 2/2, 1/2	47	Hydraenidae	Ochthebius					1
125 cm, 2/2, 1/2	48	Scirtidae					1	
125 cm, 2/2, 1/2	49	Staphylinidae				1		
125 cm, 2/2, 1/2	50	Cantharidae				1		
125 cm, 2/2, 1/2	52	Hydraenidae	Ochthebius					1
125 cm, 2/2, 1/2	53	Hydraenidae	Ochthebius				1	
125 cm, 2/2, 1/2	55	Scirtidae						f
125 cm, 2/2, 1/2	56	Hydraenidae	Ochthebius				f	
125 cm, 2/2, 1/2	57	Hydraenidae	Ochthebius				1	
125 cm, 2/2, 1/2	58	Staphylinidae					1	
125 cm, 2/2, 1/2	59	Staphylinidae					1	
125 cm, 2/2, 1/2	60	Gyrinidae			1			
125 cm, 2/2, 2/2	1	Staphylinidae	Omaliinae			1		
125 cm, 2/2, 2/2	2	Latridiidae						1
125 cm, 2/2, 2/2	3	Staphylinidae	Philonthus					1
125 cm, 2/2, 2/2	4	Hydrophilidae	Hydrochus					f
125 cm, 2/2, 2/2	5	Staphylinidae	Aleocharinae			1		
125 cm, 2/2, 2/2	6	Staphylinidae	Olophrum				1	
125 cm, 2/2, 2/2	7	Hydraenidae	Ochthebius				1	
125 cm, 2/2, 2/2	8	Staphylinidae					1	
125 cm, 2/2, 2/2	9	Staphylinidae	Stenus			1		
125 cm, 2/2, 2/2	10	Dytiscidae						
125 cm, 2/2, 2/2	13	Staphylinidae	Aleocharinae			1		
125 cm, 2/2, 2/2	15	Carabidae			1			
125 cm, 2/2, 2/2	16	Scirtidae				1		
125 cm, 2/2, 2/2	21	Scarabaeidae			1			
125 cm, 2/2, 2/2	25	Carabidae						f
125 cm, 2/2, 2/2	28	Scolytidae	Pitiopthius					1
125 cm, 2/2, 2/2	30	Staphylinidae	Stenus					1
125 cm, 2/2, 2/2	31	Hydrophilidae						f
125 cm, 2/2, 2/2	32	Scirtidae					f	
125 cm, 2/2, 2/2	35	Staphylinidae	Aleocharinae				1	
125 cm, 2/2, 2/2	37	Scolytidae						1
125 cm, 2/2, 2/2	39	Carabidae					f	
150 cm, 1/2, 1/1	4	Dytiscidae				f		
150 cm, 1/2, 1/1	7	Scirtidae				1		
150 cm, 1/2, 1/1	11	Staphylinidae	Stenus				1	
150 cm, 1/2, 1/1	12	Latridiidae						1
150 cm, 1/2, 1/1	16	Scolytidae					1	
150 cm, 1/2, 1/1	19	Staphylinidae	Aleocharinae				1	
150 cm, 1/2, 1/1	20	Scirtidae					1	
150 cm, 1/2, 1/1	22	Scolytidae						1
150 cm, 2/2, 1/1	1	Scirtidae						1
150 cm, 2/2, 1/1	2	Carabidae	Agonum	lutulentum		1		
150 cm, 2/2, 1/1	4	Curculionidae	Ceutorhynchnus					1

Table E.1. (continued)

MS28 Interval	#	Family	Genera	Species	H	P	L	R
150 cm, 2/2, 1/1	6	Staphylinidae	Aleocharinae				1	
150 cm, 2/2, 1/1	7	Hydraenidae	Hydraena				1	
150 cm, 2/2, 1/1	9	Hydraenidae	Hydraena				1	
150 cm, 2/2, 1/1	10	Scirtidae					1	
150 cm, 2/2, 1/1	12	Staphylinidae	Olophrum					1
150 cm, 2/2, 1/1	14	Hydraenidae	Hydraena					1
150 cm, 2/2, 1/1	17	Staphylinidae	Aleocharinae			1		
150 cm, 2/2, 1/1	19	Hydraenidae	Hydraena				1	
150 cm, 2/2, 1/1	21	Pselaphidae					1	
150 cm, 2/2, 1/1	23	Staphylinidae	Stenus				1	
150 cm, 2/2, 1/1	24	Scirtidae					1	
150 cm, 2/2, 1/1	27	Scirtidae				f		
150 cm, 2/2, 1/1	29	Scirtidae					1	
150 cm, 2/2, 1/1	32	Staphylinidae	Olophrum					f
150 cm, 2/2, 1/1	35	Scirtidae					f	
150 cm, 2/2, 1/1	37	Staphylinidae	Aleocharinae					1

H = head
P = pronota
L = left elytra
R = right elytra
f = fragment
sp. = species
gen. indet. = genus indeterminable

Table E.2. UPC fossil insect data.

UPC Interval	#	Family	Genera	Species	H	P	L	R
A, 1/2	2	Staphylinidae				1		
A, 1/2	3	Carabidae	Bembidion			2		
A, 1/2	4	Staphylinidae	Stenus					1
A, 1/2	5	Staphylinidae	Stenus				1	
A, 1/2	7	Staphylinidae					1	
A, 1/2	8	Staphylinidae					1	
A, 1/2	9	Staphylinidae						1
A, 1/2	10	Curculionidae	Tanysphyrus					1
A, 1/2	11	Staphylinidae	Philonthus					1
A, 1/2	12	Staphylinidae	Stenus					1
A, 1/2	14	Staphylinidae	Philonthus					1
A, 1/2	15	Hydraenidae	Ochthebius					1
A, 1/2	16	Staphylinidae	Stenus					1
A, 1/2	19	Staphylinidae	Stenus				1	
A, 1/2	20	Staphylinidae	Stenus					1
A, 1/2	21	Staphylinidae	Olophrum			1		
A, 1/2	22	Scirtidae				1		
A, 1/2	23	Staphylinidae	Stenus			1		
A, 1/2	24	Staphylinidae	Stenus				1	
A, 1/2	25	Staphylinidae						1
A, 1/2	28	Curculionidae	Tanysphyrus				1	
A, 1/2	29	Staphylinidae	Stenus					1
A, 1/2	30	Staphylinidae	Stenus				1	
A, 1/2	32	Staphylinidae	Philonthus				1	
A, 1/2	33	Staphylinidae	Stenus					1
A, 1/2	34	Hydraenidae						1
A, 1/2	36	Hydraenidae	Ochthebius					1
A, 1/2	37	Staphylinidae	Stenus					1
A, 1/2	38	Staphylinidae	Stenus				1	
A, 1/2	39	Staphylinidae	Stenus					1
A, 1/2	41	Coccinellidae					f	
A, 1/2	42	Staphylinidae	Olophrum				1	
A, 1/2	43	Carabidae	Bembidion				1	
A, 1/2	44	Staphylinidae	Stenus				1	
A, 1/2	46	Staphylinidae	Olophrum					1
A, 1/2	47	Staphylinidae	Olophrum				1	
A, 1/2	49	Staphylinidae	Philonthus					1
A, 1/2	50	Staphylinidae	Stenus					1
A, 1/2	51	Staphylinidae	Philonthus				1	
A, 1/2	52	Staphylinidae	Stenus					1
A, 1/2	53	Scolytidae	Pitiopthius				1	
A, 1/2	54	Staphylinidae	Stenus			2		
A, 1/2	55	Pselaphidae						1
A, 1/2	56	Staphylinidae	Stenus				1	
A, 1/2	59	Staphylinidae	Olophrum	consimile		1		
A, 1/2	60	Georissidae	Georissus					1
A, 2/2	1	Hydraenidae	Ochthebius					1

Table E.2. (continued)

UPC Interval	#	Family	Genera	Species	H	P	L	R
A, 2/2	2	Hydraenidae	Ochthebius				1	
A, 2/2	3	Georissidae	Georissus					1
A, 2/2	4	Staphylinidae	Stenus				1	
A, 2/2	5	Staphylinidae	Stenus					1
A, 2/2	6	Staphylinidae	Olophrum	consimile		1		
A, 2/2	7	Staphylinidae	Aleocharinae			1		
A, 2/2	8	Staphylinidae	Stenus			1		
A, 2/2	9	Curculionidae	Notaris					1
A, 2/2	11	Scirtidae					1	
A, 2/2	12	Chrysomelidae	Plateumaris				f	
A, 2/2	13	Staphylinidae	Stenus					1
A, 2/2	14	Staphylinidae	Stenus					1
A, 2/2	15	Staphylinidae	Stenus				1	
A, 2/2	16	Staphylinidae	Stenus			1		
A, 2/2	17	Staphylinidae	Stenus					1
A, 2/2	18	Staphylinidae	Stenus				2	
A, 2/2	20	Staphylinidae	Aleocharinae					1
A, 2/2	21	Staphylinidae	Stenus				1	
A, 2/2	22	Carabidae	Elaphrus	clairvillei			f	
A, 2/2	23	Pselaphidae						1
A, 2/2	24	Staphylinidae	Philonthus				1	
A, 2/2	25	Staphylinidae	Stenus					1
A, 2/2	26	Staphylinidae	Philonthus				1	
A, 2/2	30	Hydraenidae	Ochthebius				1	
A, 2/2	32	Hydraenidae	Ochthebius					1
A, 2/2	34	Pselaphidae					1	
A, 2/2	35	Hydrophilidae					1	
A, 2/2	36	Dytiscidae	Rhantus				f	
A, 2/2	37	Staphylinidae	Stenus					1
A, 2/2	38	Hydraenidae	Ochthebius					1
A, 2/2	40	Staphylinidae	Philonthus					1
A, 2/2	42	Staphylinidae	Aleocharinae					1
A, 2/2	43	Staphylinidae	Stenus					1
A, 2/2	44	Staphylinidae	Stenus				1	
A, 2/2	45	Staphylinidae	Olophrum			f		
A, 2/2	47	Staphylinidae	Stenus				2	
A, 2/2	49	Hydraenidae	Ochthebius				1	
A, 2/2	52	Scirtidae					f	
A, 2/2	54	Staphylinidae	Aleocharinae			1		
A, 2/2	55	Staphylinidae	Stenus				1	
A, 2/2	59	Hydraenidae	Ochthebius					1
B, 1/1	1	Staphylinidae	Olophrum				1	
B, 1/1	6	Staphylinidae	Philonthus				1	
B, 1/1	7	Hydrophilidae	Hydrochus					1
B, 1/1	8	Staphylinidae						1
B, 1/1	11	Staphylinidae	Stenus					1
B, 1/1	13	Carabidae				1		

Table E.2. (continued)

UPC Interval	#	Family	Genera	Species	H	P	L	R
B, 1/1	14	Hydraenidae	Ochthebius				1	
B, 1/1	17	Staphylinidae	Olophrum				1	
B, 1/1	18	Staphylinidae	Stenus					1
B, 1/1	20	Staphylinidae	Stenus				1	
B, 1/1	21	Staphylinidae	Philonthus				1	
B, 1/1	22	Hydraenidae	Ochthebius				1	
B, 1/1	23	Staphylinidae	Stenus					1
B, 1/1	24	Hydraenidae	Ochthebius				1	
B, 1/1	25	Pselaphidae					1	
B, 1/1	26	Staphylinidae	Stenus					1
B, 1/1	27	Hydraenidae	Ochthebius					2
B, 1/1	30	Staphylinidae	Aleocharinae			1		
B, 1/1	36	Hydraenidae	Ochthebius				1	
B, 1/1	38	Staphylinidae	Olophrum			f		
B, 1/1	42	Staphylinidae	Olophrum			1		
B, 1/1	43	Staphylinidae	Stenus				1	
B, 1/1	44	Staphylinidae	Olophrum				1	
B, 1/1	45	Staphylinidae	Aleocharinae			1		
B, 1/1	46	Staphylinidae	Olophrum					f
B, 1/1	48	Staphylinidae	Stenus				1	
B, 1/1	49	Pselaphidae					1	
B, 1/1	52	Hydraenidae	Ochthebius				1	
B, 1/1	53	Staphylinidae	Olophrum				1	
B, 1/1	54	Hydraenidae	Ochthebius				1	
B, 1/1	55	Curculionidae					f	
B, 1/1	56	Latridiidae						1
B, 1/1	58	Staphylinidae	Olophrum				f	
C, 1/2	1	Staphylinidae	Philonthus					1
C, 1/2	2	Staphylinidae					1	
C, 1/2	3	Staphylinidae						1
C, 1/2	4	Staphylinidae						1
C, 1/2	5	Carabidae	Bembidion				1	
C, 1/2	7	Curculionidae	Tanysphyrus					1
C, 1/2	9	Gyrinidae					1	
C, 1/2	10	Latridiidae						1
C, 1/2	11	Staphylinidae						1
C, 1/2	12	Staphylinidae	Stenus				1	
C, 1/2	14	Staphylinidae						1
C, 1/2	15	Staphylinidae	Olophrum				1	
C, 1/2	19	Staphylinidae	Stenus				2	2
C, 1/2	20	Staphylinidae	Philonthus					1
C, 1/2	21	Staphylinidae	Stenus					1
C, 1/2	24	Staphylinidae	Aeidota				1	
C, 1/2	25	Staphylinidae	Olophrum			f		
C, 1/2	26	Staphylinidae	Stenus				1	
C, 1/2	27	Hydrophilidae				1		
C, 1/2	29	Scirtidae					1	

Table E.2. (continued)

UPC Interval	#	Family	Genera	Species	H	P	L	R
C, 1/2	30	Pselaphidae						1
C, 1/2	32	Hydraenidae	Ochthebius					1
C, 1/2	33	Staphylinidae	Olophrum				1	
C, 1/2	34	Staphylinidae	Aleocharinae					1
C, 1/2	37	Staphylinidae	Stenus					1
C, 1/2	38	Hydraenidae	Ochthebius				1	
C, 1/2	39	Hydraenidae	Ochthebius					1
C, 1/2	41	Staphylinidae	Olophrum				1	
C, 1/2	43	Hydraenidae	Ochthebius					1
C, 1/2	44	Staphylinidae	Aleocharinae					1
C, 1/2	45	Hydraenidae	Ochthebius					1
C, 1/2	46	Staphylinidae					1	
C, 1/2	48	Hydrophilidae					1	
C, 1/2	49	Chrysomelidae	Donacia				1	
C, 1/2	50	Chrysomelidae	Donacia					1
C, 1/2	53	Staphylinidae	Aleocharinae				1	
C, 1/2	54	Staphylinidae	Stenus					1
C, 1/2	55	Staphylinidae	Stenus				1	
C, 1/2	56	Staphylinidae	Stenus				1	
C, 1/2	57	Staphylinidae	Stenus					1
C, 1/2	58	Staphylinidae	Stenus				1	
C, 1/2	59	Staphylinidae	Stenus					1
C, 2/2	1	Staphylinidae						1
C, 2/2	2	Hydraenidae	Ochthebius				1	
C, 2/2	3	Staphylinidae	Aleocharinae					1
C, 2/2	4	Curculionidae					f	
C, 2/2	5	Hydraenidae	Ochthebius					1
C, 2/2	6	Latridiidae						1
C, 2/2	8	Latridiidae					1	
C, 2/2	9	Staphylinidae	Aleocharinae					1
C, 2/2	11	Hydraenidae	Ochthebius				1	
C, 2/2	12	Staphylinidae	Stenus				1	
C, 2/2	14	Staphylinidae	Stenus				1	
C, 2/2	15	Staphylinidae	Stenus					1
C, 2/2	16	Hydraenidae	Ochthebius				1	
C, 2/2	17	Staphylinidae	Stenus				1	
C, 2/2	19	Staphylinidae	Aleocharinae				1	
C, 2/2	20	Staphylinidae	Stenus				1	
C, 2/2	21	Staphylinidae						1
C, 2/2	23	Staphylinidae	Stenus					1
C, 2/2	24	Hydraenidae						1
C, 2/2	25	Hydraenidae	Ochthebius					1
C, 2/2	27	Staphylinidae	Philonthus				1	
C, 2/2	28	Staphylinidae	Stenus			1		
C, 2/2	34	Staphylinidae	Stenus				1	
C, 2/2	37	Carabidae	Bembidion			1		
C, 2/2	39	Staphylinidae	Stenus			1		

Table E.2. (continued)

UPC Interval	#	Family	Genera	Species	H	P	L	R
C, 2/2	40	Scymnaebidae						1
C, 2/2	44	Dytiscidae					f	
C, 2/2	54	Scirtidae					1	
C, 2/2	55	Hydrophilidae	Hydrochus				1	
C, 2/2	57	Scirtidae					1	
C, 2/2	58	Staphylinidae	Stenus					1
D, 1/1	2	Hydrophilidae	Hydrochus				1	
D, 1/1	3	Dytiscidae						1
D, 1/1	4	Staphylinidae	Philonthus					1
D, 1/1	5	Staphylinidae						1
D, 1/1	6	Staphylinidae	Stenus					1
D, 1/1	7	Staphylinidae	Olophrum					1
D, 1/1	9	Hydraenidae	Ochthebius				1	
D, 1/1	11	Hydraenidae	Ochthebius					1
D, 1/1	12	Hydraenidae	Ochthebius					1
D, 1/1	13	Hydraenidae	Ochthebius				1	
D, 1/1	15	Hydrophilidae					1	
D, 1/1	18	Hydrophilidae	Hydrochus			1		
D, 1/1	24	Staphylinidae	Stenus				1	
D, 1/1	26	Staphylinidae	Stenus				1	
D, 1/1	28	Carabidae	Bembidion					1
D, 1/1	30	Staphylinidae	Stenus				1	
D, 1/1	31	Staphylinidae	Stenus				1	
D, 1/1	32	Staphylinidae	Stenus				1	
D, 1/1	33	Staphylinidae	Stenus					1
D, 1/1	35	Hydraenidae	Ochthebius					1
D, 1/1	41	Dytiscidae	Colymbetes				f	
D, 1/1	42	Staphylinidae	Stenus					1
D, 1/1	43	Latridiidae					1	
D, 1/1	45	Hydrophilidae					f	
D, 1/1	49	Staphylinidae						1
D, 1/1	54	Oribatida						
D, 1/1	55	Hydrophilidae	Haliplidae				f	
E, 1/2	3	Staphylinidae	Stenus			1		
E, 1/2	6	Staphylinidae	Stenus				1	
E, 1/2	8	Dytiscidae					1	
E, 1/2	9	Haliplidae						1
E, 1/2	10	Staphylinidae	Stenus					1
E, 1/2	12	Staphylinidae	Stenus				1	1
E, 1/2	15	Carabidae	Bembidion		1			
E, 1/2	19	Staphylinidae	Stenus				1	
E, 1/2	20	Carabidae	Bembidion			1		
E, 1/2	21	Carabidae	Bembidion				1	
E, 1/2	22	Hydraenidae	Ochthebius				1	
E, 1/2	24	Pselaphidae					1	
E, 1/2	25	Staphylinidae	Olophrum				1	
E, 1/2	26	Staphylinidae	Stenus				1	

Table E.2. (continued)

UPC Interval	#	Family	Genera	Species	H	P	L	R
E, 1/2	27	Staphylinidae	Stenus			1		
E, 1/2	29	Staphylinidae	Stenus				1	
E, 1/2	30	Scirtidae				f		
E, 1/2	32	Staphylinidae	Stenus				1	
E, 1/2	27	Staphylinidae	Stenus			1		
E, 1/2	34	Staphylinidae	Stenus					1
E, 1/2	35	Staphylinidae	Stenus				1	
E, 1/2	36	Staphylinidae	Aleocharinae			1		
E, 1/2	37	Carabidae	Elaphrus	clairvillei		f		
E, 1/2	38	Hydrophilidae	Hydrochus					f
E, 1/2	39	Dytiscidae	Graphoderus				f	
E, 1/2	42	Staphylinidae	Philonthus				1	
E, 1/2	44	Scirtidae						1
E, 1/2	47	Carabidae	Bembidion				1	
E, 1/2	48	Staphylinidae	Stenus					1
E, 1/2	56	Staphylinidae	Stenus					1
E, 1/2	57	Staphylinidae	Stenus				1	
E, 1/2	58	Staphylinidae	Stenus					1
E, 1/2	59	Staphylinidae	Stenus				1	
E, 1/2	60	Staphylinidae	Stenus					1
E, 2/2	7	Staphylinidae	Stenus					1
E, 2/2	10	Staphylinidae	Stenus				1	
E, 2/2	12	Staphylinidae	Stenus					1
E, 2/2	13	Staphylinidae	Stenus				1	
E, 2/2	16	Staphylinidae	Aleocharinae				1	
E, 2/2	20	Chrysomelidae					f	
E, 2/2	28	Staphylinidae	Stenus					1
E, 2/2	33	Oribatida						
E, 2/2	34	Staphylinidae	Aleocharinae				1	
E, 2/2	35	scirtidae				f		
E, 2/2	36	Scirtidae				f		
E, 2/2	38	Staphylinidae	Euaesthetus			1		
F, 1/2	1	Hydraenidae	Ochthebius				1	
F, 1/2	2	Staphylinidae	Stenus			1		
F, 1/2	3	Carabidae	Trekes				1	
F, 1/2	7	Carabidae	Bembidion			1		
F, 1/2	9	Staphylinidae	Stenus				1	
F, 1/2	11	Staphylinidae	Stenus					1
F, 1/2	12	Staphylinidae	Stenus					1
F, 1/2	14	Hydraenidae	Ochthebius					1
F, 1/2	15	Staphylinidae	Aleocharinae			1		
F, 1/2	16	Carabidae	Elaphrus	clairvillei			f	
F, 1/2	17	Staphylinidae	Stenus				1	
F, 1/2	18	Staphylinidae	Stenus					1
F, 1/2	19	Staphylinidae	Olophrum					1
F, 1/2	20	Carabidae	Bembidion					1
F, 1/2	21	Staphylinidae					1	

Table E.2. (continued)

UPC Interval	#	Family	Genera	Species	H	P	L	R
F, 1/2	23	Hydraenidae	Ochthebius				f	
F, 1/2	24	Carabidae	Metabletus	americanus				1
F, 1/2	25	Scirtidae					1	
F, 1/2	26	Staphylinidae	Stenus			1		
F, 1/2	27	Staphylinidae	Stenus				1	
F, 1/2	28	Staphylinidae	Stenus				1	
F, 1/2	29	Staphylinidae	Stenus				1	
F, 1/2	31	Staphylinidae	Stenus					1
F, 1/2	32	Dytiscidae	Colymbetes					f
F, 1/2	33	Staphylinidae						1
F, 1/2	34	Carabidae					f	
F, 1/2	35	Staphylinidae	Stenus					1
F, 1/2	36	Scolytidae					1	
F, 1/2	37	Staphylinidae					1	
F, 1/2	38	Carabidae						f
F, 1/2	40	Staphylinidae	Stenus					1
F, 1/2	41	Staphylinidae	Stenus				1	
F, 1/2	42	Staphylinidae	Olophrum					1
F, 1/2	43	Staphylinidae	Stenus					1
F, 1/2	45	Latridiidae						1
F, 1/2	46	Staphylinidae	Stenus				1	
F, 1/2	47	Staphylinidae	Stenus					1
F, 1/2	48	Dytiscidae					1	
F, 1/2	49	Latridiidae					1	
F, 1/2	50	Staphylinidae	Olophrum				1	
F, 1/2	51	Staphylinidae	Olophrum					1
F, 1/2	52	Latridiidae					1	
F, 1/2	53	Staphylinidae				1		
F, 1/2	54	Hydrophilidae					f	
F, 1/2	56	Staphylinidae	Stenus					1
F, 1/2	57	Staphylinidae	Stenus				1	
F, 1/2	58	Staphylinidae	Stenus					1
F, 2/2	1	Staphylinidae	Stenus					1
F, 2/2	2	Staphylinidae	Stenus					1
F, 2/2	3	Chrysomelidae	Donacia	pubescens				f
F, 2/2	6	Curculionidae						1
F, 2/2	7	Pselaphidae					1	
F, 2/2	9	Staphylinidae	Stenus				1	
F, 2/2	10	Staphylinidae	Stenus					1
F, 2/2	12	Scirtidae				1		
F, 2/2	13	Chrysomelidae	Donacia	pubescens				f
F, 2/2	15	Carabidae	Bembidion				1	
F, 2/2	17	Hydraenidae	Ochthebius				1	
F, 2/2	20	Pselaphidae						1
F, 2/2	22	Staphylinidae	Stenus					1
F, 2/2	23	Staphylinidae	Stenus					1
F, 2/2	24	Staphylinidae	Stenus					1

Table E.2. (continued)

UPC Interval	#	Family	Genera	Species	H	P	L	R
F, 2/2	26	Staphylinidae	Stenus					1
F, 2/2	27	Staphylinidae	Stenus				1	
F, 2/2	30	Staphylinidae	Aleocharinae				1	
F, 2/2	31	Staphylinidae	Aleocharinae				1	
F, 2/2	32	Staphylinidae	Aleocharinae			1		
F, 2/2	33	Staphylinidae	Stenus				1	
F, 2/2	37	Dytiscidae	Colymbetes				f	
F, 2/2	38	Staphylinidae	Stenus					1
F, 2/2	39	Staphylinidae	Stenus					1
F, 2/2	42	Staphylinidae	Stenus			f		
F, 2/2	44	Staphylinidae	Aleocharinae				1	
F, 2/2	45	Chrysomelidae	Donacia	pubescens			f	
G, 1/3	3	Staphylinidae	Stenus					1
G, 1/3	6	Staphylinidae	Stenus					1
G, 1/3	8	Staphylinidae					1	
G, 1/3	10	Carabidae	Elaphrus				f	
G, 1/3	12	Chrysomelidae	Donacia	pubescens			f	
G, 1/3	17	Staphylinidae	Olophrum			f		
G, 1/3	19	Carabidae	Bembidion			f		
G, 1/3	20	Hydraenidae	Ochthebius					1
G, 1/3	22	Staphylinidae	Stenus				1	
G, 1/3	23	Carabidae	Bembidion				f	
G, 1/3	25	Haliplidae						f
G, 1/3	26	Staphylinidae	Stenus					1
G, 1/3	27	Hydrophilidae				f		
G, 1/3	28	Hydrophilidae					1	
G, 1/3	30	Staphylinidae	Stenus					1
G, 1/3	31	Staphylinidae					1	
G, 1/3	33	Hydraenidae	Ochthebius					1
G, 1/3	35	Staphylinidae	Stenus				1	
G, 1/3	36	Staphylinidae	Stenus					1
G, 1/3	37	Hydraenidae	Ochthebius				1	
G, 1/3	39	Staphylinidae	Stenus				1	
G, 1/3	40	Staphylinidae	Stenus					1
G, 1/3	41	Staphylinidae	Stenus				1	
G, 1/3	45	Curculionidae						f
G, 1/3	46	Staphylinidae	Philonthus				1	
G, 1/3	49	Carabidae	Bembidion				1	
G, 1/3	54	Staphylinidae	Stenus				1	
G, 1/3	56	Staphylinidae	Stenus			1		
G, 1/3	57	Staphylinidae	Stenus					1
G, 2/3	1	Staphylinidae	Stenus					1
G, 2/3	2	Oribatida						
G, 2/3	5	Dytiscidae	Graphoderus				f	
G, 2/3	7	Staphylinidae	Stenus					1
G, 2/3	10	Scolytidae					1	
G, 2/3	11	Staphylinidae	Philonthus					1

Table E.2. (continued)

UPC Interval	#	Family	Genera	Species	H	P	L	R
G, 2/3	12	Staphylinidae	Stenus			1		
G, 2/3	20	Staphylinidae	Olophrum					1
G, 2/3	22	Staphylinidae	Stenus				1	
G, 2/3	24	Staphylinidae	Stenus				1	
G, 2/3	25	Staphylinidae	Stenus				1	
G, 2/3	27	Pselaphidae						1
G, 2/3	28	Staphylinidae	Stenus					1
G, 2/3	29	Hydrophilidae					f	
G, 2/3	30	Staphylinidae	Stenus				1	
G, 2/3	34	Hydraenidae	Ochthebius					1
G, 2/3	35	Staphylinidae	Stenus				1	
G, 2/3	36	Hydrophilidae				1		
G, 2/3	37	Staphylinidae	Stenus					1
G, 2/3	38	Hydraenidae	Ochthebius				1	
G, 2/3	39	Staphylinidae	Stenus			1		
G, 2/3	42	Staphylinidae	Stenus					1
G, 2/3	46	Staphylinidae	Olophrum			f		
G, 2/3	48	Staphylinidae	Stenus				1	
G, 2/3	50	Oribatida						
G, 2/3	51	Staphylinidae	Olophrum					f
G, 3/3	2	Oribatida						
G, 3/3	6	Curculionidae	Tanysphyrus				1	
G, 3/3	12	Hydrophilidae	Haliplidae				f	
G, 3/3	13	Hydrophilidae	Hydrobius				f	
H, 1/2	3	Staphylinidae	Aleocharinae					1
H, 1/2	6	Hydraenidae	Ochthebius		1			
H, 1/2	7	Curculionidae	Tanysphyrus					1
H, 1/2	8	Staphylinidae	Olophrum				1	
H, 1/2	9	Staphylinidae	Stenus				1	
H, 1/2	10	Chrysomelidae	Donacia				f	
H, 1/2	18	Pselaphidae					1	
H, 1/2	24	Staphylinidae	Philonthus				1	
H, 1/2	33	Scirtidae				f		
H, 1/2	37	Staphylinidae	Olophrum				f	
H, 1/2	38	Pselaphidae					1	
H, 1/2	52	Staphylinidae	Philonthus					1
H, 2/2	1	Hydraenidae	Ochthebius				1	
H, 2/2	4	Staphylinidae	Olophrum			f		
H, 2/2	7	Staphylinidae	Stenus				1	
H, 2/2	8	Staphylinidae	Stenus				1	
H, 2/2	9	Staphylinidae	Stenus					1
H, 2/2	10	Staphylinidae	Philonthus					1
H, 2/2	11	Staphylinidae	Stenus				1	
H, 2/2	12	Staphylinidae	Stenus					1
H, 2/2	13	Hydraenidae	Ochthebius				1	
H, 2/2	19	Staphylinidae	Stenus					1
H, 2/2	21	Staphylinidae	Stenus				1	

Table E.2. (continued)

UPC Interval	#	Family	Genera	Species	H	P	L	R
H, 2/2	22	Hydrophilidae					1	
H, 2/2	25	Staphylinidae	Stenus				1	
H, 2/2	26	Staphylinidae	Stenus				1	
H, 2/2	29	Chrysomelidae	Donacia				1	
BULK 1, 1/3	1	Staphylinidae	Olophrum					1
BULK 1, 1/3	2	Staphylinidae	Olophrum					1
BULK 1, 1/3	3	Carabidae	Elaphrus	clairvillei			f	
BULK 1, 1/3	4	Dytiscidae	Colymbetes				f	
BULK 1, 1/3	5	Hydraenidae	Ochthebius					1
BULK 1, 1/3	7	Staphylinidae						1
BULK 1, 1/3	8	Hydraenidae	Ochthebius					1
BULK 1, 1/3	10	Carabidae						1
BULK 1, 1/3	12	Staphylinidae	Aleocharinae				1	
BULK 1, 1/3	13	Chrysomelidae	Donacia	pubescens				f
BULK 1, 1/3	14	Scirtidae					1	
BULK 1, 1/3	15	Carabidae	Elaphrus	clairvillei			f	
BULK 1, 1/3	16	Staphylinidae	Stenus				1	
BULK 1, 1/3	17	Carabidae	Bembidion	transparens			1	
BULK 1, 1/3	19	Staphylinidae	Stenus				1	
BULK 1, 1/3	20	Staphylinidae	Stenus				1	
BULK 1, 1/3	21	Staphylinidae	Stenus				1	
BULK 1, 1/3	22	Carabidae					1	
BULK 1, 1/3	23	Staphylinidae	Olophrum				1	
BULK 1, 1/3	24	Chrysomelidae					1	
BULK 1, 1/3	25	Hydrophilidae						1
BULK 1, 1/3	30	Hydraenidae	Ochthebius				1	
BULK 1, 1/3	34	Chrysomelidae						f
BULK 1, 1/3	36	Carabidae	Bembidion				1	
BULK 1, 1/3	37	Dytiscidae					1	
BULK 1, 1/3	38	Dytiscidae	Colymbetes				f	
BULK 1, 1/3	40	Staphylinidae	Stenus			1		
BULK 1, 1/3	41	Scirtidae					f	
BULK 1, 1/3	42	Staphylinidae	Stenus				1	
BULK 1, 1/3	43	Staphylinidae	Aleocharinae					1
BULK 1, 1/3	46	Scirtidae						f
BULK 1, 1/3	47	Carabidae	Patrobus				1	
BULK 1, 1/3	48	Staphylinidae	Aleocharinae				1	
BULK 1, 1/3	51	Staphylinidae	Stenus					1
BULK 1, 1/3	53	Scirtidae					1	
BULK 1, 1/3	55	Staphylinidae	Olophrum				1	
BULK 1, 1/3	56	Staphylinidae	Olophrum	consimile		1		
BULK 1, 1/3	57	Carabidae					f	
BULK 1, 1/3	58	Staphylinidae	Olophrum					1
BULK 1, 1/3	59	Hydrophilidae						f
BULK 1, 1/3	60	Dytiscidae	Agubus					f
BULK 1, 2/3	1	Staphylinidae	Olophrum					1
BULK 1, 2/3	2	Staphylinidae	Olophrum				1	

Table E.2. (continued)

UPC Interval	#	Family	Genera	Species	H	P	L	R
BULK 1, 2/3	3	Staphylinidae	Olophrum					1
BULK 1, 2/3	4	Staphylinidae	Olophrum					1
BULK 1, 2/3	5	Staphylinidae	Olophrum				1	
BULK 1, 2/3	7	Hydrophilidae						1
BULK 1, 2/3	8	Carabidae	Bembidion					1
BULK 1, 2/3	9	Curculionidae					1	
BULK 1, 2/3	10	Hydraenidae	Ochthebius				1	
BULK 1, 2/3	11	Staphylinidae	Olophrum				1	
BULK 1, 2/3	13	Carabidae	Bembidion	transparens		1		
BULK 1, 2/3	16	Carabidae	Bembidion					f
BULK 1, 2/3	17	Chrysomelidae					f	
BULK 1, 2/3	18	Staphylinidae	Philonthus					1
BULK 1, 2/3	19	Carabidae	Bembidion					1
BULK 1, 2/3	21	Carabidae	Elaphrus	clairvillei			f	
BULK 1, 2/3	22	Staphylinidae	Philonthus					1
BULK 1, 2/3	24	Scolytidae					1	
BULK 1, 2/3	26	Hydrophilidae						1
BULK 1, 2/3	27	Carabidae	Bembidion					1
BULK 1, 2/3	31	Staphylinidae	Stenus				1	
BULK 1, 2/3	32	Staphylinidae	Stenus				1	
BULK 1, 2/3	33	Staphylinidae	Stenus					1
BULK 1, 2/3	34	Hydraenidae	Ochthebius					1
BULK 1, 2/3	35	Staphylinidae	Olophrum					1
BULK 1, 2/3	36	Carabidae	Bembidion					1
BULK 1, 2/3	37	Staphylinidae	Olophrum				f	
BULK 1, 2/3	38	Hydrophilidae						1
BULK 1, 2/3	39	Hydraenidae	Ochthebius					1
BULK 1, 2/3	40	Carabidae	Bembidion					1
BULK 1, 2/3	41	Staphylinidae	Aleocharinae			1		
BULK 1, 2/3	43	Carabidae						1
BULK 1, 2/3	44	Hydraenidae	Ochthebius					1
BULK 1, 2/3	46	Hydraenidae	Ochthebius				f	
BULK 1, 2/3	47	Hydraenidae	Ochthebius				1	
BULK 1, 2/3	48	Latridiidae						1
BULK 1, 2/3	49	Staphylinidae	Stenus				1	
BULK 1, 2/3	50	Staphylinidae	Aleocharinae			1		
BULK 1, 2/3	51	Staphylinidae	Aleocharinae			1		
BULK 1, 2/3	52	Staphylinidae	Stenus					1
BULK 1, 2/3	53	Dytiscidae						1
BULK 1, 2/3	54	Hydraenidae	Ochthebius				1	
BULK 1, 2/3	55	Hydraenidae	Ochthebius					1
BULK 1, 2/3	56	Staphylinidae	Omaliinae				1	
BULK 1, 2/3	57	Hydraenidae	Ochthebius					1
BULK 1, 2/3	58	Staphylinidae	Philonthus				1	
BULK 1, 2/3	59	Carabidae	Bembidion					1
BULK 1, 3/3	4	Latridiidae					1	
BULK 1, 3/3	5	Pselaphidae						1

Table E.2. (continued)

UPC Interval	#	Family	Genera	Species	H	P	L	R
BULK 1, 3/3	6	Staphylinidae	Stenus				1	
BULK 1, 3/3	7	Staphylinidae	Stenus				1	
BULK 1, 3/3	8	Dytiscidae					f	
BULK 1, 3/3	9	Curculionidae	Ceutorhynchus					f
BULK 1, 3/3	10	Staphylinidae	Stenus				1	
BULK 1, 3/3	12	Staphylinidae	Aleocharinae				1	
BULK 1, 3/3	13	Staphylinidae	Aleocharinae			1		
BULK 1, 3/3	14	Staphylinidae	Stenus					1
BULK 1, 3/3	16	Staphylinidae	Aleocharinae					1
BULK 1, 3/3	17	Dytiscidae	Colymbetes				f	
BULK 1, 3/3	18	Staphylinidae	Aleocharinae					1
BULK 1, 3/3	19	Dytiscidae	Agubus				f	
BULK 1, 3/3	20	Dytiscidae	Graphoderus				f	
BULK 2, 1/4	2	Saldidae					f	
BULK 2, 1/4	3	Scolytidae					1	
BULK 2, 1/4	4	Hydraenidae	Ochthebius				1	
BULK 2, 1/4	7	Staphylinidae	Olophrum					1
BULK 2, 1/4	8	Gyrinidae						1
BULK 2, 1/4	9	Chrysomelidae	Donacia	pubescens				f
BULK 2, 1/4	14	Pselaphidae						1
BULK 2, 1/4	17	Staphylinidae	Olophrum				f	
BULK 2, 1/4	19	Carabidae	Bembidion					1
BULK 2, 1/4	22	Hydraenidae	Ochthebius					1
BULK 2, 1/4	23	Staphylinidae	Olophrum				1	
BULK 2, 1/4	24	Staphylinidae	Olophrum					1
BULK 2, 1/4	25	Staphylinidae	Olophrum				f	
BULK 2, 1/4	26	Carabidae	Pterostichus					f
BULK 2, 1/4	27	Staphylinidae	Olophrum				1	
BULK 2, 1/4	28	Hydraenidae	Ochthebius					1
BULK 2, 1/4	29	Carabidae	Blethisa	multipunctata			f	
BULK 2, 1/4	31	Staphylinidae	Olophrum				1	
BULK 2, 1/4	33	Curculionidae	Notaris				1	
BULK 2, 1/4	34	Staphylinidae	Stenus					f
BULK 2, 1/4	39	Hydraenidae	Ochthebius					1
BULK 2, 1/4	40	Staphylinidae	Olophrum				1	
BULK 2, 1/4	41	Staphylinidae	Olophrum				1	
BULK 2, 1/4	42	Staphylinidae	Olophrum				1	
BULK 2, 1/4	43	Staphylinidae					1	
BULK 2, 1/4	44	Staphylinidae					1	
BULK 2, 1/4	47	Hydraenidae	Ochthebius					1
BULK 2, 1/4	48	Staphylinidae	Olophrum				1	
BULK 2, 1/4	50	Staphylinidae					1	
BULK 2, 1/4	51	Staphylinidae	Olophrum					1
BULK 2, 1/4	56	Micropeplinae	Micropeplus	tesserula			1	
BULK 2, 1/4	57	Micropeplinae	Micropeplus	tesserula				1
BULK 2, 1/4	58	Hydraenidae	Ochthebius				1	
BULK 2, 1/4	60	Dytiscidae						1

Table E.2. (continued)

UPC Interval	#	Family	Genera	Species	H	P	L	R
BULK 2, 2/4	3	Hydraenidae	Ochthebius					1
BULK 2, 2/4	4	Hydraenidae	Ochthebius				1	
BULK 2, 2/4	7	Carabidae	Bembidion					1
BULK 2, 2/4	10	Curculionidae						1
BULK 2, 2/4	11	Chrysomelidae	Donacia	pubescens			f	
BULK 2, 2/4	14	Hydraenidae	Ochthebius					1
BULK 2, 2/4	19	Staphylinidae	Olophrum				1	
BULK 2, 2/4	20	Staphylinidae	Olophrum				1	
BULK 2, 2/4	21	Carabidae					1	
BULK 2, 2/4	23	Curculionidae	Tanysphyrus				1	
BULK 2, 2/4	26	Hydraenidae					1	
BULK 2, 2/4	27	Chrysomelidae	Plateumaris					1
BULK 2, 2/4	28	Hydraenidae	Ochthebius				1	
BULK 2, 2/4	29	Hydraenidae	Ochthebius				1	
BULK 2, 2/4	30	Staphylinidae	Stenus					1
BULK 2, 2/4	31	Staphylinidae	Stenus				1	
BULK 2, 2/4	32	Staphylinidae	Stenus				1	
BULK 2, 2/4	33	Curculionidae	Notaris				1	
BULK 2, 2/4	35	Carabidae	Chlaenius				f	
BULK 2, 2/4	36	Chrysomelidae	Plateumaris				1	
BULK 2, 2/4	37	Carabidae	Agonum				1	
BULK 2, 2/4	38	Staphylinidae	Olophrum					1
BULK 2, 2/4	39	Carabidae	Agonum				1	
BULK 2, 2/4	40	Staphylinidae					1	
BULK 2, 2/4	41	Hydrophilidae					f	
BULK 2, 2/4	43	Staphylinidae	Stenus					1
BULK 2, 2/4	44	Hydraenidae	Ochthebius					1
BULK 2, 2/4	46	Staphylinidae	Olophrum					1
BULK 2, 2/4	48	Curculionidae	Tanysphyrus					1
BULK 2, 2/4	50	Carabidae	Bembidion	mutatum				1
BULK 2, 3/4	1	Staphylinidae	Stenus				1	
BULK 2, 3/4	2	Carabidae	Bembidion					1
BULK 2, 3/4	3	Dytiscidae	Agubus			f		
BULK 2, 3/4	6	Dytiscidae	Colymbetes				f	
BULK 2, 3/4	7	Hydraenidae	Ochthebius					1
BULK 2, 3/4	9	Hydraenidae	Ochthebius					1
BULK 2, 3/4	10	Scirtidae						1
BULK 2, 3/4	13	Hydraenidae	Ochthebius				1	
BULK 2, 3/4	14	Staphylinidae	Stenus				1	
BULK 2, 3/4	15	Hydraenidae	Ochthebius					1
BULK 2, 3/4	16	Hydraenidae	Ochthebius				f	
BULK 2, 3/4	17	Hydraenidae	Ochthebius					1
BULK 2, 3/4	18	Hydraenidae	Ochthebius				1	
BULK 2, 3/4	21	Hydraenidae	Ochthebius					1
BULK 2, 3/4	22	Hydraenidae					1	
BULK 2, 3/4	26	Staphylinidae	Stenus					1
BULK 2, 3/4	27	Hydraenidae	Ochthebius				1	

Table E.2. (continued)

UPC Interval	#	Family	Genera	Species	H	P	L	R
BULK 2, 3/4	29	Hydraenidae	Ochthebius				1	
BULK 2, 3/4	30	Hydraenidae	Ochthebius				1	
BULK 2, 3/4	35	Hydraenidae	Ochthebius				1	
BULK 2, 3/4	36	Staphylinidae	Stenus				1	
BULK 2, 3/4	38	Staphylinidae	Olophrum					1
BULK 2, 3/4	40	Staphylinidae	Aleocharinae				1	
BULK 2, 3/4	42	Staphylinidae	Stenus					1
BULK 2, 3/4	43	Staphylinidae	Stenus				1	
BULK 2, 3/4	44	Carabidae					f	
BULK 2, 3/4	45	Hydrophilidae						1
BULK 2, 3/4	46	Staphylinidae	Stenus					1
BULK 2, 3/4	47	Hydrophilidae	Cercyon					1
BULK 2, 3/4	48	Staphylinidae	Stenus					1
BULK 2, 3/4	49	Hydraenidae	Ochthebius				2	
BULK 2, 3/4	51	Staphylinidae	Olophrum					1
BULK 2, 3/4	56	Dytiscidae						f
BULK 2, 4/4	3	Staphylinidae	Stenus					1
BULK 2, 4/4	5	Hydraenidae	Ochthebius					1
BULK 2, 4/4	8	Hydrophilidae						1
BULK 2, 4/4	9	Hydraenidae	Ochthebius				1	
BULK 2, 4/4	11	Staphylinidae	Aleocharinae			1		
BULK 2, 4/4	12	Staphylinidae	Stenus				1	
BULK 2, 4/4	13	Curculionidae	Tanysphyrus				1	
BULK 2, 4/4	15	Curculionidae					f	
BULK 2, 4/4	16	Staphylinidae	Aleocharinae					1
BULK 2, 4/4	20	Staphylinidae	Stenus					1
BULK 2, 4/4	21	Staphylinidae	Stenus				1	
BULK 2, 4/4	22	Hydrophilidae	Hydrochus				f	
BULK 2, 4/4	23	Staphylinidae	Aleocharinae				1	
BULK 2, 4/4	24	Staphylinidae	Stenus				1	
BULK 2, 4/4	27	Staphylinidae	Aleocharinae				1	
BULK 2, 4/4	28	Staphylinidae	Olophrum			1		
BULK 2, 4/4	30	Hydraenidae						1
BULK 2, 4/4	31	Staphylinidae	Stenus			1		
BULK 2, 4/4	35	Staphylinidae	Stenus				1	
BULK 2, 4/4	38	Staphylinidae	Aleocharinae					1
BULK 2, 4/4	42	Staphylinidae	Stenus				1	
BULK 2, 4/4	43	Staphylinidae	Aleocharinae					1
BULK 2, 4/4	45	Staphylinidae	Stenus					1
BULK 2, 4/4	46	Staphylinidae	Stenus				1	
BULK 2, 4/4	47	Hydraenidae					1	
BULK 2, 4/4	49	Hydraenidae	Ochthebius					1
BULK 2, 4/4	50	Staphylinidae	Stenus				1	
BULK 2, 4/4	54	Dytiscidae	Colymbetes					f

H = head **P** = pronota **L** = left elytra **R** = right elytra **f** = fragment **sp.** = species
gen. indet. = genus indeterminable